TVA Safety Manual

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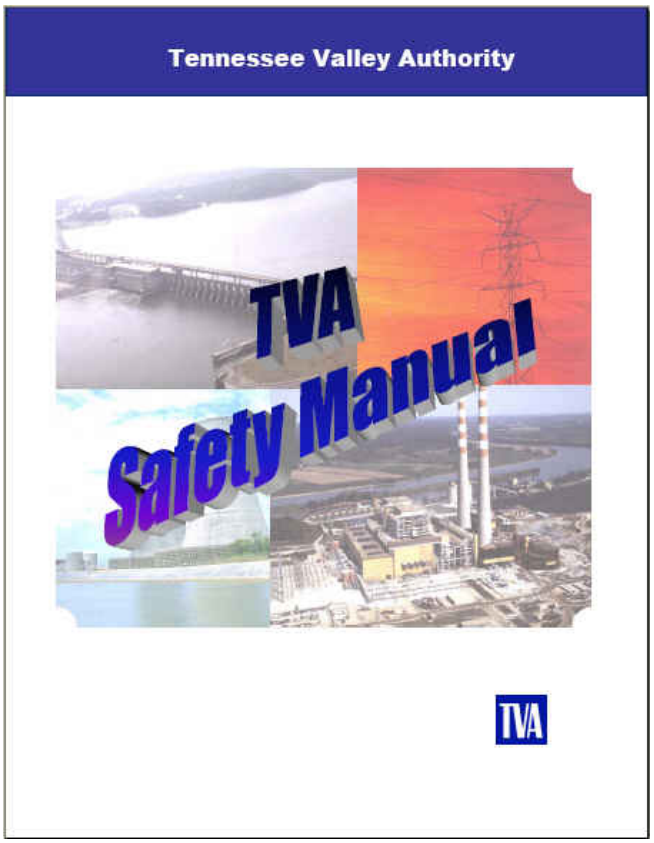


Revision Cover Sheet

Revision Log

Chapter 1 TVA Safety Program

Chapter 2 General Safety

Chapter 1 TVA Safety Program

Chapter 1 Section 1 Program

Procedure 1 TVA Safety Program

Superseded by TVA-SPP-18.0 [1]

References

[1] http://chapedmw2.cha.tva.gov/dms/pc/getdocument.asp?library=chaedmp%5echachaedmp1&idmId=101410821

Procedure 2 Develop Safety Program Documentation

Superseded by TVA-SPP-18.001 [1]

References

[1] http://chapedmw2.cha.tva.gov/dms/pc/getdocument.asp?library=chaedmp%5echachaedmp1&idmId=050490020

Procedure 3 Establish Annual Safety Goals

Superseded by TVA-SPP-18.002 (click on the SPP number to view pdf version)

Procedure 4 Implement Labor Contract Safety Requirements

Implement Labor Contract Safety Requirements (Superseded by TVA-SPP-18.003 [1])

References

[1] http://chapedmw2.cha.tva.gov/dms/pc/getdocument.asp?library=chaedmp^chachaedmp1&idmId=050560004

Procedure 5 Implement Industrial Hygiene Activities

Superseded by TVA-SPP-18.004 [1]

References

[1] http://chapedmw2.cha.tva.gov/dms/pc/getdocument.asp?library=chaedmp%5echachaedmp1&idmId=050490026

Procedure 6 Plan Jobs Safely

Superseded by TVA-SPP-18.005 [1]

References

[1] http://chapedmw2.cha.tva.gov/dms/pc/getdocument.asp?library=chaedmp^chachaedmp1&idmId=050490028

Procedure 7 Operate Certified Health & Safety Committees

Operate Certified Health and Safety Committees (Superseded by TVA-SPP-18.006 [1])

References

[1] http://chapedmw2.cha.tva.gov/dms/pc/getdocument.asp?library=chaedmp^chachaedmp1&idmId=050550001

Procedure 8 Recognize and Reward Safe Performance

Superseded by TVA-SPP-18.007 [1]

References

[1] http://chapedmw2.cha.tva.gov/dms/pc/getdocument.asp?library=chaedmp%5echachaedmp1&idmId=050490032

Procedure 9 Implement Safety Training Requirements

Superseded by TVA-SPP-18.008 [1]

References

[1] http://chapedmw2.cha.tva.gov/dms/pc/getdocument.asp?library=chaedmp^chachaedmp1&idmId=050670003

Procedure 10 Investigate Employee Hazard Identification Reports

Superseded by TVA-SPP-18.009 (click on the SPP number to view pdf version)

Procedure 11 Conduct Serious Accident Investigation

Conduct Serious Accident Investigation is superseded by TVA-SPP-18.010 [1]

References

[1] http://chapedmw2.cha.tva.gov/dms/pc/getdocument.asp?library=chaedmp^chachaedmp1&idmId=050490038

Procedure 12 Conduct Workplace Regulatory Compliance Inspections

Superseded by TVA-SPP-18.011 [1]

References

[1] http://chapedmw2.cha.tva.gov/dms/pc/getdocument.asp?library=chaedmp%5echachaedmp1&idmId=50550003

Procedure 13 Report, Investigate, and Classify Injuries and Illnesses

Report and Investigate Injuries and Illnesses (Superseded by TVA-SPP-18.012 [1])

References

[1] http://chapedmw2.cha.tva.gov/dms/pc/getdocument.asp?library=chaedmp^chachaedmp1&idmId=050490042

Procedure 14 Conduct Safety Program Assessments

Superseded by TVA-SPP-18.013 [1]

References

[1] http://chapedmw2.cha.tva.gov/dms/pc/getdocument.asp?library=chaedmp^chachaedmp1&idmId=050560002

Chapter 1 Section 2 Administrative

Procedure 201 Safety Manual

TVA Safety Manual

Procedure 202 Health and Safety Policy

TVA Safety Manual

202 Health and Safety Policy

Procedure Number 202

TVA Safety Procedure

Health and Safety Policy

Revision 0

January 06, 2003

Purpose

The purpose of this procedure is to define the Health and Safety Policy for TVA.

Health and Safety Policy

1. TVA recognizes that the health and safety of all employees is essential to the business success of TVA and is committed to providing a safe work place by eliminating dangerous conditions and developing a highly motivated, multi-skilled and trained work force.
2. TVA shall conduct its activities so as to protect the life and health of employees, contractors, visitors, and the public; and, to prevent damage to property and equipment.
3. TVA shall establish and maintain an effective and comprehensive health and safety program that complies with TVA, and federal agency health and safety requirements.
4. Health and safety shall be included in the design, construction, operations, maintenance, and modification of all TVA projects and activities.
5. TVA shall provide a work environment that protects employees from recognized hazards that may cause death or serious physical harm. Engineering controls, safety procedures, and protective equipment, shall be established for work that involves recognized accident potential. Engineering controls are the preferred means to eliminate or reduce the risk of identified hazards.
6. All levels of management and supervisors are responsible for the health and safety of their employees and for safeguarding equipment, materials, and property under their jurisdiction.
7. No TVA employee will be subject to restraint, interference, coercion, discrimination, or reprisal by virtue of his/her participation in the TVA Health and Safety Program.
8. Accident prevention is a basic responsibility of each TVA employee. As such, it will be integrated into daily activities and the effort will be managed and implemented like any other function or activity.
9. Each TVA employee is responsible for performing his/her work in a manner that protects fellow workers and members of the public. Each employee accepts this responsibility as a condition of employment.
10. Employees who are injured on the job will receive prompt medical care. Medical wage replacement benefits are provided consistent with the Federal Employees Compensation Act. Employees are returned to productive status as quickly as possible through aggressive case management.
11. Safety is a line management responsibility and line managers have appropriate authority and support to implement an effective health and safety program.
12. Priorities for developing and implementing the program are established based upon correcting the worst problems first in a cost effective manner.

13. TVA has the flexibility to implement and enforce the health and safety program consistent with TVA policy, standards, and requirements. Applicable considerations include the size, purpose, and potential hazards associated with particular activities.
14. Partners and contractors are responsible for the safety and health performance of their employees and subcontractors.
15. Partners and contractors will ensure that their employees and their subcontractors comply with appropriate health and safety standards as it relates to the type of work and contract requirements for each project.

Reference

TVA Practices and Procedures, Safety Procedure 1, TVA Safety Program

Procedure 203 Safety Awareness Bulletin

TVA Safety Manual

203 Safety Awareness Bulletin

Procedure Number 203

TVA Safety Procedure

Safety Awareness Bulletin

Revision 0

January 06, 2003

Purpose

The purpose of this procedure is to establish requirements for the development, publication and use of the Safety Awareness Bulletin.

Safety Awareness Bulletin

1. The Safety Awareness Bulletin (SAB) is established to communicate health and safety information, announcements and alerts to employees and partners.
2. COO Safety shall develop and issue SAB's as necessary and distribute to managers and supervisors included on an email distribution list. The purpose is to provide prompt communication of important safety issues.
3. An electronic copy of all SAB's shall be maintained on the Safety Resource Network (SRNet).
4. Organizations are encouraged to submit relevant health and safety information to COO Safety which they feel should be shared with other TVA organizations.

Appendix A - Safety Awarenesss Bulleting (Template)

Appendix A Safety Awareness Bulletin (Template)

Bulletin Number 03-00	January 6, 2003

Safety Awareness Bulletin

Subject: (Type Subject)

Scope

If the bulletin applies to one organization or is limited in scope define here.

This bulletin was prepared by:

Send any proposed bulletins to Senior Manager, COO Safety, LP 3A-C. Bulletins will be reviewed and approved and then distributed TVA wide and posted on the SRNet.

Senior Manager

COO Safety

Procedure 204 Employee Safety Handbook

TVA Safety Manual

204 Employee Safety Handbook

Procedure Number 204

TVA Safety Procedure

Employee Safety Handbook

Revision 0

January 06, 2003

Purpose

The purpose of this procedure is to establish requirements for the development and use of an Employee Safety Handbook.

Employee Safety Handbook

1. TVA line organizations may establish an Employee Safety Handbook (Handbook) when deemed necessary. A Handbook is a condensed, authoritative compilation of safety program information based upon requirements established in the TVA Safety Manual.
2. The TVA POST team shall be responsible for review and approval of any organization Handbook.
3. Handbooks shall be issued to employees as determined by the respective organization.
4. A current electronic copy of the Handbook shall be maintained on the Safety Resource Network (SRNet).

Organizations Establishing a Handbook

TPS

Procedure 205 Management Accountability and Responsibility for Safety and Health

TVA Safety Manual

205 Management Accountability and Responsibility for Safety and Health

Procedure Number 205

TVA Safety Procedure

Management Accountability and Responsibility for Safety and Health

Revision 0

January 06, 2003

Purpose

The purpose of this procedure is to establish management accountability and responsibility for safety and health in TVA.

Management Accountability and Responsibility for Safety and Health

1. Managers at all levels are responsible and accountable for the safety and health performance of their organizational units. Each manager or supervisor is responsible for providing for the safety and health of his/her employees and for prevention of damage to property.
2. Each manager or supervisor will convey specific safety and health responsibilities to subordinate supervisors to ensure that all levels of supervision understand their role and commitment to the prevention of accidents.
3. On a continuing basis, each manager or supervisor will evaluate and communicate to subordinate supervisors the performance of safety and health responsibilities.
4. A formal evaluation of each supervisor's safety and health performance shall be made in conjunction with the Performance Review & Development for managers and supervisors.
5. The following criteria shall also be considered as factors in management and supervisor evaluations:
   - The findings in performance audits conducted by TVA Corporate Safety in accordance with the TVA Safety Program.
   - The U.S. Department of Labor Annual Program Evaluation performed in accordance with 29 CFR 1960, "Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters".
   - Safety and health evaluations and assessments.
   - Performance relative to management responsibilities contained in the Safety Manual.
   - Statistical data depicting organization performance.
   - Accomplishment of annual safety and health goals and objectives.
   - Other evaluation criteria as defined by the plant / facility / organization manager.

Reference

TVA Practices and Procedures, Safety Procedure 3, “Annual Safety Goal Setting”

Procedure 206 Employee Responsibilities and Rights

TVA Safety Manual

206 Employee Responsibilities and Rights

Procedure Number 206

TVA Safety Procedure

Employee Responsibilities and Rights

Revision 0

January 06, 2003

Purpose

The purpose of this procedure is to establish employee responsibilities and rights relating to the TVA Safety Program.

Responsibilities and Rights

1. Each employee shall comply with the standards, rules, regulations and orders issued by TVA in accordance with section 19 Occupational Safety and Health Act of 1970, Executive Order 12196, "Occupational Safety and Health Programs for Federal Employees", and Title 29, Code of Federal Regulations, Part 1960, "Basic Program Elements for Federal Employee Occupational Safety and Health Programs" which are applicable to his/her own actions and conduct.
2. Employees shall use safety equipment, personal protective equipment, and other devices and procedures provided or directed by the agency and necessary for their protection.
3. Employees shall have the right and responsibility to report unsafe and unhealthful working conditions to appropriate officials in accordance with TVA Practices and Procedures, Safety Procedure 10, “Hazard Identification Reports”.
4. Employees shall be authorized official time to participate in the activities provided for in section 19 Occupational Safety and Health Act of 1970, Executive Order 12196, "Occupational Safety and Health Programs for Federal Employees", and Title 29, Code of Federal Regulations, Part 1960, "Basic Program Elements for Federal Employee Occupational Safety and Health Programs", and the TVA agency occupational safety and health program.
5. A representative of the official in charge of a workplace and a representative of employees shall be given an opportunity to accompany Safety and Health Inspectors during the physical inspection of any workplace, both to aid the inspection and to provide such representatives with more detailed knowledge of any existing or potential unsafe or unhealthful working conditions.
6. If there are no authorized representatives of employees, the inspector shall consult with a reasonable number of employees during the walkaround.
7. During the course of an inspection, any employee shall be afforded an opportunity to bring to the attention of the Safety and Health Inspector any unsafe or unhealthful working condition which the employee has reason to believe exists in the workplace.
8. An employee or representative of employees, who believes that an unsafe or unhealthful working condition exists in any workplace where such employee is employed, shall have the right and is encouraged to make a report of

the unsafe or unhealthful working condition to an appropriate agency safety and health official and request an inspection of such workplace for this purpose.

9. The head of each agency shall establish procedures to assure that no employee is subject to restraint, interference, coercion, discrimination or reprisal for filing a report of an unsafe or unhealthful working condition, or other participation in agency occupational safety and health program activities, or because of the exercise by such employee on behalf of himself or herself or others of any right afforded by section 19 of the Act, Executive Order 12196, or 29 CFR 1960. These rights include, among other, the right of an employee to decline to perform his or her assigned task because of a reasonable belief that, under the circumstances the task poses an imminent risk of death or serious bodily harm coupled with a reasonable belief that there is insufficient time to seek effective redress through normal hazard reporting and abatement procedures established in accordance with this part.
10. Employees shall have access to relevant health and safety information and records as specified in TVA Safety Procedure 208, “Availability of Safety and Health Information, Records and Reports for Review”.

Procedure 207 General Safety Rules and Employee Conduct

TVA Safety Manual

207 General Safety Rules and Employee Conduct

Procedure Number 207

TVA Safety Procedure

General Safety Rules and Employee Conduct

Revision 1

April 18, 2008

Purpose

The purpose of this procedure is to establish general safety rules and employee conduct.

General Safety Rules and Employee Conduct

1. All injuries, no matter how slight, shall be immediately reported to the foreman or supervisor during the shift when the injury occurred. Justification for delayed reporting shall be required from an employee who does not report an alleged occupational injury or illness immediately.
2. All employees shall know the location of emergency equipment and emergency exits for their respective work areas.
3. Possession of illegal drugs or intoxicating substances on TVA premises as well as working under their influence is prohibited.
4. Employees must not report to work under the influence of prescription or illegal [any] drugs or alcohol which will impair your ability to perform your work safely, including the operation of vehicles while on TVA business. **Note:** Specific restrictions apply to TVA nuclear plants per 10 Code of Federal Regulations 26.
5. Fighting, scuffling, threats, intimidation, and horseplay are not allowed.
6. Abuse, misuse, or unauthorized alteration of tools and equipment is prohibited.
7. Unauthorized possession of firearms, explosives, and fireworks while on TVA property is forbidden.
8. Employees having medical restrictions or limitations shall not knowingly exceed the imposed restriction or limitation. Employees shall immediately notify their supervisor whenever a medical restriction or limitation is applied and when the medical restriction is removed.
9. Employees who feel that they cannot continue to work safely because of fatigue, illness, or some other reason shall promptly report the condition to their immediate supervisor or foreman.
10. Employees shall comply with the warnings and instructions of all signs and protective tags.
11. Employees shall strictly comply with all established plant or facility rules and safety procedures.
12. Acts of employees that jeopardize their own safety or the safety of others are prohibited.
13. All electrical circuits shall be treated as energized unless they are properly cleared.
14. All pressure systems shall be treated as pressurized unless they are properly cleared and depressurized.
15. Unauthorized removal of emergency safety or fire fighting equipment, except for emergency use is prohibited.
16. Proper lifting techniques shall be used when manually handling material.
17. Employees shall wear clothing appropriate for the type of work performed and as required for high hazard work. Loose clothing, shorts or ties or the wearing of rings and wrist watches are not suitable for plant operations or

operating machinery.

18. Employees shall use the personal protective equipment specified for each job.
19. Employees creating physical hazards, such as floor openings, during their work assignments shall properly barricade and placard the hazard.
20. Employees are expected to use handrails when ascending or descending stairways.

Procedure 208 Availablility of Safety and Health Information, Records and Reports for Review

TVA Safety Manual

208 Availability of Safety and Health Information, Records and Reports for Review

Procedure Number 208

TVA Safety Procedure

Availability of Safety and Health Information, Records and Reports for Review

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish requirements for the availability of safety and health information, records and reports for review by employees.

Roles and Responsibilities

1. Each organization / plant / facility shall ensure that the safety and health material specified is available for review by employees or their authorized representatives upon their request and at times agreed to by both parties.
2. COO Safety shall have responsibility for maintaining the Safety Resource Network (SRNet) that provides electronic access to all safety and health material required to be made available for review by employees.

Safety and Health Material Available for Review

1. Details of the TVA Occupational Health and Safety Program and applicable safety and health procedures, handbooks and training materials
2. A poster informing employees of the provisions of the safety and health program and the location of relevant documents
3. TVA procedures for responding to reports by employees of unsafe or unhealthful working conditions, and to allegations of discrimination or reprisal due to participation in safety and health activities
4. Report from an investigation of a reported unsafe or unhealthful working condition (employee making the report)
5. Information about Certified Safety Committees; including notice and agenda for health and safety committee meetings and written minutes of committee meetings
6. TVA Safety Manual
7. Safety Awareness Bulletins, newsletters, etc.
8. Occupational Safety and Health Act of 1970
9. Executive Order 12196, "Occupational Safety and Health Programs for Federal Employees"
10. 29 Code of Federal Regulations, Part 1960, "Basic Program Elements for Federal Employee Occupational Safety and Health Programs"
11. Material Safety Data Sheets for all hazardous materials and written Hazard Communication Program
12. Accident logs and annual summaries
13. “TVA Notice of Unsafe and Unhealthful Working Conditions” and abatement plans

14. Access to relevant exposure and medical records and analyses
15. Emergency and fire protection plans when required by a specific OSHA standard

SRNet

The Safety Resource Network (SRNet) shall be established and maintained as a web based electronic reference for employees to access safety and health information, records, reports, procedures and standards.

Reference

29 Code of Federal Regulations 1960.12, “Dissemination of Occupational Safety and Health Program Information”

Procedure 209 Health and Safety Bulletin Boards

TVA Safety Manual

209 Health and Safety Bulletin Boards

Procedure Number 209

TVA Safety Procedure

Health and Safety Bulletin Boards

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish minimum requirements for the installation and maintenance of health & safety bulletin boards at TVA plants and facilities.

Roles and Responsibilities

1. The plant / facility manager shall be responsible for the posting and maintenance of health and safety bulletin board(s).
2. Organizational safety representatives shall provide required information and materials for posting on health and safety bulletin boards.
3. An electronic Health and Safety Bulletin Board shall be located on the Safety Resource Network (SRNet).

General Requirements

1. Each plant / facility shall establish a Health and Safety Bulletin Board in a conspicuous location.
   Note 1: In some cases more than one bulletin board may be necessary.
   Note 2: Where employees have access to computers bulletin boards are not required in the workplace.
2. The bulletin board shall be used only for the posting of information related to health and safety.
3. Material placed on the bulletin board shall not be altered, defaced, or covered by other material.
4. All employees shall be informed of the exact location of the bulletin board.

Material Posted on Health and Safety Bulletin Boards

1. **TVA Safety Information** poster informing employees of the provisions of the OSHAct, Executive Order 12196, and the TVA occupational health and safety program
   Posted permanently The following items shall be included on the poster:
   - TVA procedures for responding to reports by employees of unsafe or unhealthful working conditions, and to allegations of discrimination or reprisal due to participation in safety and/or health activities;
   - The location where employees may obtain information about TVA's occupational health and safety program, including the full text of TVA health and safety procedures, and
   - Relevant information about health and safety committees.
2. **OSHA Annual Summary of Injuries**
   Posted for 30 days in each plant or major facility and on the SRNet Health and Safety Bulletin Board. This summary is required to be posted each year

3. **Notice of Unsafe or Unhealthful Working Conditions**
   Posted for a minimum of three working days or until the condition is corrected/abated
4. **Abatement Plans**
   Post for those conditions listed in the "Notice of Unsafe or Unhealthful Working Conditions" that cannot be corrected in the required time. Abatement plans shall be posted until the condition is abated.
5. **Hazard Identification Report forms (TVA form 18090)**
   Posted permanently or located where they are easily accessible 24 hours a day (SRNet)
6. **Safety Awareness Bulletins**
   Temporary posting 30 days
7. **Plant emergency evacuation procedures**
   Posted permanently
8. **Safety posters provided for promotional activities**
   Temporary posting 30 to 60 days
9. **Plant health and safety committee meeting minutes**
   Temporary posting 30 days
10. **Accident reporting procedure**
    Posted permanently

References

29 Code of Federal Regulations 1960, “Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters”;

29 Code of Federal Regulations 1960.12, “Dissemination of Occupational Safety and Health Program Information”

Appendix A - Guidelines for Posting Information on Health & Safety Bulletin Boards

Procedure 210 Safety Resource Network (SRNet)

TVA Safety Manual

Procedure 211 Central Safety Management Review Team

Procedure 212 Programs and Activities Team

TVA Safety Manual

212 Programs and Activities Team

Procedure Number 212

TVA Safety Procedure

Programs and Activities Team

Revision 1

April 30, 2007

Purpose

The purpose of this procedure is to establish a Programs and Activities Team (PAT) to provide and develop health and safety programs, promotional activities, encourage employee awareness / participation in health and safety issues and improve performance.

Roles and Responsibilities

The plant / facility / regional / organization manager is responsible for the establishment of the PAT and for designating members of the team.

Programs and Activities Team (PAT)

1. Each plant / facility / region / organization should establish a safety PAT.
2. A written charter shall be prepared that formally establishes a safety PAT for the plant / facility / region / organization and defines the administration and role of the team in the health and safety program.
3. The safety PAT shall consist of a number of employees and supervisors appointed by the plant / facility / regional / organization manager. The number of team members is determined at the discretion of the plant / facility region / organization manager, but typically may number from 4 to 6. Representatives shall be rotated periodically to ensure greater employee involvement and participation.
4. The plant / facility / region / organization manager shall designate a chairperson for the safety PAT.
5. The safety PAT shall meet at least quarterly according to a prepared agenda.
6. The chairperson of the PAT shall regularly attend and present a summary of the PAT's activities to the Central Safety Management Review Team (CSMRT).
7. Written minutes shall be prepared and published for each safety PAT team meeting.
8. Special meetings may be called at the discretion of the chairperson of the safety PAT.

Role of the Programs and Activities Team

1. The PAT team role is to encourage management and employee interest and participation in improving health and safety performance. The PAT will develop plant / facility-wide safety themes, publications, and special activities.
2. The PAT performs the following specific duties:
   - Develop an annual safety theme and a corresponding promotional program.
   - Assist the line organization in developing material for safety meetings.
   - Assess the effectiveness of safety programs and develop new programs as needed.
   - Develop incentive and awards programs.
   - Publicize the safety program through use of posters, bulletins boards, contests, publications, etc.
   - Promote special safety program activities such as the sale of safety equipment to employees, recognition of site safety records, etc.
   - Promote off-the-job safety as an integral part of the safety program.

Appendix A - Programs and Activities Team Charter

PROGRAM AND ACTIVITIES TEAM CHARTER

Purpose

The Programs and Activities Team (PAT) team is established to encourage management and employee involvement and participation in improving health and safety performance. The safety PAT will develop plant / facility-wide safety themes, publications, and special activities in order to meet its objective. The activities of this team are reviewed by the Central Safety Management Review Team (CSMRT).

The PAT performs the following specific duties:

- Develop an annual safety theme and corresponding promotional program.
- Assist the line organization in developing material for safety meetings.
- Assess the effectiveness of safety programs and develop new programs as needed.
- Develop local incentive and awards programs.
- Publicize the safety program through use of posters, bulletins boards, contests, publications, etc.
- Promote special safety program activities such as the sale of safety equipment to employees, recognition of site safety records, etc.
- Promote off-the-job safety as an integral part of the safety program.

Organization

The safety Program and Activities Team consists of members appointed by the plant / facility / region / organization manager and includes representatives of major organizations. A team chairman shall be designated. Members of the team shall be rotated periodically to ensure greater participation among employees.

Meetings

The PAT meets at least quarterly on a fixed schedule. The chairman or his/her alternate represents the PAT in the CSMRT meetings and activities.

Procedure 213 Rules and Procedures Team

TVA Safety Manual

213 Rules and Procedures Team

Procedure Number 213

TVA Safety Procedure

Rules and Procedures Team

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish use of a Rules and Procedures Team (RPT) to develop / review safety rules and procedures to improve health and safety performance. The RPT develops site safety rules and procedures and assists in the implementation of TVA safety procedures.

Rules and Procedures Team (RPT)

1. Each plant / facility / region / organization shall establish a safety RPT.
2. A written charter shall be prepared that formally establishes a safety RPT for the plant / facility / region / organization and defines the administration and role of the team in the health and safety program.
3. The safety RPT shall consist of a number of employees and supervisors appointed by the plant / facility / regional / organization manager. The number of team members is determined at the discretion of the plant / facility / regional / organization manager, but typically may number from 4 to 6. Representatives shall be rotated periodically to ensure greater employee involvement and participation.
4. The plant / facility / regional / organization manager shall designate a chairperson for the safety RPT.
5. The safety RPT shall meet at least quarterly according to a prepared agenda.
6. The chairperson of the RPT shall regularly attend and present a summary of the RPT's activities to the Central Safety Management Review Team (CSMRT).
7. Written minutes shall be prepared and published for each safety RPT team meeting.
8. Special meetings may be called at the discretion of the chairperson of the safety RPT.

Role of the Rules and Procedures Team

1. The RPT team role is to develop site safety rules and procedures and assist in the implementation of TVA safety procedures.
2. The RPT performs the following specific duties:
   - Review implementation of existing safety procedures for effectiveness.
   - Assist the line organization in developing safe work rules and procedures.
   - Identify the need for and develop safety rules for specific plant activities..
   - Develop a feedback process from employees regarding effectiveness of safe work rules.
   - Periodically review plant / facility safety rules and procedures for effectiveness.
   - Review compliance with TVA Safety Procedures.

Appendix A - Rules and Procedures Team Charter

RULES AND PROCEDURES TEAM CHARTER

Purpose

The Rules and Procedures Team (RPT) is established to develop site safety rules and procedures and assist in the implementation of TVA safety procedures. The activities of this team are reviewed by the Central Safety Management Review Team (CSMRT.

The RPT performs the following specific duties:

- Review implementation of existing safety procedures for effectiveness.
- Assist the line organization in developing safe work rules and procedures.
- Identify the need for and develop safety rules for specific plant activities..
- Develop a feedback process from employees regarding effectiveness of safe work rules.
- Periodically review plant / facility safety rules and procedures for effectiveness.
- Review compliance with TVA safety procedures.

Organization

The safety Rules and Procedures Team consists of _____ members appointed by the plant / facility / region / organization manager and includes representatives of major organizations. A team chairman shall be designated. Members of the team shall be rotated periodically to ensure greater participation among employees.

Meetings

The RPT meets at least quarterly on a fixed schedule. The chairman or his/her alternate represents the RPT in the CSMRT meetings and activities.

Procedure 214 Chemical Hygiene for Laboratories

TVA Safety Manual

214 Chemical Hygiene for Laboratories

Procedure Number 214

TVA Safety Procedure

Chemical Hygiene for Laboratories

Revision 2

November 01, 2005

Purpose

The purpose of this procedure, “Chemical Hygiene for Laboratories” is to establish requirements to ensure that laboratory workers are protected from health hazards associated with hazardous chemicals used in laboratories.

This procedure defines requirements for safe operation and maintenance of laboratories; protective equipment; laboratory emergency situations; use of personal protective equipment, availability of medical consultation and examination following chemical exposure; training; and program records.

Roles and Responsibilities

1. Plant / facility managers ensure that each laboratory, which uses hazardous substances, has adopted the “Chemical Hygiene for Laboratories”; and shall appoint a Chemical Hygiene Officer.
2. The Chemical Hygiene Officer and managers responsible for supervising laboratories have the following responsibilities for implementing “Chemical Hygiene for Laboratories”:
   - Inform and train employees concerning chemical safety.
   - Implement and enforce rules and standards concerning health and safety for laboratories under supervisor's jurisdiction;
   - Ensure compliance of laboratory workers with this procedure;
   - Ensure the availability and enforce the use of: appropriate personal protective equipment;
   - Remain cognizant of chemicals stored and used in labs and their associated hazards;
   - Maintain a library of manufacturer's Material Safety Data Sheets (MSDS) and other laboratory and chemical safety literature; and,
   - Conduct internal inspections of labs for health and safety concerns;
3. Employee responsibilities regarding implementation of “Chemical Hygiene for Laboratories”:
   - Follow all health and safety standards and rules;
   - Report all hazardous conditions to the supervisor;
   - Wear or use prescribed protective equipment;
   - Report any job-related injuries or illnesses to the supervisor and seek treatment immediately;
   - Refrain from the operation of any equipment or instrumentation without proper instruction and authorization;
   - Remain aware of the hazards of the chemicals in the lab and how to handle hazardous chemicals safely.

Permissible Exposure Limits

For laboratory uses of OSHA-regulated substances, laboratory employees' exposure shall not exceed the permissible exposure limits specified in 29 Code of Federal Regulations, Part 1910, Subpart Z.

Standard Operating Procedures

1. Employees shall wear safety glasses with side shields, goggles, or face shields at all times where eye hazards are a possibility. Goggles or faceshields are recommended when chemical splashes are possible.
2. Employees must wear a lab coat or apron, cover legs, confine loose clothing and long hair when working with corrosive, toxic, or reactive chemicals.
3. Athletic shoes or shoes with comparable ventilation holes, sandals, or open-toed shoes must not be worn in the laboratory.
4. When handling corrosive, toxic, or reactive chemicals, appropriate gloves shall be worn. The gloves shall be in good condition with no holes or tears in them. Hands should be washed frequently, before leaving the lab, after contact with any hazardous material, and before eating.
5. All broken glassware shall be immediately disposed of in UL approved (puncture resistant / closable / leak-proof / labeled / color coded) containers to avoid injuring laboratory personnel and potentially exposing them to chemical contact.
6. Only the suction devices designed for use with pipettes shall be used in pipetting liquids. Mouth suction for pipetting or initiating a siphon is strictly forbidden.
7. All personnel performing laboratory analyses shall wash exposed areas of skin, primarily arms and hands, thoroughly with soap and water at the completion of bench work, before eating, and/or before leaving the laboratory.
8. Laboratory bench areas shall be kept clean of any equipment, glassware, chemicals, etc., except what is actually needed to perform an analyses. Laboratory bench and/or fume hood work stations for each type of analyses routinely performed is highly recommended if space is available.
9. To the maximum extent possible, all chemical handling, transfers, etc., should be performed in laboratory fume hood(s).
10. The laboratory should be cleaned up and equipment, glassware, and chemicals stored in their proper areas at the end of each shift.
11. If a toxic/hazardous chemical has made contact with the skin, start flushing the area immediately.
12. Access to electrical equipment, shut-offs e.g. plugs, switches and electrical panels must be maintained free from obstructions to allow immediate access in an emergency. All receptacle outlets in laboratory spaces shall be the polarized grounding type. Ground Fault Circuit Interrupters (GFCI's) shall be used in those locations involving wet processes or outdoor work. All electrical hand tools used inside laboratories shall be grounded or double insulated.
13. Eating, drinking and the application of cosmetics is forbidden in areas where hazardous chemicals are used and shall be done only in well-defined designated non-chemical areas. Do not store food in the same refrigerator with chemicals, biohazards or radioactive materials. Eating and drinking may be done at a personnel desk in laboratories, provided these desks are not used for any chemical storage or operations.
14. If perchloric acid is heated above ambient temperature it will give off vapors that can condense and form explosive perchlorates. Hence, when heating perchloric acid above ambient temperature, a perchloric acid fume hood with a wash down system or a local scrubbing or trapping system must be used.
15. Laboratories where hazardous materials or operations are present must follow TVA signage guidelines. An annually updated emergency contact list must be posted for each laboratory
16. No smoking in laboratories.

Laboratory Safety Equipment

Laboratory equipment shall typically include:

- Fume hood (at least one per laboratory) for use in preparing corrosive or toxic solutions and which is vented either directly to the outside away from personnel areas or to the building vent where it is diluted and vented to the outside and not to a personnel area in the building.
- An eyewash station (at least one per laboratory) shall be permanently installed to a potable water supply. A pressurized, portable eyewash kit may be used until permanent facilities are installed.
- A safety shower shall be installed in the laboratory and readily accessible to laboratory personnel. Eye washes and safety showers shall be tested once per month as a minimum to ensure full flow and to clear the lines of stale water and debris. An inspection log shall be maintained in the laboratory to note the date of the test and any operational problems noted with corrective action taken.
- Fire extinguishers (at least one per laboratory) equipped to extinguish chemical fires.
- Blanket for use in smothering fire on personnel.

Laboratory Equipment Maintenance

1. Laboratory fume hoods shall be maintained in a neat and orderly manner, and all chemical spills shall be cleaned up immediately in the prescribed manner.
2. The face velocity of the fume hood used for non-carcinogenic hazardous chemicals shall be maintained at 100 linear feet per minute (lfpm) or greater.
3. The face velocity shall be verified to be in the above range at least annually using an appropriate velometer.
4. If the performance of the hood decreases significantly but still meets applicable criteria, notify responsible manager.
5. If the fume hood does not meet applicable criteria, an immediate evaluation shall be made to correct the deficiency.
6. The face velocity of the fume hood for carcinogenic materials are recommended to be maintained at least 150-200 linear feet per minute (lfpm).
   NOTE: Non-mandatory guideline recommended by OSHA.
7. The hoods shall be marked with an arrow indicating the maximum sash height required to maintain optimum face velocity.

Corrosive Chemicals

1. These chemicals include most acids and bases.
2. These chemicals can cause severe chemical burns when in contact with the eyes or skin. Hydrofluoric acid, in particular, will cause severe burns going deep under the skin. There is very little pain following immediate contact; however, this pain will be very intense one to two hours after contact.
3. These chemicals are oily and therefore will cause a tripping hazard if spilled on the floor in addition to body damage from contact.
4. In addition to being corrosive, strong mineral acids (sulfuric, hydrochloric, fluoric, phosphoric, nitric, and glacial acetic acids) are strong oxidizing agents and should not be stored near organic chemicals or used near paper, rubber, or wood products.
5. All concentrated, liquid acids and bases shall be transported from one storage area to another using plastic containers to minimize spill hazards.
6. Following a transfer of corrosive liquids from one container to another, inspect both containers and remove any spilled liquid from the container exterior.
7. For corrosive chemicals with a high vapor pressure such as hydrochloric acid and ammonia, wash exposed skin after handling these chemicals.

Organic Solvents

1. Most organic solvents are high in vapor pressure and should be handled in the fume hood. Also, many solvents, particularly the non-halogenated ones, are flammable and shall be handled accordingly.
2. Exposure to halogenated (chloride, iodide, bromide, fluoride) organics on a long-term basis can result in damage to the central nervous system, liver, and kidneys. Exposure to flame or high temperature can result in breakdown of halogenated compounds into acid vapors, e.g., hydrochloric acid. Symptoms due to overexposure to halogenated compounds may be delayed for several hours.
3. Exposure to organic compounds in general can result in headaches, dizziness, nausea, tingling in the extremities, drowsiness, etc. Symptoms of overexposure to non-halogenated chemicals may disappear following removal to fresh air.

Reactive Chemicals (Oxidizing Agents)

1. Reactive chemicals are primarily related to strong oxidizing agents in addition to the strong mineral acids mentioned above. These strong oxidizing agents include chromates, permanganates, bromates, hydrogen peroxide, etc. These strong oxidizing agents are very reactive with organic materials and may result in explosions.
2. These oxidizers are corrosive and some, such as chromates, are not only toxic but carcinogenic.
3. Oxidizers should be used with caution as they are corrosive and may cause skin and eye damage only slightly less than strong mineral acids.

Labels

1. All chemical containers must be labeled. All labels must be legible, in English and include chemical/product name and information related to relevant hazards.
2. Labels on incoming containers must not be removed or defaced. Date all chemicals which may become unstable over time (e.g. picric acid, ethers); test and/or dispose of them when appropriate. Waste chemical containers must be clearly marked “Hazardous Waste” indicating specific name of waste chemical and date when full.
3. Label all secondary containers with the chemical name and appropriate hazards

Hazardous Material Handling and Storage

1. Only approved chemicals should be maintained by each plant's chemical laboratory.
2. Only the minimum amount of chemicals should be procured to avoid maintaining excessive amounts in the laboratory and plant power stores which could cause future disposal problems. The laboratory staff should be familiar with the rate of chemical use and determine the lowest maximum/minimum amounts to maintain.
3. Encourage the use of poly coated bottles or use bottle carriers for transporting chemicals which are in regular glass containers. Close caps securely and avoid storing chemical containers in hard to reach areas. Pour chemicals carefully, and never add water to concentrated acid. Metal containers and non-conductive containers (e.g., glass or plastic) holding more than five gallons must be grounded when transferring flammable liquids.
4. Chemicals should be segregated by hazard classification, and incompatibles should not be stored together. Basic segregation may be:

oxidizers	away from	organic
air/water reactive	away from	air and water
caustics	away from	acids
cyanides	away from	acids

5. Laboratories with large numbers of hazard classifications may choose to further segregate mineral / organic acids, unstable compounds, heat sensitive compounds, gases, etc. Volatile toxic substances shall be stored in volatile storage cabinets adequate to the purpose, or in hoods when cabinets are unavailable. Flammable materials must be stored in appropriate, labeled containers, in safety cans and Department of Transportation (DOT) approved containers. If in a substantial amount, waste solvents should be stored in poly containers. Waste halogenated solvents may not be stored in metal safety cans due to corrosion. If volatile substances are stored in a hood, other uses of the hood shall be restricted to activities compatible with the chemical and physical properties of the stored or used chemicals.
6. Reagent chemicals should be stored according to hazardous classifications. Corrosive chemicals should be stored in reagent cabinets especially designed for that purpose. However, acids and bases shall be maintained in separate cabinets to avoid accidental contact.
7. Reactive, flammable reagent chemicals shall be stored in cabinets especially designed for these types of chemicals.
8. All other concentrated reagent chemicals not requiring the special storage requirements above should be stored in a central location for ease of control. Diluted reagent solutions should be maintained in the area where the related analyses are performed.
9. Check the integrity of containers. Observe compatibility, for example, hydrofluoric acid shall not be stored in glass and some oxidizers shall not be stored in plastic containers.
10. Compressed gas cylinders must be stored in well ventilated areas with their protective caps screwed on and the cylinder secured (e.g., strapped or chained down) to reduce the chance of the cylinder being knocked over.
11. Do not store cylinders near heat or high traffic areas.
12. Do not store flammables and oxidizers together.
13. Do not store empty and full cylinders together. Storage of large quantities of cylinders must be done in an approved gas cylinder storage area.
14. Use appropriate hand carts to move cylinders. Cylinders must be secured to the cart during transport. Highly toxic gases should not be moved through the corridors, particularly during business hours.
15. Always consider cylinders as full and handle them with corresponding care.

Fume Hoods and Other Engineering Controls

1. Fume hoods and other engineering controls such as vented gas cabinets should be surveyed annually by the contracted industrial hygiene partner, with a written report of the results maintained by the supervisor of the lab.
2. Because the status of the fume hood can change within one year, continuous air flow indicators are recommended. New fume hoods should be equipped with air flow monitoring devices which will alert the user if there is a problem with air flow. For older hoods without air flow monitoring devices, a simple visible test to ensure flow into fume hoods and other ventilating devices is to tape a tissue to the hood and note its movement when the exhaust fan is turned on.
3. Protective equipment other than fume hoods should be checked periodically by the laboratory supervisor to ensure that the equipment is functioning properly.

Chemical Disposal

All chemical disposal shall be in accordance with Material Safety Data Sheets and established chemical traffic control programs and site environmental release (NPDES) limits.

Medical Consultation

All laboratory staff will be informed of and given the opportunity to receive medical consultation and/or examination to include follow-up examinations, if required, under the following conditions:

- Development of signs or symptoms associated with exposure to a hazardous chemical;
- When laboratory exposure monitoring indicates possible exposure levels above Personnel Exposure Limits;
- Whenever a leak, spill, explosion, fire, or comparable event occurs which could result in personnel exposure to hazardous chemicals

Employee Information and Training

1. All individuals who work in TVA laboratories who may be exposed to hazardous chemicals shall be informed of the hazards of chemicals present in their work area and shall receive training course “Chemical Hygiene Orientation”, ATIS 00059108. THIS INFORMATION AND TRAINING MUST BE PROVIDED BEFORE INITIAL ASSIGNMENT AND BEFORE NEW EXPOSURE SITUATIONS.
2. Laboratory workers shall be informed of the location and availability of the following:
   - 29 Code of Federal Regulations 1910.1450, "Occupational Exposures to Hazardous Chemicals in Laboratories" (the Occupational Safety and Health Administration (OSHA) Lab Standard);
   - “Chemical Hygiene for Laboratories” This procedure shall be reviewed by all laboratory workers prior to the commencement of lab duties at TVA Labs and reviewed annually by the Chemical Hygiene Officer.
   - Reference materials on chemical safety, including Material Safety Data Sheets (MSDS) must be immediately available,
   - Permissible exposure limits (PEL) for OSHA regulated substances, or if there is no applicable OSHA standard, the recommended exposure limits or threshold limit value (TLV) may be provided; and,
   - Signs and symptoms associated with exposure to the hazardous chemicals found in the lab.
3. Training shall be provided to the plant / facility laboratory staff by the plant / facility Chemical Hygiene Officer on the following specific areas:
   - The harmful and hazardous properties of all chemicals used by the plant / facility laboratory and the related probable physical problems related to exposure to these chemicals. This training will include the type of information listed on each chemical's MSDS.
   - Laboratory safety practices related to the use of these chemicals to include their storage and disposal.
   - Laboratory spill control and cleanup.
   - Laboratory fire prevention and control.
   - Medical examination and consultation services available to the employee following exposure or expected exposure to hazardous laboratory chemicals.

Laboratory Emergencies

1. Each plant / facility laboratory shall maintain equipment readily available for cleaning up spills. This equipment may include commercially packaged chemical spill kits, absorbents, receptacles for the spilled chemical plus spent absorbent(s).
2. ALL CHEMICAL SPILLS SHALL BE CONTAINED AND CLEANED UP IMMEDIATELY.
3. The spill area shall be declared off-limits except those responsible for the cleanup operations. For other than small spills or spills involving small volumes of dilute chemicals, e.g., a 2-liter bottle of concentrated sulfuric acid, the spill shall be reported to the responsible manager / supervisor.
4. Any personal skin or eye contact of the chemical either as a result of the spill or during cleanup, shall be immediately reported and treated.
5. Following spill cleanup, the area shall be inspected thoroughly to ensure that all of the chemical has been removed from laboratory surfaces.
6. All laboratories should post or have readily available a poison prevention and treatment table.

Records

The following records and information shall be maintained by each plant / facility:

- MSDS for each chemical used in the laboratory available to the laboratory staff;
- Documentation of personnel exposure events (above PEL), laboratory spills, and/or laboratory fires.
- Documentation to include dates of any required inspection and testing associated with laboratory test equipment to include fume hoods, personnel showers, eyewash stations, and fire extinguishers.
- Documentation of training in ATIS.
- Copies of medical examinations and consultations by physicians with employees that are not considered to violate employee-physician confidentiality.

Definitions

Action Level - A concentration designated in 29 CFR Part 1910 for a specific substance, calculated as an eight-hour, time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.

Acute Effect - An adverse effect with severe symptoms occurring very quickly, as a result of a single excessive exposure to a chemical substance.

Asphyxiate - A vapor or gas that can cause unconsciousness or death by suffocation due to the lack of oxygen.

Carcinogen - A chemical substance capable of causing cancer in mammals.

Chemical Hygiene Officer - An employee who is designated by the plant / facility manager, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of "Chemical Hygiene for Laboratories".

Chronic Effect - An adverse effect with symptoms that develop or recur very slowly, or over long periods of time.

Combustible - A term used to classify liquids, gases, or solids that will burn readily. Combustible liquids have flash points at or above 100°F, but below 200°F.

Corrosive - A material with the chemical characteristic of causing tissue destruction or burns to human skin, eyes, throat, lungs, or other body tissue it contacts.

Decomposition - the breakdown of materials or chemicals in other substances or parts of a compound. This usually occurs as a result of a chemical reaction or heat.

Dermatitis - Inflammation of the skin. It may be seen as redness, swelling, or a rash.

Explosive - A chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

Exposure - When a person is subjected to a chemical through inhalation, ingestion, or contact.

Flammable - Any liquid that has a flash point below 100°F. Also, any gas or solid which can sustain fire and ignite readily.

Flash Point - The lowest temperature at which a liquid gives off enough vapors to make a mixture in air that will burn. The lower the flash point of a chemical, the greater the fire hazard.

Hazardous Chemical - Any chemical for which there is significant evidence that acute or chronic health effects may occur in exposed employees.

Laboratory - a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

Laboratory workers - an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments

Material Safety Data Sheets (MSDS) - The manufacturer's written or printed material concerning a hazardous chemical. MSDSs are available through the Company Hazard Communication Program MSDS data base.

Medical Consultation - A consultation which takes place between an employee and a licensed physician for the purpose of determining what medical examinations or procedures, if any, are appropriate in cases where a significant exposure to a hazardous chemical may have taken place.

Physical Hazard - A chemical for which there is evidence that it is a combustible liquid, a compressed gas, an explosive, an oxidizer, flammable, unstable, or water-reactive.

Reproductive Toxins - Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

Select Carcinogen - Any substance which meets one of the following criteria:

- It is regulated by OSHA as a carcinogen; or
- It is listed under the category "known to be carcinogens" in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or
- It is listed under Group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC) (latest editions); or
- It is listed in either Group 2A or 2B by IARC or under the category "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals.

Sensitizer - A substance which on first exposure causes little or no reaction; however, with repeated exposure, will induce a marked response not necessarily limited to the exposure site. Usually associated with skin sensitization.

Vapor Pressure - A number used to describe the pressure that a saturated vapor will exert on top of its own liquid in a closed container. Usually, the higher the vapor pressure, the lower the boiling point and, therefore, the more dangerous the chemical can be, if flammable or toxic.

Water-Reactive - A chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

References

29 Code of Federal Regulations 1910.1450, "Occupational Exposures to Hazardous Chemicals in Laboratories"

Material Safety Data Sheets (MSDS) for each chemical used.

Appendix A - NFPA Hazard Identification System

NFPA Hazard Identification System

This appendix provides hazard rating information for many common chemicals. Use this reference to complete the health, fire, reactivity, and special notice areas in the diamond.

Health Hazard (Blue Diamond)

0	Material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible material.
1	Material that on exposure would cause irritation but only minor residual injury.
2	Material that on intense or continued but not chronic exposure could cause temporary incapacitation or possible residual injury.
3	Material that on short exposure could cause serious temporary or residual injury.
4	Material that on very shot exposure could cause death or major residual injury.

Flammability (Red Diamond)

0	Material will not burn.
1	Material must be pre-heated before ignition can occur.
2	Material must be moderately heated or exposed to relatively high ambient temperature before ignition can occur.
3	Liquids and solids that can be ignited under almost all ambient conditions.
4	Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature, or that are readily dispersed in air and that burn rapidly.

Reactivity (Yellow Diamond)

0	Material that in itself is normally stable, even under fire exposure conditions, and is not reactive with water.
1	Material that in itself is normally stable, but which can become unstable at elevated temperatures and pressures.
2	Material that readily undergoes violent chemical change at elevated temperatures and pressures or which reacts violently with water or which may form explosive mixtures with water.
3	Material that in itself is capable of detonation or explosive decomposition or reaction but requires a strong initiating source or which must be heated under confinement before initiation or which reacts explosively with water.
4	Material that in itself is readily capable of detonation or of explosive decomposition or reaction at normal temperatures and pressures.

Special Notice (White Diamond)

OX	Denotes materials that are oxidizing agents. These compounds give up oxygen easily, remove hydrogen from other compounds or attract negative electrons.
W	Denotes materials that are water reactive. These compounds undergo rapid energy releases on contact with water.

Procedure 215 Hazard Assessment/Evaluation

TVA Safety Manual

215 Hazard Assessment/Evaluation

Procedure Number 215

TVA Safety Procedure

Hazard Assessment / Evaluation

Revision 0

January 06, 2003

Purpose

This safety procedure establishes requirements for performing a hazard assessment and evaluation of personal protective equipment (PPE).

Controlling Hazards

Organizations and employees should not rely exclusively on PPE for protection from hazards. PPE should be used, where appropriate, in conjunction with engineering controls, guards, and safe work practices and procedures.

Assessment and Selection

Plants and facilities need to consider certain general guidelines for assessing the hazardous situations that are likely to arise under foreseeable work activity conditions and to match employee PPE to the identified hazards.

Assessment Process

1. Hazard Assessment Evaluations shall be conducted by qualified TVA safety professionals along with responsible plant / facility / organization managers. (See section 5 for requirements to reassess)
2. Conduct a walk-through survey of the plant / facility to identify sources of hazards.
3. Categories for consideration:
   - Impact
   - Penetration
   - Compression (roll-over)
   - Chemical
   - Heat
   - Harmful dust
   - Non-ionizing radiation
   - Drowning
   - Falling
4. During the walk-through survey observe:
   - Sources of motion
   - Sources of high temperatures that could result in burns
   - Types of chemical exposures
   - Sources of harmful dust
   - Sources of light radiation, e.g., welding, cutting, and high intensity lights

- Sources of falling objects or potential for dropping objects
- Sources of sharp objects which might pierce or cut the hands and body
- Sources of rolling or pinching objects which could crush the feet
- Layout of work place and location of co-workers
- Electrical hazards
- Review injury/accident data to help identify problem areas

5. Following the walk-through survey, it is necessary to organize the data and other information obtained. That material provides the basis for hazard assessment that enables the manager / supervisor to select the appropriate PPE.
6. Having gathered and organized data, TVA safety professionals and supervisors shall estimate the potential for injuries. Each of the identified hazards shall be reviewed and classified as to its type, the level of risk, and the seriousness of any potential injury.
7. Where it is foreseeable that an employee may be exposed to several hazards simultaneously, the consequences of such exposure shall be considered.
8. After completion of the survey, the general procedure for selection of protective equipment is:
   - Become familiar with the potential hazards and the types of protective equipment that are available, and what they can do; for example, splash protection, and impact protection;
   - Compare the hazards associated with the environment; for instance, impact velocities, masses, projectile shapes, non-ionizing radiation intensities, with the capabilities of the available protective equipment;
   - Select the protective equipment which ensures a level of protection greater than the minimum required to protect employees from the hazards; and
   - Fit the user with the protective device and give instructions on care and use of the PPE.
9. It is very important that users be made aware of all warning labels and limitations of their PPE.

Reassessment of Hazards

1. Compliance with the hazard assessment requirements will involve the reassessment of work activities where changing circumstances make it necessary.
2. A qualified person should reassess the hazards of the work activity area as necessary. This reassessment should take into account changes in the workplace or work practices, such as those associated with the installation of new equipment, and the lessons learned from reviewing accident records, and a reevaluation performed to determine the suitability of PPE selected for use.

Specific Assessment Requirements

1. A Hazard Assessment / Evaluation shall be conducted and documented for eye and face hazards.
2. A Hazard Assessment / Evaluation shall be conducted and documented for head hazards.
3. A Hazard Assessment / Evaluation shall be conducted and documented for hand hazards.
4. A Hazard Assessment / Evaluation shall be conducted and documented for foot hazards.
5. A Hazard Assessment / Evaluation shall be conducted and documented for respiratory hazards.

Records

A copy of the Hazard Assessment Evaluation shall be maintained at each plant / facility and a copy shall be sent to the responsible TVA safety professional. Copies of these evaluations shall be maintained electronically.

Procedure 216 Hazard Communication

TVA Safety Manual

216 Hazard Communication

Procedure Number 216

TVA Safety Procedure

Hazard Communication

Revision 2

November 01, 2005

Purpose

The purpose of this procedure is to provide a written hazard communication program which establishes workplace requirements for the safe use, proper storage and disposal of chemicals and hazardous materials.

This procedure provides a process for implementing requirements of 29 Code of Federal Regulations 1910.1200, "Hazard Communication". The Hazard Communication Standard (HCS) is based on the concept--that employees have both a need and a right to know the hazards and identities of the chemicals they are exposed to when working.

Roles and Responsibilities

1. Each plant / facility / regional / group manager has overall responsibility for the administration of and compliance with the Hazard Communication Program at their respective plant / facility.
2. The plant / facility / regional / group manager shall appoint a designated person at their respective plant / facility with responsibility for chemical traffic control and hazard communication issues.
3. Responsibilities of the hazard communication program designee shall include:
   - coordinating approval of purchases of new chemicals,
   - coordinating the maintenance of the site specific List of Hazardous Chemicals (including information required for environmental chemical tracking and reporting),
   - ensuring a copy of all MSDS are sent to the TVA Service Center for inclusion in the Electronic Document Management System (EDMS),
   - ensuring preferable substitutes are used whenever possible and acceptable to primary users,
   - determining use restrictions where applicable for stored items,
   - ensuring that information and copies of MSDS are provided to employees when requested
4. Each manager / first line supervisor shall be responsible for surveying their areas of responsibility to ensure an annual review of hazardous chemicals used by their organization is conducted.
   - It is recommended that the hazardous chemical review be conducted during January – March, each year.
   - The survey shall include the entire plant / facility / site.
   - The review is used to update the plant / site List of Hazardous Chemicals and is provided to the hazard communication program designee for updating the chemical list.
   - Each manager / supervisor shall be responsible for forwarding copies of MSDS on any new products to the plant / site hazard communication program designee for inclusion in the List of Hazardous Chemicals, the TVA Service Center, (WT CP-K) for inclusion in the Electronic Document Management System (EDMS).
5. At least annually each manager / supervisor shall determine whether the chemicals in his/her work and storage areas are actually needed for current activities. The entire plant / facility shall be included in this assessment.

Chemicals identified as unnecessary or no longer used shall be disposed of in accordance with applicable environmental regulations.

6. All individuals with responsibility for purchasing chemicals and hazardous materials addressed by this plan shall ensure that an MSDS is available. The material shall not be released to the user until the MSDS is available.
7. All employees and contractors who use chemicals and hazardous materials shall comply with the requirements of the hazard communication program, container labels and MSDS requirements.
8. Employees / contractors shall report spills, accidents, or excessive exposures so that cleanup or corrective action can be taken.

Hazard Determination

1. Chemical manufacturers and importers shall evaluate chemicals to determine if they are hazardous as manufactured. TVA is not required to evaluate chemicals unless a decision is made not to rely on the evaluation performed by the chemical manufacturer or importer.
2. In instances where TVA is the manufacturer or distributor, i.e. for flyash, gypsum, Atmospheric Fluidized Bed Combustion (AFBC) by-products, etc, a hazard evaluation shall be conducted and an MSDS prepared by the responsible TVA organization which shall be provided to recipients of the material.

Labeling and Other Forms of Warning

1. The chemical manufacturer, importer, or distributor shall ensure that each container of hazardous chemicals is labeled with the following information:
   - Identity of the hazardous chemical(s);
   - appropriate hazard warnings;
   - and name and address of the chemical manufacturer, importer, or other responsible party.
2. In-plant containers of hazardous chemicals must be labeled with the identity of the material and appropriate hazard warnings.
3. TVA shall use the labels provided by suppliers.
   NOTE: TVAN labels chemicals and hazardous materials using the TVAN chemical traffic control specifications.
4. Containers of hazardous chemicals must always be labeled, with the exception that it is not required for portable containers to be labeled whenever chemicals are transferred from labeled containers, and which are intended only for the immediate use of the employee who performs the transfer and are used during a single 8 hour shift (must be in possession of employee).
5. Labels must be legible, in English, and prominently displayed. There are no specific requirements for size or color, or any specified text.
6. Employees shall not remove or deface labels on containers of hazardous chemicals.
7. Signs, placards, operating instructions, or other plant instructions may be used in lieu of affixing labels to plant process equipment (pipes, tanks, pumps, and stationary containers of like materials in an immediate area, etc.).

List of Hazardous Chemicals

1. A “List of Hazardous Chemicals”, see example, Appendix A, shall be maintained by each plant / facility. The list shall be updated annually and whenever new hazardous chemicals are received.
2. The annual “List of Hazardous Chemicals” shall be archived annually and copies maintained for 30 years.

Material Safety Data Sheets

1. All TVA locations shall have an MSDS available for each hazardous chemical used. This may be accomplished in different ways. e.g., some locations may keep an MSDS in a binder in a central location; others may provide electronic access through SRNet. As long as employees can get the information when they need it, any approach may be used. **EMPLOYEES SHALL NOT BE ALLOWED TO USE A HAZARDOUS CHEMICAL FOR WHICH AN MSDS IS NOT AVAILABLE.**
2. Each MSDS shall be in English and legible and shall contain at least the following:
   - the identity of the chemical;
   - the physical hazards, including the potential for fire, explosion, and reactivity;
   - the health hazards, including signs and symptoms of exposure, and the primary route(s) of entry;
   - the OSHA permissible exposure limit, or ACGIH Threshold Limit Value,
   - precautions for safe handling and use and procedures for clean-up of spills and leaks;
   - control measures, such as appropriate engineering controls, work practices, or personal protective equipment;
   - emergency and first aid procedures;
   - date of preparation of the MSDS and,
   - the name, address and telephone number of the responsible party who can provide additional information on the hazardous chemical and appropriate emergency procedures.

Employee Information and Training

1. Each employee who may be exposed to hazardous chemicals must be provided information and trained prior to initial assignment to work with a hazardous chemical, and whenever the hazard changes.
2. The training course required is: (Hazard Communication ATIS Course 00059126).
3. Records shall be maintained by ATIS.
4. Employees shall be informed of:
   - the requirements and location of this procedure;
   - any operations where hazardous chemicals are present;
   - the location of the list of hazardous chemicals;
   - the location of MSDS;
   - how to access an MSDS using the SRNet
5. The supervisor of an employee performing a non-routine task using hazardous chemicals shall be responsible for training the employee concerning the potential hazards prior to performing the task.

Partners/Contractors

1. Partners/contractors shall be informed of any hazardous chemical they may be exposed to.
2. Partners/contractors shall inform the appropriate manager of any hazardous chemicals brought to the plant.
3. Partners/contractors shall provide an MSDS and a complete list of any hazardous chemicals that they will be using to the hazard communication program designee.

Reference

29 Code of Federal Regulations 1910.1200, “Hazard Communication”

Appendix A - Example "List of Hazardous Chemicals"

Example “List of Hazardous Chemicals”

Chemical Inventory List

Plant / Facility Name

Date of Last Annual Inventory
11/01/2005

Responsible Supervisor	Product Name	Chemical Name	Product #	Manufacturer / Distributor	Use	Container Type

Procedure 217 Safety Coaching Visits

TVA Safety Manual

217 Safety Coaching Visits

Procedure Number 217

TVA Safety Procedure

Safety Coaching Visits

Revision 2

April 14, 2008

Purpose

The purpose of this procedure is to establish requirements for managers, supervisors and foremen to conduct Safety Coaching Visits (SCV). The primary focus of these visits is to identify correct behaviors and eliminate at-risk behaviors while engaging individuals and work crews in discussions about workplace safety improvement opportunities.

Requirements

1. Each plant / facility manager, line manager / supervisor and foreman at TVA plants / facilities / regions / organizations shall conduct at least one SCV each month.
2. Each SCV shall be documented on the SCV checklist (Appendix A, TVA Form 20218 Safety Coaching Visit Checklist [1] Appendix A) and sent to the responsible manager / supervisor for review and analysis. Managers / supervisors must use the results or their review and analysis to determine common at-risk behaviors and develop and implement corrective actions. The Plant / Facility Roll-up Report (#Appendix B - Safety Coaching Visit Plant / Facility Roll-up Report (Optional)) can be used to calculate the percent of safe behaviors observed.
3. A review of the monthly SCV's reports shall be accomplished during the Central Safety Management Review Team (CSMRT) meeting.
4. The CSMRT (Leaders) must be prepared to provide expectations and feedback on both positive and undesirable behaviors discussed.
5. Managers / supervisors / foremen conducting SCVs will ensure that observed violations of TVA safety rules and unsafe conditions are corrected prior to leaving the worksite, if possible. If conditions cannot be corrected immediately, ensure that interim actions that protect employees are in place until permanent actions can be completed.

Guidelines for Conducting SCVs

1. Safety Coaching Visits are normally most effective when conducted with a subordinate supervisor. However it is acceptable for the observation to be conducted individually.
2. Select an area to conduct the SCV where you know work has been scheduled; with emphasis on known high-hazard (see TVA-SPP-18.005) potential work.
3. Introduce yourself to the individual or work crew and explain to them the purpose SCVs. Inform those participating in the SCV that the purpose of the visit is to improve safety performance. Ask to be briefed on the nature of the job being performed, what was covered at the pre-job briefing and if they have adequate tools and equipment to conduct the work safely. Ask to see a copy of the Pre-Job Briefing and any associated documentation, Job Safety Analysis, permits that are used with this particular task. Ask how the two minute rule was used prior to working.
4. Inspect the selected area and observe employee work activities and techniques with a focus on identifying both safe and at-risk behaviors. Focus primarily on employee work practices (people actions, orderliness, body position, tools and equipment used). Use common sense and a questioning attitude about what you see, it is not necessary to know all the safety rules or be a safety professional in order to conduct a meaningful SCV.
5. At the conclusion of the SCV engage coached employees in discussions of workplace safety. Emphasize recognition of good safe work practices, constructive coaching on unsafe (at-risk) acts and commitment to needed improvement. This face to face contact affords the person conducting the SCV an opportunity to make their safety expectations clear. Remember, positive recognition and praise of individuals is the best tool we have to encourage employees to continue to demonstrate safe behaviors in the future.
6. Complete the SCV checklist and distribute it as required in this procedure.

What to Observe

1. Observe the adequacy of personal protective equipment (PPE) used. Is the employee using the proper PPE and using it correctly? Be sure to review eye and face protection, hearing protection, head protection, hand protection, foot protection, respiratory protection, fall protection, and special clothing requirements.
2. **Are workers keeping themselves out of the Line of Fire?** Review positions of people. Are positions adequate to protect all parts of the body from striking against or being struck by an object, being sprayed, hit by stream, liquid, air, gas or other projectiles trapped by energy releases of any kind?
3. **Does the work involve ergonomic hazards?** Is the employee required to work in an awkward position? Does the work involve repetitive motion or overexertion?
4. **Does the work involve the potential for a fall?** Is there potential for a fall from an elevation, or fall on same level from a slip, trip hazard?
5. **Does the work involve potential pinch points?** Are employees keeping body parts and clothing from between moving and stationary parts that are closing or may be close together, including rotating parts?
6. **Does the work involve potential for exposure to energized electrical contact or arc flash exposure?** Are adequate clearances in place, proper tools used, and proper level of arc flash clothing worn?
7. **Are workers maintaining a positive Eyes on Path focus?** Review the reactions of people to working conditions. Are employees looking for hazards in the direction they are moving, does the employee clear obstructions out of the way or walk around them? Does the work involve changing positions, exposure to moving equipment, hurrying, or changing work conditions that could create a greater exposure to injury?
8. Review tools and equipment used for suitability and condition. Are the proper tools being used, are they being used correctly; are the tools in a safe working condition; are periodic (e.g., annual) inspection color codes present and correct; and have necessary barricades or barriers been installed?
9. Review work rules and procedures. Have standard work rules and procedures been established and are the rules and procedures adequate for the work being performed (this includes applicable Job Safety Analysis)? Have proper clearances been established and was the employee properly briefed during the pre-job briefing / post job

review?

10. Review housekeeping and orderliness. Is the work area maintained in an orderly manner, are passageways kept clear and unobstructed, are tools, equipment, and materials stored/arranged to prevent them from being a tripping hazard?

Appendices

Appendix A - TVA Form 20218 Safety Coaching Visit Checklist [1]

Appendix B - Safety Coaching Visit Plant / Facility Roll-up Report (Optional)

Safety Coaching Visit

Plant / Facility Roll-up Report

Date:	Total People Observed:
Plant Facility:	**Total Observations:**

Category	Description	Safe Behaviors	At Risk Behaviors	Percent Safe
A	Personal Protective Equipment			
B	Positions of People			
C	Reactions of People			
D	Tools & Equipment			
E	Procedures			
F	Orderliness			
	TOTAL			

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=082320225

Procedure 218 Pre-job Briefing / Post-job Review

TVA Safety Manual

218 Pre-job Briefing / Post-job Review

Procedure Number 218

TVA Safety Procedure

Pre-job Briefing / Post-job Review

Revision 1

November 01, 2005

Purpose

This procedure identifies the process within TVA to implement the requirements of 29 Code of Federal Regulations 1910.269 (c), Electric Power Generation, Transmission and Distribution to conduct job briefings for employees.

Requirements of the Regulation

1. **Job Briefing** - The employer shall ensure that the employee in charge conducts a job briefing with the employees involved before they start each job. The briefing shall cover at least the following subjects:
   - hazards associated with the job,
   - work procedures involved,
   - special precautions,
   - energy source controls, and
   - personal protective equipment requirements
2. **Number of Briefings** - If the work or operations to be performed during the workday or shift are repetitive and similar, at least one job briefing shall be conducted before the start of the first job of each day or shift. Additional job briefings shall be held if significant changes, which might affect the safety of the employees, occur during the course of the work.
3. **Extent of Briefing** - A brief discussion is satisfactory if the work involved is routine and if the employee, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job. A more extensive discussion shall be conducted if the work is complicated or particularly hazardous, or if the employee cannot be expected to recognize and avoid the hazards involved in the job.
4. **Working Alone** - An employee working alone need not conduct a job briefing. However, the employer shall ensure that the tasks to be performed are planned as if a briefing were required.

Implementing the Job Briefing Regulation

The requirements, instructions and management expectations for conducting pre-job briefings and post-job reviews within the TVA organization are contained in TVA Practices and Procedures, Safety Procedure 6, “Plan Jobs Safely”.

References

29 Code of Federal Regulations 1910.269(c), Electric Power Generation, Transmission, Distribution

TVA Practices and Procedures, Safety Procedure 6, “Plan Jobs Safely”.

Procedure 219 Process Safety Management

TVA Safety Manual

219 Process Safety Management

Procedure Number 219

TVA Safety Procedure

Process Safety Management

Revision 2

May 18, 2011

Purpose

The purpose of this procedure is to establish requirements for preventing or minimizing the consequences of catastrophic releases of toxic, reactive, flammable, or explosive chemicals.

This procedure applies to and is binding on all TVA organizations, plants and facilities when the following processes are involved.

- A process which involves a chemical at or above the specified threshold quantities listed in Appendix A to 29 Code of Federal Regulations 1910.119, Process Safety Management of Highly Hazardous Chemicals.
- A process which involves a flammable liquid or gas (as defined in 29 Code of Federal Regulations 1910.1200, Hazard Communication, paragraph (c) on site in one location, in a quantity of 10,000 pounds (4535.9 kg) or more except for: Hydrocarbon fuels used solely for workplace consumption as a fuel (e.g., propane used for comfort heating, gasoline for vehicle refueling), if such fuels are not a part of a process containing another highly hazardous chemical; Flammable liquids stored in atmospheric tanks or transferred which are kept below their normal boiling point without benefit of chilling or refrigeration.

Responsibilities

1. The plant / facility manager shall be responsible for the development and implementation of a process safety management program for all processes covered by 29 CFR 1910.119, Process Safety Management (PSM) of Highly Hazardous Chemicals and 40 CFR 68, "Risk Management Programs for Chemical Accident Release Prevention (RMP).
2. The plant / facility manager shall designate the System Engineer as the PSM/RMP Program Coordinator to oversee the program.
3. The PSM/RMP Program Coordinator shall assist with the development of the PSM/RMP document. The coordinator will also be responsible for the effective implementation of the PSM/RMP program for the plant / facility and have the authority to institute needed actions to assure system safety.
4. TVA Safety Programs will assist line organizations in the development of their PSM/RMP program.

Process Hazard Analysis

1. An initial process hazard analysis (hazard evaluation) shall be performed on processes covered by PSM/RMP and processes established in this procedure.
2. An initial process hazard analysis (hazard evaluation) shall be performed on processes covered by PSM/RMP and processes established in this procedure.
3. One or more of the following methodologies that are appropriate to determine and evaluate the hazards of the process being analyzed shall be used. The preferred method is the HAZOP.
   - What-If;
   - Checklist;
   - What-If/Checklist;
   - Hazard and Operability Study (HAZOP);
   - Failure Mode and Effects Analysis (FMEA);
   - Fault Tree Analysis
4. The process hazard analysis shall be performed by a team with expertise in engineering and process operations, and the team shall include at least one employee who has experience and knowledge specific to the process being evaluated. At least one member of the team must be knowledgeable in the specific process hazard analysis methodology being used.
5. A system shall be established to promptly address the team's findings and recommendations; assure that the recommendations are resolved in a timely manner and that the resolution is documented; document what actions are to be taken; complete actions as soon as possible; develop a written schedule of when these actions are to be completed; communicate the actions to operating, maintenance and other employees whose work assignments are in the process and who may be affected by the recommendations or actions.
6. PER's shall be generated for all PHA Revalidations to track findings and recommendations.
7. At least every five (5) years after the completion of the initial process hazard analysis, the process hazard analysis shall be updated and revalidated to assure that the process hazard analysis is consistent with the current process.
8. The plant / facility shall retain process hazards analyses and updates or revalidation for each process covered by the standard, as well as the documented resolution of recommendations for the life of the process.

Employee Participation

1. A written plan of action shall be developed regarding the implementation of the employee participation required.
2. Consultation with employees and their representatives shall occur on the conduct and development of process hazards analyses.
3. Employees and their representatives shall be provided access to process hazard analyses and all other information required to be developed in conjunction with this procedure.

Process Safety Information

1. A written plan of action shall be developed regarding the implementation of the employee participation required.
2. The following process safety information relating to the hazards of the chemicals shall be compiled:
   - information pertaining to the hazards of the highly hazardous chemicals used or produced by the process,
   - information pertaining to the technology of the process, and
   - information pertaining to the equipment in the process
   - Toxicity information;
   - Permissible exposure limits;
   - Physical data;
   - Reactivity data:
   - Corrosivity data;

- Thermal and chemical stability data; and
- Hazardous effects of inadvertent mixing of different materials that could reasonably occur.

  Note: Material Safety Data Sheets meeting the requirements of 29 CFR 1910.1200(g) may be used to comply with this requirement to the extent they contain the information required.

- Information pertaining to the technology of the process.

3. Information concerning the technology of the process shall be compiled and contain at least the following:
   - A block flow diagram or simplified process flow diagram
   - Process chemistry;
   - Maximum intended inventory;
   - Safe upper and lower limits for such items as temperatures, pressures, flows or compositions; and,
   - An evaluation of the consequences of deviations, including those affecting the safety and health of employees.

Operating Procedures

1. Written operating procedures shall be developed and implemented that provide clear instructions for safely conducting activities involved in each covered process consistent with the process safety information and shall address at least the following elements.

   Steps for each operating phase

   - Initial startup;
   - Normal operations;
   - Temporary operations;
   - Emergency shutdown including the conditions under which emergency shutdown is required, and the assignment of shutdown responsibility to qualified operators to ensure that emergency shutdown is executed in a safe and timely manner.
   - Emergency Operations;
   - Normal shutdown; and,
   - Startup following a turnaround, or after an emergency shutdown.

   Operating limits

   - Consequences of deviation; and steps required to correct or avoid deviation.

   Safety and health considerations

   Properties of, and hazards presented by, the chemicals used in the process;

   - Precautions necessary to prevent exposure, including engineering controls, administrative controls, and personal protective equipment;
   - Control measures to be taken if physical contact or airborne exposure occurs; Quality control for raw materials and control of hazardous chemical inventory levels; and,
   - Any special or unique hazards.

2. Operating procedures shall be readily accessible to employees who work in or maintain a process.
3. The operating procedures shall be reviewed as often as necessary to assure that they reflect current operating practice, including changes that result from changes in process chemicals, technology, and equipment, and changes to facilities. The responsible plant / facility manager shall certify annually that these operating procedures are current and accurate.
4. Safe work practices shall be developed and implemented to provide for the control of hazards during operations such as current clearance procedure; confined space entry; opening process equipment or piping; and control over entrance into a facility by maintenance, contractor, laboratory, or other support personnel. These safe work practices shall apply to employees and contractor employees.

Training

1. Each employee presently involved in operating a process, and each employee before being involved in operating a newly assigned process, shall be trained in an overview of the process and in the operating procedures.
2. The training shall include emphasis on the specific safety and health hazards, emergency operations including shutdown, and safe work practices applicable to the employee's job tasks.
3. Refresher training shall be provided at least every three years, and more often if necessary, to each employee involved in operating a process to assure that the employee understands and adheres to the current operating procedures of the process.
4. The following courses are required:
   - Ammonia Awareness, ATIS 00059103 shall be required for all employees or visitors to plants with SCR or any employee who may have exposure to ammonia.

     Exception: Visitors who are escorted at all times by trained personnel during their visit to a plant are not required to be trained.
   - Mechanical Integrity, ATIS (To be determined), shall be required for those who work on/or near the covered process.
5. Training records shall be documented in the ATIS system.

Contractors

1. This procedure applies to contractors performing maintenance or repair, turnaround, major renovation, or specialty work on or adjacent to a covered process.
2. It does not apply to contractors providing incidental services which do not influence process safety, such as janitorial work, food and drink services, laundry, delivery or other supply services.
3. The responsible plant / facility manager, when selecting a contractor that will perform maintenance or repair, turnaround, major renovation, or specialty work on or adjacent to a covered process, shall obtain and evaluate information regarding the contract employer's safety performance and programs.
4. Contract employers shall be informed of known potential fire, explosion, or toxic release hazards related to the contractor's work and the process.
5. Contract employers shall be informed concerning the applicable provisions of the emergency action plan.
6. Safe work practices shall be developed and implemented to control the entrance, presence and exit of contract employers and contract employees in covered process areas.
7. Contract employers shall be periodically evaluated concerning their obligations as specified.
8. The contract employer shall advise the responsible plant / facility manager of any unique hazards presented by the contract employer's work, or of any hazards found by the contract employer's work.

Pre-startup Safety Review

1. A pre-startup safety review shall be performed for new facilities and for modified facilities when the modification is significant enough to require a change in the process safety information.
2. The pre-startup safety review shall confirm that prior to the introduction of highly hazardous chemicals to a process:
   - Construction and equipment is in accordance with design specifications;
   - Safety, operating, maintenance, and emergency procedures are in place and are adequate;
   - For new facilities, a process hazard analysis has been performed and recommendations have been resolved or implemented before startup; and modified facilities meet the requirements contained in management of change.
   - Training of each employee involved in operating a process has been completed.

Mechanical Integrity

1. Written procedures shall be established and implemented to maintain the on-going integrity of process equipment.
2. Each employee involved shall be trained in maintaining the on-going integrity of process equipment with an overview of that process and its hazards and in the procedures applicable to the employee's job tasks to assure that the employee can perform the job tasks in a safe manner.
3. Inspections and tests shall be performed on process equipment.
4. Inspection and testing procedures shall follow recognized and generally accepted good engineering practices.
5. The frequency of inspections and tests of process equipment shall be consistent with applicable manufacturers' recommendations and good engineering practices, and more frequently if determined to be necessary by prior operating experience.
6. Documentation of the inspections and tests shall identify the date of the inspection or test, the name of the person who performed the inspection or test, the serial number or other identifier of the equipment on which the inspection or test was performed, a description of the inspection or test performed, and the results of the inspection or test.
7. Deficiencies in equipment that are outside acceptable limits shall be corrected before further use or in a safe and timely manner when necessary means are taken to assure safe operation.
8. In the construction of new plants and equipment, equipment shall be determined to be suitable for the process application for which they will be used.
9. Appropriate checks and inspections shall be performed to assure that equipment is installed properly and consistent with design specifications and the manufacturer's instructions.
10. Maintenance materials, spare parts and equipment shall be suitable for the process application for which they will be used.

Hot Work

1. A hot work permit shall be issued for hot work operations conducted on or near a covered process.
2. The permit shall document fire prevention and protection measures that have been implemented prior to beginning the hot work operations; it shall indicate the date(s) authorized for hot work; and identify the object on which hot work is to be performed.
3. The permit shall be kept on file until completion of the hot work operations.

Management of Change

1. Written procedures shall be established and implemented to manage changes (except for "replacements in kind") to process chemicals, technology, equipment, and procedures; and, changes to facilities that affect a covered process.
2. The procedures shall assure that the following considerations are addressed prior to any change:
   - The technical basis for the proposed change;
   - Impact of change on safety and health;
   - Modifications to operating procedures;
   - Necessary time period for the change; and,
   - Authorization requirements for the proposed change.
3. Employees involved in operating a process and maintenance and contract employees whose job tasks will be affected by a change in the process shall be informed of, and trained in, the change prior to start-up of the process or affected part of the process.
4. If a change results in a change in the process safety information required, such information shall be updated accordingly.

5. If a change results in a change in the operating procedures or practices required, such procedures or practices shall be updated accordingly.

Incident Investigation

1. Each incident, which results in, or could reasonably have resulted in a catastrophic release of highly hazardous chemical in the workplace shall be investigated.
2. An incident investigation shall be initiated as promptly as possible, but not later than 24 hours following the incident.
3. An incident investigation team shall be established and consist of at least one person knowledgeable in the process involved, including a contract employee if the incident involved work of the contractor, and other persons with appropriate knowledge and experience to thoroughly investigate and analyze the incident.
4. A report shall be prepared at the conclusion of the investigation which includes at a minimum:
   - Date of incident;
   - Date investigation began;
   - A description of the incident;
   - The factors that contributed to the incident; and,
   - Any recommendations resulting from the investigation.
5. A system shall be established to promptly address and resolve the incident report findings and recommendations.
6. Resolutions and corrective actions shall be documented.
7. The report shall be reviewed with all affected personnel whose job tasks are relevant to the incident findings including contract employees where applicable.
8. Incident investigation reports shall be retained for five years by TVA Safety.
9. All incident investigations shall be in accordance with the criteria specified in Procedure COO-SPP-3.1.10, Incident Prompt Investigation.
10. All incident investigations and reports of injury/illness will meet the requirements of TVA-SPP-18.012, “Report and Investigate Injuries and Illnesses,” and TVA-SPP-18.010, “Conduct Serious Accident Investigation,” as applicable.

Emergency Planning and Response

1. An emergency action plan shall be established and implemented for the entire plant in accordance with the provisions of 29 CFR 1910.38(a).
2. In addition, the emergency action plan shall include procedures for handling small releases.

Compliance Assessments

1. The responsible plant / facility manager shall certify that TVA has evaluated compliance with the provisions of this procedure at least every three years to verify that the procedures and practices developed under the standard are adequate and are being followed.
2. The compliance assessment shall be conducted by at least one person knowledgeable in the process.
3. A report of the findings of the assessment shall be developed.
4. The responsible plant / facility manager shall promptly determine and document an appropriate response to each of the findings of the compliance assessment, and document that deficiencies have been corrected.
5. The two (2) most recent compliance assessment reports shall be retained by the facility audited and TVA Safety.
6. PER’s shall be generated for all assessment findings.

Trade Secrets

1. All information necessary to comply with standard requirements shall be available to those persons responsible for compiling the process safety information, to those assisting in the development of the process hazard analysis, to those responsible for developing the operating procedures, and to those involved in incident investigations, emergency planning and response and compliance audits without regard to possible trade secret status of such information.

Risk Management Plan

The RMP contains the same requirements of the PSM program plus the following:

1. The Offsite Consequence Analysis which includes the worst-case release scenario analysis and alternative release scenarios. The analysis defines impacted populations and environment.

   Note: The following warning concerning the offsite consequence analysis:

   WARNING Due to the risk associated with the public dissemination of the sensitive information contained in this Offsite Consequence Analysis (OCA), the Department of Justice (DOJ) and the Environmental Protection Agency (EPA) have established strict guidelines for distributing OCA information. Under this rule, **federal employees are prohibited from indiscriminately distributing OCA information to the public**. Distribution of OCA information to federal, state, and local government officials is also prohibited. Violation of this provision subjects the violator to criminal liability as provided in 42 U.S.C. 7412(r)(7)(H)(v) and civil liability as provided in 42 U.S.C. 7413. Information must be shared with Local Emergency Planning Committees and related local government agencies. These agencies are encouraged to share OCA information with individuals in their jurisdiction, however, members of the public are only allowed to read the information and not allowed to remove a paper copy or make a mechanical copy of the information. The complete regulation can be found in title 40 of the Code of Federal Regulations:
   CHAPTER IV- ENVIRONMENTAL PROTECTION AGENCY AND THE DEPARTMENT OF JUSTICE
   SUBCHAPTER A - ACCIDENTAL RELEASE PREVENTION REQUIREMENTS; RISK MANAGEMENT PROGRAMS UNDER THE CLEAN AIR ACT SECTION 112(r)(7);DISTRIBUTION OF OFF-SITE CONSEQUENCE ANALYSIS INFORMATION PART 1400-DISTRIBUTION OF OFF-SITE CONSEQUENCE ANALYSIS INFORMATION.
2. The analysis shall be reviewed and updated at least once every five years. If changes in the process, quantities stored or handled, or any other aspect of the stationary source might reasonably be expected to increase or decrease the distance to the endpoint by a factor of two or more, the owner or operator shall complete a revised Risk Management Plan to EPA.
3. Five-Year Accident History: The owner or operator shall include in the five-year accident history all accidental releases from covered processes that result in deaths, injuries, or significant property damage on site, or known offsite deaths, injuries, evacuations, sheltering in place, property damage, or environmental damage. The data to be collected and level of accuracy of estimates is detailed in 40 CFR 68.42.
4. Submission of plan: The owner or operator shall submit a single RMP that includes the information required by 40 CFR 68.155 through 185 for all covered processes at the facility. Required information includes:
   68.155 - Executive Summary
   68.160 - Registration
   68.165 - Offsite Consequence Analysis
   68.168 - Five-Year Accident History
   68.175 - Prevention Program/Program 3
   68.180 - Emergency Response Program
   68.185 - Certification

   A. The first submission of the RMP, must be no later than the following:

- Three years after the date on which the regulated substance is first listed under 40 CFR 68.130; or
- The date on which a regulated substance is first present above a threshold quantity in a process.

B. The owner or operator shall review and update the RMP per criteria below and submit to EPA. Requirements to revise the RMP:

a. At least once every 5 years from the date of the original submission or earlier base on items b -g below.
b. No later than 3 years after a newly regulated substance is first listed by EPA;
c. No later than the date on which a new regulated substance is first present in an already covered process above a threshold quantity;
d. No later than the date on which a regulated substance is first present above a threshold quantity in a new process;
e. Within six months of a change that requires a revised PHA or hazard review;
f. Within six months of a change that requires a revised Offsite Consequence Analysis;
g. Within six months of a change that alters the Program Level that applied to any covered process.

C. Required Corrections. The submitted RMP shall be corrected and resubmitted as follows:

a. New accident history information – For any accidental release meeting the five-year accidental history reporting criteria above, the owner or operator shall submit the required data with respect to the accident within six months of the release or by the time the RMP is updated, whichever is earlier.
b. Emergency Contact Information – Within 1 month of any change in the emergency contact information as listed in the RMP.

Definitions

1. **Highly hazardous chemical** - A substance possessing toxic, reactive, flammable, or explosive properties.
2. **Hot work** - Work involving electric or gas welding, cutting, brazing, or similar flame or spark-producing operations.
3. **Process** - Any activity involving a highly hazardous chemical including any use, storage, manufacturing, handling, or the on-site movement of such chemicals, or combination of these activities. For the purpose of this definition, any group of vessels which are interconnected and separate vessels which are located such that a highly hazardous chemical could be involved in a potential release shall be considered a single process.
4. **Replacement in kind** - An exact replacement of specified equipment/part as dictated by design requirements which satisfies the design specifications.
5. **Trade secret** - Any confidential formula, pattern, process, device, information or compilation of information that is used in an employer's business, and that give the employer an opportunity to obtain an advantage over competitors who do not know or use it.

Appendix

Appendix A - Anhydrous Ammonia

References

- Code of Federal Regulations 1910.119, "Process Safety Management of Highly Hazardous Chemicals"
- 40 CFR 68, "Chemical Accident Prevention Provisions"

Procedure 220 Safety Meetings

TVA Safety Manual

220 Safety Meetings

Procedure Number 220

TVA Safety Procedure

Safety Meetings

Revision 2

April 18, 2008

Purpose

The purpose of this procedure is to establish requirements for conducting safety meetings for employees. The objective is to inform employees about health and safety and plant hazards and to promote employee involvement and participation in the health and safety program.

Requirements for Conducting Safety Meetings

1. Weekly safety meetings shall be conducted for all operations and maintenance employees, (quarterly for administrative and clerical employees).
   NOTE: FM O&M conducts safety meetings on a monthly basis.
2. Employees are expected to actively participate in safety meetings. The opportunity to report unsafe and/or unhealthful working conditions shall be an integral part of the weekly meeting.
3. Safety meetings should be planned in advance to include a flexible schedule of topics.
4. Work schedules should specify the name of person responsible for preparing and holding the safety meetings, as well as minimum topics to be covered.
5. All safety meetings shall be reported on the Safety Meeting Report, Appendix A.
6. Line Managers and line supervisors shall attend meetings on a regular basis with their employees, at least one per week to visibly display management interest and to evaluate/critique the effectiveness of the safety meeting. This evaluation/critique shall be recorded by completing the evaluation/critique section of the Safety Meeting Report.
7. Foremen and line supervisors shall evaluate all reported unsafe and/or unhealthful conditions and shall take necessary action or initiate appropriate work implementing document to correct the conditions.
8. Employees shall be informed of disposition of their reports.
9. Copies of the report shall be kept by each supervisor / foreman for three (3) months as a record of corrective actions taken and evidence that safety meetings are being conducted.

Suggested Materials for Conducting Safety Meetings

Subjects covered should reflect those most relevant for the employees involved. Safety meetings also serve as a mechanism to accomplish informal occupational safety training on a planned and scheduled basis.

- Safety Awareness Bulletins
- Accident/Incident/Near-Miss Incident/Fire Investigation Reports
- Reported unsafe or unhealthful acts/conditions
- TVA Safety Procedures
- OSHA standards
- Health and safety audiovisuals (these resources are at no cost to the plants, but are available on a first come-first served basis) Link to TVA Audiovisual Catalog

How to Conduct Safety Meetings

1. Use material from the selected topics in section **Suggested Materials for Conducting Safety Meetings**.
2. Request input from each employee on unsafe/unhealthful conditions or acts and;
3. Provide feedback to the employees on the status of reports previously reported during safety meetings.
4. Although employees may report current hazardous conditions at these meetings, they are encouraged to report these to their foreman/supervisor as they are identified instead of holding them until the next meeting.
5. Ensure that all reported unsafe/unhealthful conditions/acts are recorded on the form.
6. Take action to correct those reported unsafe/unhealthful conditions.
7. Submit work orders so that the corrective actions can be scheduled through the work order (WO) tracking system. Corrective actions taken tracking system numbers shall be recorded on the TVA Safety Meeting Report. Where this is not possible or the corrective actions may involve several possibilities or where capital expenditures may be required, the foreman / supervisor shall record the report on the meeting report form and forward the completed form to their supervisor / manager.
8. The supervisor / manager shall review the safety meeting reports as soon as possible for meeting attendance, topics presented, the evaluation/critique and reported items. Actions taken by the foreman / supervisor on employee reported items shall be reviewed for timeliness and effectiveness. For those reported items for which no corrective action has been taken, the supervisor / manager shall take corrective action and if appropriate, initiate a work order. For those actions outside his/her responsibility, the reported problem shall be elevated to the next level of management and/or the Central Safety Management Review Team (CSMRT) for review and resolution.
9. When a corrective action on an employee report of unsafe/unhealthful condition/act is completed, the responsible manager shall notify the employee or employee's foreman / supervisor. This feedback should be done as soon as possible, but no later than the next week's safety meeting.
10. The manager shall report open action items as part of the CSMRT meeting agenda. This is important in that open action items indicate either management problems, system problems, or other issues such as capital expenditures. The CSMRT represents the top-level management forum for addressing these problems.
11. Corrective actions that require expenditure of capital funds, engineering work, ordering of equipment, etc. that cannot be resolved in a timely manner, shall require a written abatement plan with a time table for resolution. This abatement plan shall be communicated to the employees. A manager shall be assigned responsibility for development of the plan, action items of the plan and tracking to completion. The abatement plan shall be a part of the monthly agenda of the CSMRT until completion.

Appendix

TVA 17720, Safety Meeting Report [1]

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072561008

Procedure 221 Safety Recognition and Awards

TVA Safety Manual

221 Safety Recognition and Awards

Procedure Number 221

TVA Safety Procedure

Safety Recognition and Awards

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish annual safety recognition plans for TVA line organizations.

Annual Safety Recognition Plan

Example Appendix A COO Annual Safety Recognition Plan

Reference

TVA Practices and Procedures, “Recognize and Reward Safety Performance”

Appendix A

Example COO Annual Safety Recognition Plan

President / COO Safety Excellence Award Trophy

The purpose of the President / COO Safety Excellence Award Trophy is to recognize those plants / facilities that have achieved **superior** safety performance during the year.

Award Criteria President / COO Safety Excellence Award Trophy

Each eligible plant / group / facility that completes the fiscal year with no lost-time accidents and achieves a total recordable injury rate 5 % better than the group target rate will receive the President’s / COO Safety Excellence Award Trophy for permanent display.

Presentations of this President’s trophy will be made by the winning group Vice-President at either an established or a special meeting / celebration onsite for this purpose.

Eligible Locations for President / COO Safety Excellence Award Trophy

Each Fossil Plant	TPS - Electric System Projects (Transmission Line Construction)
Each Nuclear Plant	TPS - Electric System Projects (Sub-Station Construction)
Power Service Center	TPS - Electric System Projects (Telecommunication Construction)
Central Laboratories Services	TPS - Transmission Operations & Maintenance (TOM East)
Combustion Turbines (Combined)	TPS - Transmission Operations & Maintenance (TOM West)
Heavy Equipment Division	TPS - Transmission Operations & Maintenance (TOM North)
RSO&E - Resource Stewardship	
RSO&E - Environmental Research & Technology	
River Operations (Central Region)	
River Operations (Northern Region)	
River Operations (Southwest Region)	
Pumped Storage Hydro	

President / COO Safety Award Flag

The purpose of the President / COO Safety Excellence Award Flag is to recognize those plants / facilities that have achieved outstanding safety performance during the year.

Award Criteria for President / COO Safety Award Flag

Each eligible plant / facility that completes the fiscal year with no lost-time accidents and achieves a total recordable injury rate at the group target or better will receive the President's / COO Safety Award Flag for permanent display.

Presentations of this president's flag will be made by the winning group Vice-President at either an established or a special meeting / celebration onsite for this purpose.

Eligible Locations for President / COO Safety Award Flag

Each Fossil Plant	TPS - Electric System Projects (Transmission Line Construction)
Each Nuclear Plant	TPS - Electric System Projects (Sub-Station Construction)
Power Service Center	TPS - Electric System Projects (Telecommunication Construction)
Central Laboratories Services	TPS - Transmission Operations & Maintenance (TOM East)
Combustion Turbines (Combined)	TPS - Transmission Operations & Maintenance (TOM West)
Heavy Equipment Division	TPS - Transmission Operations & Maintenance (TOM North)
RSO&E - Resource Stewardship	
RSO&E - Environmental Research & Technology	
River Operations (Central Region)	
River Operations (Northern Region)	
River Operations (Southwest Region)	
Pumped Storage Hydro	

President / COO Safety Award Plaque

The purpose of the President / COO Safety Award Plaque is to recognize corporate / administrative groups that have contributed to the success of the COO safety program during the year.

Award Criteria for President / COO Safety Award Plaque

Each eligible group that completes the fiscal year with no lost-time accidents or recordable accidents will receive the President / COO Safety Award Plaque.

Presentations of the President's plaque will be made by the winning group manager or Vice- President at a special meeting / celebration for this purpose.

Eligible Organizations for President / COO Safety Award Plaque

Those COO corporate organizations (Vice-President / General Manager level) reported out monthly from the TVA Work Injury Incident System for recordkeeping purposes.

Discretionary Awards

At their discretion, the COO Safety Staff may recognize various individuals with award symbols bearing "COO Safety a powerful team", during routine safety visits or during formal regulatory workplace compliance inspections. Awards will go to those employees making significant contributions to the COO safety program such as participating on safety committees, teams etc. and to those employees exhibiting command of safety leading indicators such as

- Job Pre-planning
- Pre-Job / Shift Briefings
- Conducting Safety Audits
- Self-Checking
- Presenting Safety Meeting Topics
- Participating in Safety Self- Assessments
- Safety Procedure Use and Adherence
- Execution of Safe Work

The actual award will be presented to the individual(s) upon notification by the manager in charge.

The purpose of this meeting should be to thank (actively caring) the employees who have participated in the COO safety program and / or demonstrated outstanding safety performance.

Budget and Administration The COO Safety Staff will be responsible for administering this program in conjunction with all affected COO reporting organizations. The budget for the cost of all President's Trophies, President's Flags, President's Safety Plaques, and Discretionary Awards will be included in the COO Operations Support Group budget.

Plants / Facilities or organizations that achieve one of the President / COO safety awards, may, at their discretion, budget for a local celebration in honor of their achievement.

Procedure 222 Safety Self Assessments

Procedure 223 Weapon (Shotgun Deslagging) Accountability Policy

TVA Safety Manual

Procedure 224 Workers' Compensation and Case Management

TVA Safety Manual

224 Workers' Compensation and Case Management

Procedure Number 224

TVA Safety Procedure

Workers' Compensation and Case Management

Revision 1

April 30, 2007

Purpose

The purpose of this procedure is to establish requirements for managing workers' compensation cases for employees who submit claims for work-related injuries and illnesses.

Workers Compensation

1. TVA and other Federal employees who sustain injuries while in the performance of duty are entitled to the benefits of the Federal Employees' Compensation Act (FECA). The FECA is administered by the U.S. Department of Labor, Office of Workers' Compensation Programs (OWCP).
2. All determinations and payments of workers' compensation benefits are made by OWCP.
3. TVA has no jurisdiction over OWCP and does not have the authority to have OWCP accept or deny claims.

FECA - Sole Remedy

1. The benefits provided under FECA are the only compensation benefits available to Federal employees for work-related injuries, illnesses, or death.
2. This provision of FECA is known as the "sole remedy clause" and means that a Federal employee or surviving dependent is not entitled to sue the United States or its agencies (including TVA) to recover damages for an injury, illness, or death which is covered under FECA.

Non-Adversarial

1. While FECA's sole remedy provision protects the employing agency from lawsuits by claimants, TVA also has no right to "go to court" to contest claims with which it disagrees. Therefore, the claims procedures under FECA are non-adversarial.
2. TVA is not entitled to appeal but may provide evidence or comments to OWCP during the claim adjudication process and during appeals by the claimant.

Penalties

Federal regulations state that any person responsible for making injury reports who willfully fails to do so, compels a worker to forego filing a claim, or willfully retains any paper connected with an injury is subject to a $500 fine and/or up to one year imprisonment. In addition, any employee, official superior, or other person who makes false or misrepresented statements or conceals facts connected with a FECA claim or accepts compensation to which he or she is not entitled, is subject to criminal prosecution which under appropriate U.S. Criminal Code provisions can be punished by fines up to $10,000 and/or up to five years imprisonment. In addition to these penalties, the employee must repay OWCP the benefits which were paid.

Requirements For Eligibility Under FECA

1. Claims must meet all of the following requirements in order to be compensable under FECA.
2. Form CA-1 must be completed within 30 days of injury for continuation-of-pay eligibility.
3. For eligibility for any FECA benefit, the claim must be filed within 3 years from the date of injury (traumatic injury) or 3 years from the date he/she became aware of the work-related condition or was last exposed to the employment factors (occupational illness).
4. OWCP may waive the 3-year time limit only if TVA had knowledge of injury/illness within 30 days of incident.
5. The individual must be a TVA employee to be covered under the FECA.
6. Employees of contractors working for TVA are not considered TVA employees, but are employees of the contractors that carry their own workers' compensation coverage.
7. OWCP must accept that the employee sustained an injury in the time, place, and manner alleged.
8. The claimant's report of injury should be consistent with the surrounding facts and circumstances such as information in the supervisor's report, witness statements, or medical reports. If the following factors (particularly two or more) exist, doubt is cast on "fact of injury":
   - Inconsistencies in how injury occurred (different history in medical report, etc.)
   - Failure to promptly report injury
   - Failure to seek immediate medical treatment
   - Failure to mention the injury to anyone
   - History of having the same condition prior to the alleged injury or history of an injury having occurred prior to alleged injury
   - Absence of witnesses to an event that reasonably should have been observed
9. The injury must have occurred in the course of the employee's official duties or during an activity reasonably required as part of the employee's official duties.
10. The injury or condition claimed must be shown by medical evidence (from a physician) to have been caused or aggravated by the injury alleged by the employee.

Claims Of Work Injuries Should Be Investigated

1. Verify employee's duties on the alleged date of injury.
2. Examine claimed injury site for existence or lack of physical evidence.
3. Talk to reported witnesses.
4. Talk to the employee's co-workers and to employees working in the area where the injury reportedly occurred.
5. Verify that medical evidence supports the existence of injury to the body.
6. Get written, detailed statements from employees.
7. Prepare a written summary of the findings of the administrative investigation.
8. Attach applicable statements and other pertinent documents.
9. Complete supervisor's portion of injury claim consistent with investigation results.
10. Attach complete investigation results to injury claim and submit promptly.

Case Management

1. TVA provides claim and case management and return to work service for employees who incur job-related injuries and include:
   - Initial treatment by TVA or contract medical providers where available or assistance as necessary to obtain other treatment by the physician of the employee's choice.
   - Helping employees submit workers' compensation claims correctly and obtain benefits through the Office of Workers' Compensation Programs (OWCP).
   - Monitoring the medical recovery of employees following job-related injuries.
   - Facilitating prompt return to work through cooperative working relationships with the injured employee and the employee's physician.
   - An aggressive case management program to ensure timely, appropriate benefits and prevent unnecessary lost time and misuse of benefits.
2. TVA provides these services to:
   - Help employees file claims correctly and obtain benefits promptly.
   - Facilitate recovery from work injuries.
   - Prevent unnecessary time away from work.
   - Prevent inappropriate benefits and unnecessary costs.
   - Meet the requirements of FECA and other applicable laws and regulations.

Role of the Line Organization

1. Employees shall report injuries to supervisors immediately.
2. The supervisor / management designee ensures the employee obtains prompt medical care when needed and accompanies the employee to obtain treatment to TVA or contract medical provider when available or to an emergency room or private physician.
3. The supervisor / management designee notifies the physician that light duty will be made available, if necessary to prevent work stoppage or expedite return to work.
4. The supervisor / management designee ensures that the employee is assisted in completion of proper injury or illness reports, CA-1 (traumatic injury) or CA-2 (occupational illness).
5. The supervisor / management designee completes the supervisor's portion of the form and submits it to TVA's Workers' Compensation Department (WCD) within 8 workdays of receipt from the employee.
6. The supervisor / designated manager ensures that all claims are investigated to obtain an objective, factual record for use in improving safety and managing workers' compensation claims and costs. The investigation report is attached to the CA-1 or CA-2. Suspected fraud is referred to the Office of the Inspector General.
7. The supervisor / designated manager contacts TVA's WCD immediately if an employee stops work or does not return to work following a work injury (regardless of leave status) to initiate the case management process.
8. Injured employees shall be returned to work as soon as their return is medically approved.
9. If an employee is not capable of resuming his/her regular job duties, temporary light duty shall be assigned during the recovery process to promote recovery and prevent unnecessary time away from work.
10. The supervisor or designated manager and the nurse case manager assigned by TVA's WCD will work together to coordinate and identify light duty work and prepare a description of the work.
11. The nurse case manager will provide case management services including monitoring medical recovery and obtaining and expediting medical approvals for the employee's return to work.
12. For employees working with medical constraints, supervisors/designated managers should contact the Workers' Compensation Department promptly at anytime there is difficulty identifying or continuing light duty work or when employees do not return to regular duty in the time period expected.

Early Intervention

1. Early Intervention is prompt, planned action to return injured employees to work during the recovery process as soon as they are able to do some productive work. Early Intervention often enables the employee to remain at work after the injury, preventing unnecessary lost-time.
2. At TVA, the Early Intervention process begins on the day of injury and involves timely, persistent action with regular communication between the injured worker, his/her physician, his/her supervisor, and the Workers' Compensation Department (WCD) Nurse Case Manager.
3. For lost-time or potential lost-time injuries, the Case Manager's functions may include;
   - Accompanying employee to his/her physician;
   - Intervening to expedite medical procedures, tests and other treatment;
   - Talking to the employee and physician openly about the employee returning to work;
   - Counseling employee to resolve conflicts, problems and other deterrents to return to work;
   - Working with supervisors to design or arrange appropriate light duty work assignments;
   - Obtaining releases to work from physicians;
   - Assisting supervisors in monitoring employee progress toward a goal of regular duty.

References

Additional help and forms may be obtained at the Workers' Compensation Department web site.

Medical information may be obtained at the TVA Occupational Health web site.

Procedure 225 Classifying and Recording Work Injuries (cancelled)

TVA Safety Manual

Procedure 226 Safety Stand-down

TVA Safety Manual

226 Safety Stand-down

Procedure Number 226

TVA Safety Procedure

Safety Stand-down

Revision 0

April 29, 2005

Purpose

The purpose of this procedure is to establish a process to conduct a safety stand-down as a means to ensure expeditious communication for understanding and compliance with specific safety requirements and immediate actions required following serious accidents or nearmisses.

The objective of the stand-down is to:

- Increase safety awareness,
- Provide specific instructions for job/task performance,
- Ensure previous training was understood and implemented on the job,
- Ensure that physical job site safety requirements are met,
- Roll out a new safety requirement,
- Issue interim corrective actions following an accident until the investigation is complete,
- Investigate compliance with a safety requirement.

What is a Safety Stand-down?

1. A safety-stand-down is a stoppage of work directed by management in response to a serious accident, near miss, identified program or physical deficiency or to improve overall safety.
2. A safety stand-down in TVA may be a Level 1 Safety Stand-down or a Level 2 Safety Standdown.

Level 1 Safety Stand-down

1. A Level 1 Safety Stand-down is an immediate stoppage of work and is generally used in response to events that may be immediately dangerous to life and health and is issued by the group Executive Vice-President.
2. TVA Safety supports the affected line organization in the development of the Level 1 Safety Stand-down.

Level 2 Safety Stand-down

1. A Level-Two Safety Stand-down is less serious in nature, does not require an immediate work stoppage, and may be accomplished at any time within the next seven (7) days.
2. The Level 2 Safety Stand-down is issued at the plant / business unit level.
3. The assigned TVA Safety Consultants support their plants / business units in the development of the Level 2 stand-down.

When do you Conduct a Safety Stand-down?

1. Safety stand-downs can be conducted at anytime. Managers and supervisors can use this tool as a means to address specific concerns at their discretion or review issues related to specific events.
2. A Level 1 Safety Stand-down must be conducted no later than the next work day after the event that initiated the stand down. A Level 2 Safety Stand-down can be conducted anytime during the next 7 days after the issue of the stand-down.

How to Conduct a Safety Stand-down

1. A safety stand-down directed to affected organizations by a TVA Safety Awareness Bulletin will describe the level of the stand-down, provide information to be discussed and communicated to employees, identify the target group for the stand-down, and identify the feedback required for verification that the elements of the stand down were put into place.
2. Safety stand-downs directed by a local manager must be planned to meet established objectives. Stand-down objectives are generally to improve safety performance, evaluate safety and health risks, correct deficiencies, and emphasize awareness of good safety and health practices for all employees.
3. All safety stand-downs must identify the specific action to be taken or safe behavior to be emphasized as well as how the results are to be verified.

Documentation of Safety Stand-downs

1. Safety stand-downs typically are documented by using Safety Meeting attendance sheets. In some cases, particularly for a Level 1 Safety Stand-down the responsible manager may require individual documentation of attendance in ATIS. A determination is made by the responsible manager at the time the stand-down is initiated concerning the target audience for the stand-down and the expectations for documentation of attendance. Employees that may be off from work at the time of the stand-down will be advised of the required information upon their return to work.
2. Documentation must include results achieved based on the actions required by the stand down.

Verification of Effectiveness

1. Within forty-eight (48) hours following the completion of the safety stand-down, local management must verify the effectiveness of the stand down using one or more of the following;
   - Conduct random discussions with a representative sample group of employees
   - Random observations of work being performed to verify that required work methods and behaviors are being used.
   - Physical verification that equipment and material changes have been made.
2. Results of this verification of effectiveness must be reported to their management and if necessary, the safety stand-down may be repeated.

Chapter 1 Section 3 Personal Protective Equipment

Procedure 301 Breathing Air Systems

TVA Safety Manual

301 Breathing Air Systems

Procedure Number 301

TVA Safety Procedure

Breathing Air Systems

Revision 0

January 6, 2003

Purpose

This procedure establishes requirements for breathing air.

Hazards

1. Contaminants present the major hazard to users of compressed air. Air entering the compressor may be contaminated or contaminants may be added by decomposition of compressor lubricants.
2. The presence of objectionable odors may warn of contamination of the air and may discourage the use of air supplied respiratory protection in atmospheres that may be hazardous.

General Requirements

1. Oil free compressors should be selected for breathing air.
2. Breathing air compressors should be equipped with dependable high temperature alarms or automatic shutdown systems and with warning devices to indicate loss of system air pressure.
3. Signs shall be installed to identify a compressor that is used for breathing air. A testing label shall also be installed to indicate the last air test.
4. Testing shall be performed at least semi-annually to determine that air quality meets required standards for breathing air. Testing shall also be performed anytime maintenance is performed on the compressor.
5. Records shall be maintained of breathing air testing.
6. Where compressors are used for supplying air, the compressor must be constructed and situated so contaminated air cannot enter the air-supply system. The location of the air intake must be in an uncontaminated area where exhaust gases from nearby vehicles, the internal combustion engine that is powering the compressor itself (if applicable), or other exhaust gases being ventilated from the plant will not be picked up by the compressor air intake.
7. Compressors shall be equipped with suitable in-line, air-purifying sorbent beds and filters to further ensure breathing air quality, and to minimize moisture content so that the dew point at 1 atmosphere pressure is 10°F (5.56°C) below the ambient temperature. Sorbent beds and filters must be maintained and replaced or refurbished

periodically according to the manufacturer's recommendations, and a tag must be kept at the compressor indicating the most recent change date and the signature of the person authorized by the employer to perform the change.

8. For compressors that are not oil-lubricated, carbon monoxide levels shall not exceed 10 ppm. This requirement can be met by several different methods, including the use of continuous carbon monoxide alarms, carbon monoxide sorbent materials, proper air intake location in an area free of contaminants, frequent monitoring of air quality, or the use of high-temperature alarms and automatic shutoff devices, as appropriate. Plants have flexibility in selecting the method(s) most appropriate for conditions in their workplace.
9. Oil-lubricated compressors can produce carbon monoxide if the oil enters the combustion chamber and is ignited. This problem can be particularly severe in older compressors with worn piston rings and cylinders. Consequently, if an oil-lubricated compressor is used, it must have a high-temperature or carbon monoxide alarm, or both, to monitor carbon monoxide levels. If only a high-temperature alarm is used, the air from the compressor must be tested for carbon monoxide at intervals sufficient to prevent carbon monoxide in the breathing air from exceeding 10 ppm.
10. Breathing air couplings must be incompatible with outlets for non-respirable plant air or other gas systems to prevent accidental servicing of air line respirators with non-respirable gases or oxygen.
11. Hose used for breathing air may not be used for any other purpose.

Specifications for Breathing Air

Breathing air for atmosphere-supplying respirators must be of high purity, meet quality levels for content, and not exceed certain contaminant levels and moisture requirements. Compressed air used for respiration must be in accordance with the following requirements:

- Compressed breathing air must meet at least the requirements for Grade D breathing air as described in the ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989.
- Breathing air may be supplied to respirators from cylinders or air compressors. Where cylinders are used, they must be tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR parts 173 and 178).
- Cylinders of purchased breathing air must have a certificate of analysis from the supplier stating that the air meets the requirements for Grade D breathing air.
- The moisture content of the compressed air in the cylinder cannot exceed a dew point of -50°F (-45.6°C) at 1 atmosphere pressure.
- This requirement will prevent respirator valves from freezing, which can occur when excess moisture accumulates on the valves.
- All breathing gas containers must be marked in accordance with the NIOSH respirator certification standard, 42 CFR Part 84.

Cautions in the Use of Breathing Air Systems

1. The compressor intake should be properly located to intake ordinary uncontaminated ambient air.
2. The compressor intake should be located to ensure that air with normal ambient air oxygen content (19.5% - 23.5%) is always available.
3. The compressor intake should be remotely located from all possible mobile exhaust to ensure that carbon monoxide (CO) is excluded from the intake. The intake should be remotely plumbed to a safe position at each worksite.
4. A continuous carbon monoxide monitor and alarm should be installed and functioning in the compressor output breathing air stream.
5. Any internal combustion engine-driven compressor should also have the exhaust line plumbed to a safe location.

6. Air supply hose or lines should be restrained every 15 feet of their length. (This does not include the length of hose from the distribution manifold to the respirator).
7. The compressor intake point and intake hose should never be operated in air contaminated with asbestos fibers. The compressor and air intake hose should be located in a clean air environment outside the asbestos work zone.
8. Use only compressor oil suitable for use in breathing air applications.
9. Compressors equipped with breathing air purifier assemblies should be used. Breathing air purifier assemblies should be used as designed and not overloaded.
10. Never use pure oxygen gas in any part of the gas supply system supplying the air supplied respirators. Respirators are supplied only with Grade D air.
11. Before starting and operating a compressor and purifier system, inspect all system components for structural damage which could result in an explosion. Inspect safety relief valves carefully. and verify that they are in good working order.

Procedure 302 Electric Arc Flash Protection

TVA Safety Manual

302 Electric Arc Flash Protection

Procedure Number 302

TVA Safety Procedure

Electric Arc Flash Protection

Revision 2

August 1, 2003

Notice

The requirements of TVA Safety Procedure 302, “Electric Arc Flash Protection” have been established in a new more comprehensive procedure, TVA Safety Procedure 1022, “Arc Flash Hazard Calculation and Required Protection”.

TVA Safety Procedure 302, “Electric Arc Flash Protection” is cancelled.

This procedure number may be re-assigned in a future revision to the TVA Safety Manual.

Procedure 303 Emergency Showers and Eyewash

TVA Safety Manual

303 Emergency Showers and Eyewash

Procedure Number 303

TVA Safety Procedure

Emergency Showers and Eyewash

Revision 1

June 25, 2010

Purpose

The purpose of this procedure is to establish requirements for emergency showers and eyewash equipment.

Requirements for Emergency Showers and Eyewash

1. Emergency showers, eyewash, or other deluge systems shall be provided in areas where any of the following conditions exist · Acid, caustic, or other hazardous chemicals are used, stored or handled (and the possibility of spillage exists)
   - Airborne dust or contaminants may be present
   - Chemical fumes that may cause eye or skin irritation are present
2. Self-contained portable eye wash units are recommended for use in most areas due to the lower testing, maintenance and cost. At a minimum, the self contained unit must provide a flow rate of 0.4 gal/min for 15 minutes. Signs shall be posted in these areas indicating that the portable unit must be present prior to beginning work involving potential contact with the chemical.

Locating Eyewash and Emergency Showers

1. Emergency showers or eyewash units shall be located within 10 seconds or 100 feet from the hazard.
2. Locate emergency showers and / or eyewash equipment for areas that include battery charging equipment within 25 feet of the battery charging equipment.
3. Locate emergency showers and / or eyewash equipment for areas where highly corrosive chemicals are stored or used within 10 - 20 feet from where the highly corrosive chemicals are stored and / or used.
4. The location of emergency showers and eyewash units shall be free from any obstructions and accessible from at least two directions.
5. A 45 inch radius shall be kept clear and unobstructed around emergency showers and eyewash units at all times.
6. Emergency showers and eyewash units shall be located where the water spray will not contact electrical apparatus or power outlets.
   NOTE: Electrical outlets within a 45 inch radius around emergency showers and eyewash units shall be permanently de-energized.
7. Emergency shower and eyewash locations shall be marked with identification signs.
8. Actuating valves shall be easily accessible and manipulated.
9. Flow rates for permanent units should be approximately 20 gallons per minute for emergency showers and 3 gallons per minute for the eyewash units.
10. Eyewash units provide twin curtains of aerated water which cover the face area.

11. Water supplying emergency showers and eyewash units shall be potable.
12. De-ionized water may be used for the fixed water supply in building areas where potable water is not available.
13. Self-contained portable units and the supply lines of permanently installed eyewash units shall be protected from freezing and excessive heat. Heat-tracing is prohibited as a method of freeze protection.
14. All permanently installed emergency showers and eyewash units shall be tested quarterly by operating the valves. A record of the quarterly tests shall be maintained. Portable units are required to be inspected before work operations begin in areas where hazardous chemicals are used or stored.
15. Emergency showers located in areas that include battery charging equipment and areas where highly corrosive chemicals are stored or used shall be inspected daily or before the operation begins.
16. When maintenance on building water systems requires that any emergency shower or eyewash be inoperative, the supervisors of employees working in the affected area shall be notified prior to the outage and immediately after service is restored and each eyewash/shower shall be placarded "Out of Service."
17. Whenever work activities requiring access to a permanently installed emergency shower and eyewash unit are ongoing during the outage of the potable water supply, an adequate number of portable emergency shower and eyewash units shall be located in the work area until the water supply is restored.
    Note: The locations of portable units shall be marked and workers in the area notified of their location.
18. Water temperature of emergency showers and eyewash equipment should be "tepid" (moderately warm).

Reference

29 Code of Federal Regulations 1910.151, "Medical Services and First Aid"

29 Code of Federal Regulations 1926.441, "Batteries and Battery Charging"

American National Standards Institute (ANSI) Z358.1-1998, "Emergency Eyewash and Shower Equipment

Procedure 304 Eye and Face Protection

TVA Safety Manual

304 Eye and Face Protection

Procedure Number 304

TVA Safety Procedure

Eye and Face Protection

Revision 3

October 01, 2007

Purpose

The purpose of this procedure is to establish requirements for eye and face protection at plants/ facilities.

TVA Requirements

1. Non-prescription safety glasses shall comply with the current edition of ANSI Z87.1, "American National Standard Practice for Occupational and Educational Eye and Face Protection" and Canadian Standard Association (CSA) Z94.3-02, “Eye and Face Protectors” and Military Standard, MIL-STD-662, “Ballistic Test for Armor”. **Note: The TVA Standard Leverage Item Catalog provides a listing of approved nonprescription** safety glasses, goggles and faceshields.
2. Goggles and faceshields shall comply with the current edition of ANSI Z87.1, "American National Standard Practice for Occupational and Educational Eye and Face Protection".
3. Prescription safety glasses shall comply with the current edition of ANSI Z87.1, "American National Standard Practice for Occupational and Educational Eye and Face Protection".
4. Eye and face protection shall be provided to protect employees from potential hazards that could cause injury to the eye.
5. Eye protection shall provide adequate protection against the hazard.
6. Employees shall not alter or modify eye protection equipment.

Hazard Assessment

1. Workplace Hazard Assessment Eye and Face Protection shall be conducted by qualified TVA safety professionals along with responsible plant / facility / organization managers.
2. All plants and facilities shall assess the workplace to determine if hazards are present, or are likely to be present, which necessitate the use of eye and face protection. If such hazards are present, or likely to be present, the responsible manager shall:
   - Select, and have each affected employee use, the types of eye and face protection that will protect the affected employee from the hazards identified in the hazard assessment;
   - Communicate selection decisions to each affected employee; and,
   - Verify that the required workplace hazard assessment has been performed through a written certification, (Appendix A, Workplace Hazard Assessment Eye and Face Protection).
3. The supervisor and/or foreman and the employees performing a job or activity not addressed in Appendix A shall evaluate the activity on a case-by-case basis to determine appropriate eye protection and ensures that the appropriate eye/face protection is used.

General Requirements

1. All plants / facilities shall ensure that each employee uses appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation. Appendix B, Eye and Face Protection Selection Guide, provides information to select the appropriate eye protection for the hazard.
2. Employees, contractors, and visitors shall wear eye protection for those activities identified as presenting a recognizable hazard.
3. All plants / facilities shall ensure that each employee who wears prescription lenses while engaged in operations that involve eye hazards wears eye protection that incorporates the prescription in its design, or wears eye protection that can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or the protective lenses.
4. Eye and face protectors shall meet the following minimum requirements:
   - They shall provide adequate protection against the particular hazards for which they are designed.
   - They shall be reasonably comfortable when worn under the designated conditions.
   - They shall fit snugly and shall not unduly interfere with the movements of the wearer.
   - They shall be durable.
   - They shall be capable of being disinfected.
   - They shall be easily cleanable.
   - Every protector shall be distinctly marked to facilitate identification only of the manufacturer.
5. If prescription glasses are necessary for the respirator users, he/she shall use an appropriate mounting frame so the sealing area of the respirator is not penetrated. If corrective eyewear is required, it is the type designed for the particular respirator to be worn.
6. Use of contact lenses is permitted with respirator wear for industrial health hazards provided the individual has previously demonstrated he or she has had successful experience wearing contact lenses. The contact lens wearer is required to have practice wearing the respirator while wearing the contact lenses.
7. Defective safety glasses shall be replaced without cost to the employee upon return of the defective or damaged safety glasses.
8. Employees whose vision requires the use of corrective lenses in spectacles, when required by this procedure to wear eye protection, shall be protected by goggles or spectacles of one of the following types:
   - Spectacles whose protective lenses provide optical correction;
   - Goggles that can be worn over corrective spectacles without disturbing the adjustment of the spectacles;
   - Goggles that incorporate corrective lenses mounted behind the protective lenses.
9. All plants / facilities shall ensure that eye protection that provides side protection shall be worn when working with tools, equipment, or devices where flying objects, sharp objects, liquids, steam, or high-pressure or high-temperature gases might result in a hazard to the eyes or face. Safety glasses with side shields shall be worn. **Note: for the Nuclear Power Group safety glasses and all other eyewear, when worn within all Foreign Exclusion Areas including the control zone of the spent fuel pit, fuel transfer canal, up-ender area, or refuel cavity, when these facilities are flooded, are secured with behind-the-head straps or as otherwise specified by the refuel floor coordinator.**
10. Employees performing jobs that could result in eye hazards to others in an area where eye protection is not normally required must erect shields or warning signs around the hazard area.
11. Faceshields shall be worn to provide protection to the face and neck from flying particles, objects, and liquids. Safety glasses shall be worn under faceshields to provide additional protection to the eyes.
12. Eye protectors with darkly tinted lenses shall not be used indoors except for activities that emit harmful light rays such as welding. Appendix C, Filter Lenses for Protection Against Radiant Energy, provides guidance in the selection of the proper lens.
    NOTE: This restriction against tinted glasses is subject to review and waiver for employees having

verifiable medical restrictions requiring tinted lenses.

13. Non-prescription safety glasses, goggles, welding helmets, and faceshields approved for use are listed in the TVA Standard Leverage Item Catalog.
14. Visitors, contractors, and new employees who do not have prescription safety glasses with side shields shall wear standard goggles or visitors' spectacles over their prescription eyewear.
15. Employees who must wear prescription eyewear and who are assigned a job that requires the wearing of full-face respirators, breathing apparatus, or other full-face masks are furnished (free of charge) a special metal frame (spectacle kit) and clear 44-millimeter corrective lenses for use with the respiratory protective equipment.
16. The employee requiring special eyewear for use with full-face respiratory protective devices furnishes a current prescription for the 44-millimeter corrective lenses. The lenses are forwarded to the employee's doctor who fits the lenses to the spectacle kit and then fits and dispenses the special eyewear to the employee.
17. During emergencies, regular safety glasses may be used with respiratory apparatus by breaking or cutting the temple pieces to fit the face mask. Temple pieces cut or broken for such emergency use will be replaced.
18. Employees who wear contact lens shall wear eye and face protection as required by the same circumstances and of the same type as would be required if they were not wearing contact lens.

Plant / Facility Specific Requirements

1. A mandatory program for eye and face protection requires that approved safety eyewear shall be worn in the following type plant areas.
2. Powerhouse, warehouses, shops, coal handling areas, construction areas

Exceptions

1. Control rooms, offices, computer rooms, training rooms, lunch areas, assembly and meeting areas, parking areas, shower and locker rooms, bathrooms and similar occupancies.
2. Safety spectacles shall be required to be worn in any area that may not be specifically designated or that may be an excepted area such as when a known hazard that may produce an eye injury is present.
   Note: Any Nuclear Power Group areas exempted require approval by the Site Vice President and documentation in the Workplace Hazard Assessment for Eye and Face Protection, Appendix A.
3. All facilities that do not have general area requirements are required to identify and post areas where eye protection is required.

Cleaning and Maintenance

1. Eye and face protection equipment shall be kept clean and in good repair. The use of this type equipment with structural or optical defects is prohibited.
2. Cleaning is particularly important for eye and face protection where dirty or fogged lenses could impair vision.

Definitions

Chemical goggles - eye protection with contour-shaped eyecups having a minimum thickness of 0.060 inch with all ventilation openings baffled or screened to prevent direct passage of dusts or liquids into the interior of the eyecup.

Face shield - a transparent plastic shield worn or positioned in front of the face to provide frontal protection or the face and neck; used in conjunction with other eye protection.

Safety glasses - spectacle-type eye protection, with sideshields, designed to provide protection for the eyes from frontal impact from flying objects and particles (and some degree of side protection for the eyes from flying objects).

Standard goggles - eye protection with contour-shaped eyecups having plastic lenses and having a minimum thickness of 0.060 inch.

Reference

29 Code of Federal Regulations 1910.133, “Eye and Face Protection”.

29 Code of Federal Regulations 1926.102, “Eye and Face Protection”.

American National Standard Z87.1, "Practice for Occupational and Educational Eye and Face Protection".

Canadian Standard Association (CSA) Z94.3-02, “Eye and Face Protectors”.

Military Standard, MIL-STD-662, “Ballistic Test for Armor”

Appendices

Appendix A

Workplace Hazard Assessment

Eye and Face Protection

Plant / Facility	Plant / Facility
Assessment Date:	10/01/07
Type Assessment:	Eye and Face Protection
Potential Hazards:	Describe potential hazards to eyes and face
Assessment Results:	Safety glasses, goggles or face shields shall be required to be worn in any area or when performing tasks when there are known hazards that may cause an eye injury.
	1.
Exceptions:	None or list specific approved exceptions
Certification:	This certifies that a workplace hazard assessment has been performed for the hazards described and required personal protective equipement measures established.
Certified By:	Name of person who conducted assessment TVA safety professional

Appendix B

Eye and Face Protection Selection Guide

Operations	Hazards	Required Protectors
1. Acetylene-burning, cutting, welding molten metal	Sparks, harmful rays, molten metal, flying particles	Welding goggles
2. Chemical handling (and other liquids)	Splash, acid burns, flying particles	Chemical goggles (use cryogenic liquids) faceshield for severe exposures)
3. Chipping	Flying particles	Standard goggles or faceshields with safety glasses with sideshields
4. Electric (arc) welding	Sparks, intense rays, molten metal	Welding helmet with required lenses and safety glasses with sideshields
5. Energized Electrical	Electric Arc Flash, burns	Special tinted face shield over safety glasses (minimum 8 calorie per cm^2)
6. Grass cutting	Flying objects	Standard goggles or safety glasses with sideshields
7. Grinding and disc cutting	Flying particles	Faceshield over standard goggles or safety glasses with sideshields
8. Machining	Flying particles	Standard goggles or safety glasses with sideshields

9. Portable power	Flying particles	Standard goggles or safety glasses with sideshields
10. Soldering	Molten metal	Standard goggles or safety glasses with sideshields
11. Cleaning with air	Flying particles	Standard goggles
12. Using hammers or other impact tools	Flying particles	Safety glasses with sideshields
13. Wire and metal band cutting	Flying objects	Safety glasses with sideshields
14. Racking breakers in or out	Electric arc flash, sparks, flying particles	Special tinted face shield over safety glasses (minimum 8 calorie per cm^2)
15. Replacing or removing / expulsion fuses over 240 volts	Electric arc flash, sparks, flying particles	Special tinted face shield over safety glasses (minimum 8 calorie per cm^2)
16. Any work near the above activities	Conditional	Safety glasses with sideshields minimum (other protection as indicated by the operation hazard)

NOTE 1: Full face respirators and self-contained breathing apparatus satisfy the eye and face protection requirements for all of the above except for 1, 4, 5, 14, 15.

NOTE 2: The eye and face protection requirements identified in TVA Safety Procedure 1022, "Arc Flash Hazard Calculation and Required Protection" have precedence over this procedure.

Appendix C

Filter Lenses for Protection Against Radiant Energy

Operations	Electrode Size 1/32 in.	Arc Current	Minimum Protective Shade
Shielded metal arc welding	less than 3 3-5 5-8 More than 8	less than 60…….. 60-160…….. 160-250…… 250-550……	7 8 10 11
Gas metal arc welding and flux cored arc welding		less than 60…….. 60-160…….. 160-250…… 250-550……	7 10 10 10
Gas tungsten arc welding		less than 50…… 50-150…….. 150-500……	8 8 10
Air carbon Arc cutting	(light)…… (heavy)……	less than 500…… 500-1000……..	10 11
Plasma arc welding		less than 20…….. 20-100…….. 100-400…… 400-800……	6 8 10 11
Plasma arc cutting	(light)…… (medium)…….. (heavy)……..	less than 300…… 300-400…… 400-800……	8 9 10
Torch brazing Torch soldering Carbon arc welding		…….. …….. ……..	3 4 14

Operations	Plate Thickness -inches	Plate Thickness -millimeters	Minimum Protective Shade
Gas Welding: Light Medium Heavy	Under 1/8……. 1/8 to ½…… Over ½…….	Under 3.2…….. 3.2 to 12.7……. Over 12.7……..	4 5 6
Oxygen cutting Light Medium Heavy	Under 1……. 1 to 6……. Over 6 ……..	Under 25…….. 25 to 150……. Over 150…….	3 4 5

Note 1: As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum. In oxy-fuel gas welding or cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the (spectrum) operation.

Note 2: The Minimum Protective Shade values shown for plasma arc cutting apply where the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is hidden by the work piece.

Procedure 305 Fall Protection Systems

TVA Safety Manual

305 Fall Protection Systems

Procedure Number 305

TVA Safety Procedure

Fall Protection Systems

Revision 8

May 3, 2011

Purpose

The purpose of this procedure is to establish the safety requirements for fall protection when working from unprotected elevations or suspended scaffolds.

Hazard Identification

1. Fall protection begins with identification of all fall hazards in the workplace.
2. As a general rule, any time a worker is at a **height of 4 feet or more**, a fall hazard exists.
3. Where a fall hazard exists, there are two acceptable options: (1) eliminate the hazard, or (2) use approved fall protection equipment.
4. Where conventional fall protection is infeasible or creates a greater hazard at the leading edge of a building or structure the following controls may be used:
   - Develop a Job Safety Analysis as identified in paragraph Leading Edge Work.
   - Use a Fall Protection Safety Monitoring System (see paragraph Fall Protection Safety Monitoring System)
   - Establish Fall Protection Controlled Access Zone (see paragraph Fall Protection Control Access Zone)

   NOTE: When working from flat bed trucks and conventional fall protection is impractical to use, a Job Safety Analysis shall be developed and the use of a “Fall Protection Safety Monitoring System” as described in paragraph 20 shall be implemented
5. A comprehensive fall protection program must be viewed as a “total system” beginning with hazard identification and ending with ongoing management review.

General Fall Protection Requirements

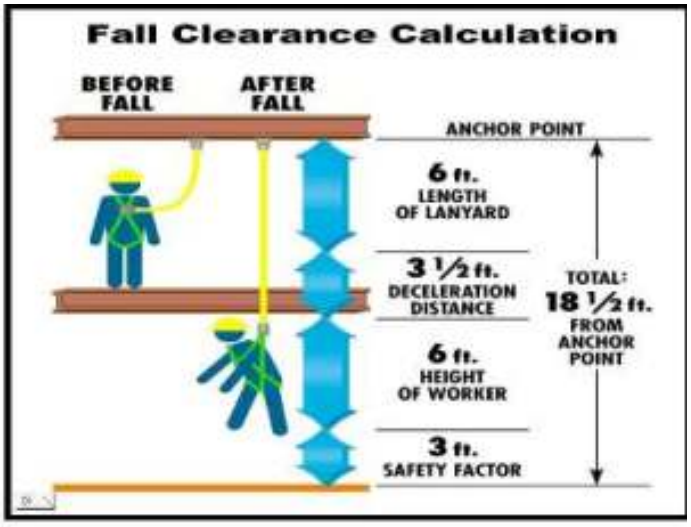
1. Always read all instructions and warnings before using any fall protection equipment.
2. A personal fall protection system shall be worn by employees under the following conditions:
   - Whenever working from unprotected working surfaces at a **height of 4 feet or more**
   - Whenever working from suspended scaffolds at a **height of 4 feet or more**
3. All employees shall understand regulations pertaining to fall protection before using the equipment.
4. A rescue program shall be established prior to using fall protection equipment.
5. Should a fall occur, the body harness will distribute the load throughout the body instead of concentrating the forces on the abdomen. The sliding back D-ring will keep the worker in an upright position in the event of a fall, which allows the worker to remain as comfortable as possible while awaiting a rescue.
6. If a fall occurs, all components of the fall protection system shall be removed from service.

Tie-Off Procedures

1. Tie-off is the act of connecting, directly or indirectly, to an anchorage point.
2. To reduce free fall distance, tie-off the lifeline above the D-Ring at the back of the full body harness.
3. A tie-off using a knot can reduce the strength of the line by 80 percent.
4. Tying-off around “H” or “I” Beams can reduce the strength of the line by 70 percent or more.
5. A webbing lanyard or wire core lifeline should be used around the beam for protection of the lanyard.

Personal Fall Arrest Systems

1. A Personal Fall Arrest System (PFAS) consists of anchor points, body harness, and connectors and may include a deceleration device, lifeline, or suitable combinations. A fall arrest system is designed to be passive and only come into service should a fall occur.
2. A PFAS is used for fall protection, it must do the following:
   - Limit maximum arresting force on an employee to 1,800 pounds when used with a body harness;
   - Be rigged so that an employee can neither free fall more than 6 feet nor contact any lower level;
   - Bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet; and
   - Have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of 6 feet or the free fall distance permitted by the system, whichever is less.
3. The maximum fall distance is calculated as shown in the chart below. The maximum fall distance must be known to ensure that a falling employee does not contact any lower level.



System Components

1. Three key components of the PFAS need to be in place and properly used to provide maximum worker protection: **Only components that are fully compatible with one another should be used.** Fall arrest systems are designed and tested as complete systems and will be used in this way.
   - **Body Harness**: The first component is the body harness. Full-body harnesses are the only appropriate equipment to be worn in the event of a free fall.
   - **Connecting Devices**: The second system component is the connecting device. This device can be a rope or web lanyard, rope grab or retractable lifeline. However, shock-absorbing lanyards are recommended because they significantly reduce the forces generated in a fall.
   - **Anchorage Point**: The final component of the system is the anchor point (often referred to as the tie-off point). This point must be capable of supporting 5,000 pounds per worker or shall be designed, installed, and used as

part of a complete personal fall arrest system which maintains a safety factor of at least two and under the supervision of a qualified person. The following are examples that may meet the criteria, a support beam, cross-arm strap or beam trolley.

Positioning

1. A personal positioning system holds a worker in place while allowing a hands-free work environment. Whenever a worker leans back, the system is activated, making this an “active” system.
2. The components of a positioning system typically are:
   - Body Harness/Body Belt,
   - Rebar Chain Assembly,
   - Vertical Rods
   - Positioning Lanyard

NOTE

A fall arrest system should be used in conjunction with the personal positioning system. A combination system should be used whenever possible, since a personal positioning system is not specifically designed for fall arrest purposes. By using this combination system, the fall arrest components will be activated should a fall occur.

Suspension

1. Personal suspension systems are designed to lower and support a worker while allowing a hands-free work environment.
2. Because the suspension system components are not designed to arrest a free fall, a back-up fall arrest system should be used in conjunction with the personal suspension system. This fall arrest system will only activate should the worker experience a free fall.

Retrieval

The retrieval system is mostly used in confined space. This system is primarily used where workers must be lowered into tanks, manholes, etc., and may require retrieval from above should an emergency occur.

Inspection and Maintenance of Fall Protection Equipment

1. Personal fall protection equipment must be inspected prior to each use for wear damage, and other deterioration. Defective components must be removed from service. Inspection procedures for fall protection equipment are included in Appendix A, Inspection Procedures for Fall Protection Equipment.
2. Fall protection equipment shall be inspected annually by a designated qualified person who has a met the minimal training requirements of this procedure.
3. All inspections shall be documented.Peronnell fall protection eqipment will be color coded to show completition of the required annual inspection in accordance with TVA Safety Procedure 617 Color Coding Identification - Safety Test / Inspection of Material and Equipment
4. Cleaning instructions for fall protection equipment at included in Appendix B, Cleaning Fall Protection Equipment.

Lifelines

1. Lifelines shall be protected against being cut or abraded.
2. A vertical lifeline is a flexible vertical lifeline suspended from a fixed anchorage to which a fall arrest device, such as a rope grab, is secured.
3. When vertical lifelines are used, each employee must have a separate lifeline.
4. Self-retracting lifelines and lanyards that automatically limit free fall distance to 2 feet or less shall be capable of sustaining a minimum tensile load of 3,000 pounds applied to the device with the lifeline or lanyard in the fully extended position.
5. Self-retracting lifelines and lanyards that do not limit free fall distance to 2 feet or less, ripstitch lanyards, and tearing and deforming lanyards shall be capable of sustaining a minimum tensile load of 5,000 pounds applied to the device with the lifeline or lanyard in the fully extended position.
6. Horizontal lifelines shall be designed, by a qualified person, as part of a complete personal fall arrest system that maintains a safety factor of at least two. Horizontal lifelines must be installed and used by a competent person of the appropriate craft.
   Note: A horizontal lifeline must be specially designed and approved by a person knowledgeable on fall protection systems.
7. Horizontal lifeline and anchorage strength must be increased for each additional employee tied-off to a single line
8. Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body belts and body harnesses shall be made of synthetic fibers.
9. Anchor points shall be designed by a qualified person. Anchor points shall be installed and used by a competent person of the appropriate craft.
10. Lanyards and vertical lifelines must have a minimum breaking strength of 5,000 pounds.

Lanyards

1. Lanyards with built-in shock absorbers reduce fall arresting forces by 65–80% compared to forces generated by traditional lanyards. Double-locking snaphooks feature self-closing, self-locking keepers which remain closed until unlocked and pressed open for connection or disconnection. This feature of locking snaps significantly reduces the possibility of accidental disengagement or “rollout.”
2. Reliable Anchorage Points — Anchor points and attachments must be capable of supporting 5000 lbs. per worker or shall be designed, installed, and used as part of a complete personal fall arrest system which maintains a safety factor of at least two and under the supervision of a qualified person. If there is any doubt about the strength of the anchor and/or attachment point — DO NOT ATTACH. Search for an alternative anchor point and select a proper attachment device.

Proper Anchor Connecting Procedures

1. When using a full-body harness, connecting devices should be attached to the Dorsal D-ring in the middle of back.
2. When using a body harness for restraint, connecting devices should be attached to the D-ring in the back at waist level. Side D-rings or front D-ring should be used for positioning only, not fall arrest.
3. Always keep free-fall distance to 6 feet or less. If using a six-foot or shorter lanyard, attach at or above your back D-ring. Also attach to an anchor point that ensures no lower level is struck during a fall. This is especially important when utilizing shock absorbers.

Safety Net Systems

1. Safety nets must be installed as close as practicable under the walking/working surface on which employees are working and never more than 30 feet below such levels.
2. Defective nets shall not be used.
3. Safety nets shall be inspected at least once a week for wear, damage, and other deterioration.
4. The maximum size of each safety net mesh opening shall not exceed 36 square inches nor be longer than 6 inches on any side, and the openings, measured center-to-center, of mesh ropes or webbing, shall not exceed 6 inches. All mesh crossings shall be secured to prevent enlargement of the mesh opening.
5. Each safety net or section shall have a border rope for webbing with a minimum breaking strength of 5,000 pounds. Connections between safety net panels shall be as strong as integral net components and be spaced no more than 6 inches apart.
6. Safety nets shall be installed with sufficient clearance underneath to prevent contact with the surface or structure below.
7. Safety nets shall be deisgned by a qualified person, as part of a complete personal fall arrest system that maintains a safety factor of at least two and installed by a competent person of the appropriate craft.
8. Safety nets may be used independently; however, they are typically used in conjunction with other approved OSHA fall protection systems.

Positioning Device System

1. A Positioning Device System is used with a body harness to support a worker on an elevated surface.
2. This system allows the employee to have both hands free to work.
3. This system functions as a fall protection system for climbing activities.
4. The positioning device system does not require the employee to hold, push or pull any part of the system.

Self Retracting - Lifelines

1. These lifelines are portable self-contained devices that are attached to an anchorage point above the work area.
2. The full body harness is connected by a lifeline to a reel that hangs from the anchorage point.
3. The lifeline freely retracts when the worker moves closer to the anchorage and extends as the worker moves away from it.
4. A self-retracting lifeline can arrest a free fall within 2 feet.

Lanyards

1. Lanyards are short, flexible lines usually having connectors at each end.
2. Lanyards are made of steel cable, or high-tensile strength webbing.
3. They connect body harnesses to deceleration devices.
4. **DO NOT** connect a lanyard between a body harness and a self-retracting deceleration device. Doing so can add more free fall distance to the system.

Snap-Hooks

1. Unless the snaphook is a double-locking type and designed for the following connections, they shall not be engaged (a) directly to webbing, rope, or wire rope; (b) to each other; (c) to a D-ring to which another snaphook or other connector is attached; (d) to a horizontal lifeline; or (e) to any object incompatible in shape or dimension relative to the snaphook, thereby causing the connected object to depress the snaphook keeper and release.
2. On suspended scaffolds or similar work platforms with horizontal lifelines that may become vertical lifelines, the devices used to connect to a horizontal lifeline shall be capable of locking in both directions on the lifeline.
3. Lanyards are to be attached to the anchorage point with snap-hooks in a way that does not reduce its required strength. The Snap-Hooks and D-Rings on the body harness must fit together properly.
4. Locking snap-hooks have a spring-loaded keeper. The keeper prevents roll-out from occurring.
5. Make sure snap-hooks are compatible with the hardware they are being attached.
6. DO NOT attach two snap-hooks together.

Leading Edge Work

1. A job safety analysis (JSA) shall be developed by a qualified person for any location where conventional fall protection methods cannot be used or where leading edge work is performed. The JSA must be maintained up to date and a copy of the plan maintained at the job site.
2. These locations shall be classified as “Controlled Access Zones” and the JSA shall document the reasons why the use of a conventional fall protection system is infeasible or why their use would create a greater hazard.
3. The JSA shall include a written review of other measures that will be taken to reduce or eliminate the fall hazard for workers who cannot be provided with protection from the conventional fall protection systems (i.e. Fall Protection Safety Monitoring System or Fall Protection Controlled Access Zone).

Fall Protection Safety Monitoring System

1. A fall protection safety monitoring system may be used that exposes only a minimum number of employees for the time necessary to actually accomplish the job. The maximum number of workers to be monitored by one safety monitor is six (6), provided that all workers are in visual control of the monitor.
2. A safety monitoring system means a fall protection system in which a competent person is responsible for recognizing and warning employees of fall hazards. The duties of the safety monitor are to:
   - Warn by voice when approaching the open edge in an unsafe manner.
   - Warn by voice if there is a dangerous situation developing which cannot be seen by another person involved with product placement, such as a member getting out of control.
   - Make the designated erectors aware they are in a dangerous area.
   - Be competent in recognizing fall hazards.
   - Warn employees when they appear to be unaware of a fall hazard or are acting in an unsafe manner.
   - Be on the same walking / working surface as the monitored employees and within visual sighting distance of the monitored employees.
   - Be close enough to communicate orally with the employees.
   - Not allow other responsibilities to encumber monitoring. If the safety monitorbecomes too encumbered with other responsibilities, the monitor shall (1) stop the work or (2) turn over the safety monitoring function to another designated, competent person.
3. The fall protection safety monitoring system shall not be used during very windy conditions or when weather conditions cause the walking-working surfaces to become icy or slippery.

Fall Protection Control Access Zone

1. A fall protection controlled access zone is an area designated and clearly marked, in which leading edge work may take place without the use of guardrail, safety net or personal fall arrest systems to protect the employees in the area.
2. All access to the controlled access zone shall be restricted to authorized entrants
3. When used to control access to areas where leading edge and other operations are taking place the controlled access zone shall be defined by a control line or by any other means that restricts access.
4. When control lines are used, they shall be erected not less than 6 feet from the leading edge.
5. The control line shall extend along the entire length of the unprotected or leading edge and shall be approximately parallel to the unprotected or leading edge.
6. The control line shall be connected on each side to a guardrail system or wall.
7. Control lines shall consist of ropes, wires, tapes, or equivalent materials, and supporting stanchions as follows:
8. Each line shall be flagged or otherwise clearly marked at not more than 6-foot intervals with high-visibility material.
9. Each line shall be rigged and supported in such a way that its lowest point (including sag) is not less than 39 inches from the walking/working surface and its highest point is not more than 45 inches from the walking/working surface.
10. Each line shall have a minimum breaking strength of 200 pounds.

Training

All employees whose job requires the use of fall arrest equipment or who work from temporary elevated work platforms, aerial lifts or scaffolds shall receive training course “Fall Protection Systems”, ATIS 00059120.

Definitions

Anchorage—a secure point of attachment for lifelines, lanyards, or deceleration device.

Arresting Force—the force transmitted to the body when a fall is arrested.

Body Harness—a design of straps which is secured about the person in a manner to distribute the arresting forces over at least the thighs, shoulders, and pelvis, with provisions for attaching a lanyard, lifeline,or deceleration device.

Competent Person—one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are hazardous, or dangerous to employees, and who has the authority to take prompt corrective measures to eliminate them.

Deceleration Device—any mechanism which serves to dissipate energy during a fall.

Deceleration Distance—the additional vertical distance a falling person travels, excluding lifeline elongation, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of a person’s body harness attachment point just prior to activation of the deceleration device during a fall, and the location of that attachment point after the person comes to a full stop.

Free Fall—the act of falling, before the personal fall protection system begins to arrest the fall.

Free Fall Distance—the vertical distance a person falls before the fall arresting system begins to arrest the fall.

Lanyard—means a flexible line used to secure a body belt or body harness to a lifeline or directly to a point of anchorage.

Lifeline—a line provided for direct or indirect attachment to a body belt, body harness, lanyard, or deceleration device. Such lifelines may be horizontal or vertical in application.

Personal Fall Arrest System — A Personal Fall Arrest System (PFAS) is a passive system that stops a worker in a fall from a working level. This system includes a full body harness with an anchorage and lanyard.

Qualified Person — means one with a recognized degree or professional certificate and extensive knowledge and experience in the subject field who is capable of design, analysis, evaluation and specifications in the subject work, project, or product.

Retractable Lifeline—an automatic tensioning line that pays out and retracts a line at a certain speed and locks or brakes when the speed is exceeded.

Rope Grab—a device which attaches to a lifeline as an anchoring point that provides a means of arresting a fall.

Self-Retracting Lifeline/Lanyard—a deceleration device which contains a drum-wound line which may be slowly extracted from, or retracted onto the drum under slight tension during normal movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.

Shock Absorbers—a component of a personal fall arrest system which allows dissipation of energy by extending the deceleration distance reducing fall arrest forces.

Shock-absorbing Lanyard—specially designed shock-absorbing lanyard elongates during a fall to significantly reduce fall arresting forces.

Snap Hook—A self-closing device with a keeper, latch or other similar arrangement which will remain closed until manually opened.

Total Fall Distance—the maximum vertical distance between the full-body harness attachment point and the lowest extremity of the body before and after the fall is arrested including lanyard extension and/or deceleration distance.

Reference

29 Code of Federal Regulations 1910.23 “Floor and Wall Openings”

29 Code of Federal Regulations 1910.27, “Ladder Safety Devices”

29 Code of Federal Regulations 1910.66, “Powered Platforms and Building Maintenance”

29 Code of Federal Regulations 1926 Subpart M, “Fall Protection”

29 CFR 1910.66, Powered Platforms for Building Maintenance, Appendix C, Fall Protection Systems

29 CFR 1910.269(g)(2)

29 Code of Federal Regulations 1926.104, “Safety Belts, lifelines, and lanyards”

Appendices

Appendix A

Inspection Procedures for Fall Protection Equipment

Harness Inspection

To inspect the harness, perform the following procedures for all harness straps.

- Grasp the webbing with your hands 6 to 8 inches apart.
- Bend the webbing in an inverted “U”. The surface tension resulting makes damaged fibers or cuts easier to see. Follow this procedure the entire length of the webbing, inspecting both sides of each strap. Watch for frayed edges, broken fibers, pulled stitches, cuts, burns, and chemical damage.
- Check D-rings for distortion, cracks, breaks, and rough or sharp edges. The D-ring should pivot freely. D-ring back pads should also be inspected for damage.
- Attachments of buckles and D-rings should be given special attention. Note any unusual wear, frayed or cut fibers, or distortion of the buckles or D-rings.
- The tongue receives heavy wear from repeated buckling and unbuckling. Inspect for loose, distorted or broken grommets. Webbing should not have additional punched holes.

- Buckle tongues should be free of distortion in shape and motion. They should overlap the buckle frame and move freely back and forth in their socket. Roller should turn freely on frame. Check for distortion or sharp edges.
- Inspect the buckle for distortion. The outer bars and center bars must be straight. Pay special attention to corners and attachment points of the center bar.

Lanyard Inspection

- When inspecting lanyards, begin at one end and work to the opposite end. Slowly rotate the lanyard so that the entire circumference is checked. Spliced ends require particular attention.
- Visual indications of damage to webbing and lanyards:

  -In excessive heat, nylon becomes brittle and has a shriveled brownish appearance. Fibers will break when flexed. Should not be exposed to temperatures above 180°F. Change in color usually appearing as a brownish smear or smudge.

  -Transverse cracks when bent over a mandrel. Loss of elasticity

  -Webbing strands fuse together

  -Hard shiny spots, hard and brittle feel
- Paint which penetrates and dries restricts movement of fibers. Drying agents and solvents in some paints cause chemical damage. Signs of chemical damage are discoloration, burns and damage to fibers.
- **Snaps**: Inspect closely for hook and eye distortions, cracks, corrosion, or pitted surfaces. The keeper (latch) should seat into the nose without binding and should not be distorted or obstructed. The keeper spring should exert sufficient force to firmly close the keeper freely without binding. Keeper locks must prevent the keeper from opening when the keeper closes.
- **Thimbles**: The thimble must be firmly seated in the eye of the splice, and the splice should have no loose or cut strands. The edges of the thimble must be free of sharp edges, distortion, or cracks.
- While rotating the steel lanyard watch for cuts, frayed areas, or unusual wearing patterns on the wire. Broken strands will separate from the body of the lanyard.
- While bending webbing over a pipe or mandrel, observe each side of the webbed lanyard for cuts or breaks. Examine the webbing for swelling, discoloration, cracks, charring are obvious signs of chemical or heat damage. Observe closely for breaks in the stitching.
- Rotation of the rope lanyard while inspecting from end-to-end will bring to light any fuzzy, worn, broken or cut fibers. Weakened areas from extreme loads will appear as a noticeable change in original diameter. The rope diameter should be uniform throughout, following a short break-in-period.
- The outer portion of the pack should be examined for burn holes and tears. Stitching on areas where the pack is sewn to D-rings, belts, or lanyards should be examined for loose strands, rips, and deterioration.
- Shock-absorbing lanyards should be examined as a web lanyard. However, also look for the warning flag or signs of deployment. If the flag has been activated, remove this shock-absorbing lanyard from service.

Other Fall Protection Equipment

- On an annual basis follow manufacturer inspection requirements for other fall protection equipment such as retractable lifelines and boom strap anchorage points.

Appendix B

Cleaning Fall Protection Equipment

1. Basic care of all fall protection equipment will prolong the durable life and will contribute toward the performance of its vital safety function.
2. Proper storage and maintenance after use are as important as cleansing the equipment of dirt, corrosives, or contaminants. Storage areas should be clean, dry and free of exposure to fumes or corrosive elements.
3. Wipe off all surface dirt with a sponge dampened in plain water. Squeeze the sponge dry. Dip the sponge in a mild solution of water and commercial soap or detergent. Work up a thick lather, with a vigorous back and forth motion. Then wipe with a clean cloth. Hang freely to dry, but away from excessive heat.
4. Equipment should dry thoroughly without close exposure to heat, steam, or long periods of sunlight.
5. Refer to manufacturer's recommendations for cleaning of equipment.

Procedure 306 Flotation Devices

TVA Safety Manual

306 Flotation Devices

Procedure Number 306

TVA Safety Procedure

Flotation Devices

Revision 3

April 29, 2011

Purpose

This procedure establishes requirements for employees who routinely perform work while working over, on, or near water and defines the minimum requirements for the maintenance and use of personal protective flotation devices, such as life vests, work vests, ring buoys, and skiffs.

Roles and Responsibilities

Each manager and supervisor responsible for the selection, procurement, and/or maintenance of personal protective flotation devices shall ensure compliance with this procedure and shall ensure that employees wear flotation devices as required.

Each employee is required to wear personal flotation devices when specified for his/her job activities.

Personal Flotation Devices

1. Personal flotation devices, (Work Vests) of the appropriate U.S. Coast Guard Type shall be provided and worn by employees at the following locations where not protected by guardrails, safety nets, or body harness and lifelines meeting the standard requirements.
   - On flotation pipelines, pontoons, rafts, or float stages.
   - On open decks of barges or tugs.
   - On structures extending over or adjacent to water.
   - In skiffs, small motor boats, or launches (except when inside an enclosed cabin or wheelhouse).
2. Each work vest used outdoors shall be equipped with an Emergency/Life Preserver Flashing Light.
3. Buoyant cushions do not provide adequate flotation protection and shall not be used.

Inspection and Maintenance

1. Personal flotation devices shall be inspected by each user for defects before and after each use. Personal flotation devices found to have defects which would alter the strength or buoyancy of the device shall not be used and shall be immediately removed from service and destroyed and replaced.
2. Personal flotation devices (PFD) shall be formally inspected by the responsible supervisor annually for defects and serviceability. Each type and make of PFD may require different inspection needs, thus the inspection shall be performed in accordance with that particular manufacturer instructions to ensure the personal flotation device will perform to specifications. Personal flotation devices found to have defects which would alter the strength or buoyancy of the device or devices with significant wear shall not be used and shall be destroyed and replaced.
3. Flotation devices permanently installed for emergency use shall be inspected semiannually.

4. Records of the formal inspection of personal flotation devices shall be recorded on the Personal Flotation Device Assignment / Inspection Log, Appendix A and shall be kept on file with the responsible supervisor.

PFD/Work Vests

1. A Type I, II, III or V, U.S. Coast Guard approved pfd/work vest with Type I reflective material shall be worn at all times by deckhands and other employees performing work operations aboard a vessel where there is an exposure to a fall overboard.
   NOTE: While working in the wheelhouse, pilots are not required to wear a personal flotation device.
2. A Type III, U.S. Coast Guard approved work vest with Type I reflective material shall be readily available for immediate use by marine operation pilots and other employees on board a vessel.
3. A Type I, U S. Coast guard approved work vest with Type I reflective material shall be readily available for immediate use by any authorized passenger.

Ring Buoys

1. When frequent work assignments are performed on pipelines, walkways, piers, bulkhead, scaffolds, platforms, and similar structures extending over or immediately adjacent to water, one ring buoy and line with additional buoys shall be provided at intervals of not more than 200 feet. For non-frequent work tasks at the above locations, a ring buoy(s) shall be carried to the work location. These requirements are applicable to both guarded and non-guarded work areas.
2. A minimum of one ring buoy shall be provided in all motorboats 16 to 40 feet in length and two ring buoys for motorboats 40 feet or over in length.
3. Ring buoys shall meet the requirements of 46 Code of Federal Regulations 160.050, “Specification for a Buoy, Life Ring, Unicellular Plastic”. Ring buoys shall have an outside diameter of 24 inches. Ring buoys shall be International Orange in color.
4. The grab line around the buoy shall be 3/8-inch diameter, synthetic material having a minimum breaking strength of 1,500 pounds.
5. A minimum of 90 feet of 3/8-inch diameter synthetic line shall be attached to each ring buoy. Each length of line shall have a minimum breaking strength of 1,500 pounds.

Skiffs

1. One or more lifesaving skiffs shall be provided at locations where employees are working over or immediately adjacent to water and are depending on flotation devices instead of guardrails or body harnesses, to prevent drowning. Does not apply to ash ponds.
2. Each lifesaving skiff shall be equipped with the following:
   - Two oars.
   - Oarlocks securely attached to gunwales or the oars.
   - One ball-pointed boat hook.
   - One ring buoy with at least 90 feet of 3/8-inch diameter synthetic throw line attached.
   - Two work vests.
3. Lifesaving skiffs shall have a minimum capacity of 800 pounds; flotation tanks or buoyant material capable of floating the boat, its equipment, and three adults; and the equipment.
4. In locations where the water is rough or swift or where manually operated lifesaving skiffs are not practical, a powered boat shall be provided.

Definitions

Personal Flotation Device - a buoyant device used to support persons in water and consists of life vests, work vests, ring buoys, and skiffs.

Life Vest - a type of flotation device to be worn around the upper torso and equipped with buckles and adjustment straps for securing.

Work Vest - a type of flotation device to be worn around the upper torso and equipped with buckles and adjustment straps for securing. Work vests are more compact than life vests to allow freedom of movement.

Ring buoy - a circular flotation device shaped like a doughnut with a line around the periphery for a handhold and an attached throw line.

Lifesaving skiff - a light rowboat used exclusively for rescue.

Reference

29 Code of Federal Regulations, Part 160, “Shipping”

29 Code of Federal Regulations 1926.106 “Working Over or Near Water”

Appendix A

Personal Flotation Device Assignment / Inspection Log

Employee	Date Issued	Last Inspection Date	Type	Strobe Light	Reflective Tape	Snaps	Straps	Physical Condition	Signature

Procedure 307 Foot Protection

TVA Safety Manual

307 Foot Protection

Procedure Number 307

TVA Safety Procedure

Foot Protection

Revision 1

October 21, 2009

Purpose

This procedure establishes requirements for footwear worn in TVA.

Basic Requirements for Footwear in TVA Industrial Environments

1. General Use Footwear worn in all plant / facility operating, maintenance, yard, field, and warehouse/storage areas shall be designed for industrial work exposures and constructed of substantial materials. Open toe or high heel shoes (heels more than 1 ½ inches) or sandals are not permitted in any industrial or field environment. General Use footwear is approved for temporary or casual use in industrial areas where there are not exposures to foot hazards requiring the use of safety footwear described in section Approved Safety Footwear Requirements item 1.
2. General Use Footwear is made out of substantial materials which are defined as strong, durable materials that provide protection against abrasions, heat, flame, chemical irritants, oils and limited impact forces. Leather is the most common material that meets the criteria. Soles made out of neoprene, gum rubber, or other materials that are resistant to oils and chemicals are preferable. Shoes made from cloth, canvas, or open mesh materials, etc. do not meet the criteria for general use footwear in the industrial environment. Material other than leather will be evaluated on a case by case basis by the responsible supervisor to determine puncture resistant equivalency to leather. People who work only in office environments and pass through industrial environments will wear footwear meeting General Use Footwear requirements while in the industrial environment areas.
3. Flip-flops and similar footwear are prohibited except in showers and adjacent locker rooms.
4. Visitors, contractors, employees, and others without shoes meeting general footwear or approved safety footwear requirements will be restricted to administrative and office areas. Contractor and Augmented staff workers will meet items 1 and 2 above and meet the requirements of Section Approved Safety Footwear Requirements for approved safety footwear should their job offer exposures to foot hazards of falling or rolling objects, or objects that could pierce the soles, and/or electrical hazards. Contractors will provide a written foot protection policy that includes a hazard assessment process that applies the use of safety footwear where there are direct exposures to foot hazards.

Approved Safety Footwear Requirements

1. Safety shoes meeting Class 75 requirements of ASTM F2413-05 (formerly ANSI Z41 PT 99) are required for employees in construction, maintenance, and materials-handling work activities where there is a presence of foot hazards due to falling or rolling objects, or objects piercing the sole, or where there are potential electrical hazards.
2. TVA provides safety footwear that meets the requirements of item 1 of this paragraph when employees are exposed to the danger of foot injuries. TVA will replace the footwear as needed due to normal wear and tear as determined by the first line supervisor. TVA organizations will order safety footwear from vendors approved by Supply Chain. All footwear will meet the following:
   a. Meet appropriate ANSI or ASTM requirements. Athletic type safety footwear with steel/composite toes meeting these requirements is approved.
   b. Rated for EH (electrical hazard).
   c. Have sole and heel materials rated as “good or excellent” for slip resistance.
   d. Offer ankle support and protection.
   e. Maintained in a reasonably clean and serviceable manner by the employee.

Hazard Assessment and Equipment Selection

1. TVA conducted a PPE hazard assessment for foot injuries as required by OSHA. This consisted of a review of employee work that involves direct or potential exposures to electrical hazards, puncture exposures, rolling stock exposures, and impact exposures. The assessments indicate employees in the following job classifications are required to use safety footwear due to exposure to potential foot injuries.

Mechanical Techs	Property Maintenance Workers	Assistant Unit Operators
Machinists	Deckhands	Unit Operators
Electricians	Conveyor Car Dump Operators	Materials Handlers / Power Stores
Boilermakers	Linemen	Tech Levels 1 – 4
Pipefitters	Groundmen	Tech 5 and Foremen
Laborers	Heavy Equipment Operators	Instrument Mechanics

2. Other employees not listed in item 1 of this section who may be exposed to the same hazards must be provided safety footwear in accordance with paragraph Approved Safety Footwear Requirements or temporary foot protection during the time of exposure. Examples include PSO TOM Field Technicians (Power Communication, SAM, ROW, Environmental); PSO TOM Field Engineers, Site Engineers (Power Communication, SAM, Environmental); and PSO Field Surveyors.
3. Local management will make recommendations for use of temporary protection devices or assigning safety footwear. The EVP of the Business Unit or designee will approve the assignment of people being included in the safety footwear program where it goes beyond positions included in item 1 of this section.

Special Purpose Footwear

1. Rubber boots shall be used for protection from potential injury or contact diseases caused by exposure to hazardous materials. Non-electrical rated insulating footwear **shall not** be used for electrical protection.
2. Impact protection for the toes and instep shall be used for jackhammer, pavement breaker, air spade, or tamping activities. Other activities involving the potential for impacts, i.e. material handling, rigging activities, etc. must be evaluated to determine if additional impact protection is required. Protection may be incorporated in the footwear or provided by an attachment-type combination instep and toe protector to be worn over the employee's footwear.
3. Welders and other employees subject to foot burns from slag or hot liquids shall not wear slip-on boots or must employ measures to prevent the entry of same into their slip-on footwear.
4. Electrical rated insulating footwear will be used to provide additional protection from hazards associated with emergency/routine transmission line activities; construction activities; and to limit step and touch potential concerns. Electrical rated insulating footwear must be maintained in serviceable condition.

Reference

Code of Federal Regulations 1910.136 "Foot Protection"

ASTM F2413-05 (formerly ANSI Z41 PT 99)

Procedure 308 Hand Protection

TVA Safety Manual

308 Hand Protection

Procedure Number 308

TVA Safety Procedure

Hand Protection

Revision 7

March 17, 2010

Purpose

The purpose of this procedure is to establish requirements for hand protection.

General Requirements for Hand Protection

1. All employees shall wear approved gloves where hand injuries are likely to occur.
   Note: FPG employees shall have appropriate gloves in their possession in all plant/site operating areas including outside shop areas, fabrication areas, and stores loading dock.
2. Specific operations being performed are the basis for selection of appropriate gloves.
3. Gloves shall not be worn when working near rotating or moving machinery that could create a hazard.
   Note: Gloves may be required when using portable power tools such as drills, grinders, sanders, etc. to protect against the risk of cuts, burns or other exposures. Using these tools usually involves two handed operation and the tools are equipped with a constant pressure switch which allows the tool to be shut off on release of the switch. The user must ensure that when using gloves that an additional hazard is not created. Appropriate gloves must be selected and the gloves must fit the user.
4. Hand protection is normally required when handling sharp objects, rough materials, chemicals, hot and cold objects, and welding and cutting.
5. TVAP shall use neoprene gloves in medical response situations.

Hazard Assessment

1. Workplace Hazard Assessment Hand Protection shall be conducted by qualified TVA safety professionals along with responsible plant / facility / organization managers.
2. All plants and facilities shall assess the workplace to determine if hazards are present, or are likely to be present, which necessitate the use of hand protection. If such hazards are present, or likely to be present, the responsible manager shall:
   - Select, and have each affected employee use, the types of hand protection that will protect the affected employee from the hazards identified in the hazard assessment;
   - Communicate selection decisions to each affected employee; and,
   - Verify that the required workplace hazard assessment has been performed through a written certification, (Appendix A, Workplace Hazard Assessment Hand Protection).

Selection of Hand Protection

1. Gloves are often relied upon to prevent cuts, abrasions, burns, and skin contact with chemicals that are capable of causing local or systemic effects following dermal exposure.
2. There are no gloves that provide protection against all potential hand hazards, and commonly available glove materials provide only limited protection against many chemicals. Therefore, it is important to select the most appropriate glove for a particular application and to determine how long it can be worn, and whether it can be reused.
3. It is also important to know the performance characteristics of gloves relative to the specific hazard anticipated, e.g., chemical hazards, cut hazards, and flame hazards.
4. As long as the performance characteristics are acceptable, in certain circumstances, it may be more cost effective to regularly change cheaper gloves than to reuse more expensive types.
5. The work activities of the employee should be studied to determine the degree of dexterity required, the duration, frequency, and degree of exposure to the hazard, and the physical stresses that will be applied.

Selection of Gloves for Protection Against Chemical Hazards

1. The toxic properties of the chemical(s) must be determined; in particular, the ability of the chemical to cause local effects on the skin or to pass through the skin and cause systemic effects or both;
2. For mixtures and formulated products (unless specific test data are available), a glove should be selected on the basis of the chemical component with the shortest breakthrough time, since it is possible for solvents to carry active ingredients through polymeric materials; and,
3. The selection of hand protectors depends upon the desirable properties of various glove materials in relationship to the hazards expected.

Types of Gloves

1. Fabric gloves—normally made from cotton and may or may not have lining. A general-purpose glove that offers limited protection from abrasive objects being handled.
2. Coated fabric gloves—normally made from cotton flannel with napping on one side. The unnapped side is coated with a plastic material. A general-purpose protector offering slip-resistant qualities.
3. Leather gloves—available in heavy, medium, or light-duty, and offer good protection against abrasives. Leather gloves sewn with Kevlar thread shall be used for electrical arc flash protection.
4. Kevlar gloves - Dupont **KEVLAR®** brand fiber for high tensile strength, will not melt, ignite or conduct electricity used as gloves or glove liners.
5. Aluminized gloves-normally made from asbestos with an aluminum pigmented resin coating. These gloves offer both reflective and insulative protection to the user.
6. Chrome leather gloves—a basic leather glove with chromed-tanned outer lining. Offers excellent insulative and reflective qualities to the user.
7. Terri-cord gloves—a closely knitted loop and pile construction. Excellent abrasive resistance and offers limited heat resistance.
8. Chemical and liquid resistant gloves—made from rubber latex, nitrile, or Buty (1) or a synthetic composition, such as neoprene, polyethylene, or polyvinyl chloride (PVC). These gloves are special-purpose and each type of glove, according to its composition, has physical limitations that make it mandatory that the correct glove be used for the particular task.
9. Latex rubber gloves will provide protection against most liquids. Lightweight surgical types are recommended for use where maximum sense of touch is required. These gloves shall not be used for protection from concentrated acids, alkalies, hydraulic fluids, aromatic solvents, or chlorinated solvents.
10. Neoprene gloves provide good protection from hydraulic fluids, gasoline, alcohols, organic acids, and alkalies.

11. Nitrite rubber gloves are recommended for protection from chlorinated solvents (i.e., trichloroethylene, perchloroethylene).
12. Butyl rubber gloves are effective protection from liquid oxygen, hydrofluoric acid, and red fuming nitric acid.
13. Polyethylene gloves have excellent chemical resistance but are normally extremely lightweight and should be used only for splash protection.
14. PVC gloves are recommended for concentrated acids and alkalies. PVC gloves should not be used for protection from acetone, methyl ethyl ketone, or any solvent containing ketones. Gives good protection for chlorinated solvents.
15. Electrical gloves—made from premium quality natural rubber under the highest standards of manufacture and subsequent testing. These gloves are special-purpose providing dielectric characteristics for the user.

Gloves for Electrical Work

1. See TVA Safety Procedure 1022, "Arc Flash Hazard Calculation and Required Protection" for additional specific requirements.
2. Electrical rubber gloves shall not be used for work on energized electrical equipment unless the gloves have been tested and approved within the previous six months by Central Laboratories Services or other approved testing facilities. The gloves shall not be used on a voltage higher than that identified on the glove.
3. Electrical rubber gloves are inspected before each use. The inspection consists of rolling the cuff and observing for possible leaks and stretching the rubber (especially between the fingers) to detect defects.
4. Electrical rubber gloves used on voltages not exceeding 15 kilovolt (kV) are Class 2, 20- kV, ozone resistant, 18-inch, contoured type with contrasting inside and outside colors. Electrical gloves shall meet the requirements of ASTM D120-02, Standard Specification for Rubber Insulating Gloves.
5. Gloves used on voltages not exceeding 5 kV meet the requirements of Federal Specification ZZ-G-401-1970.
6. Lineman's style leather gloves meet the requirements of Federal Specifications KK-G-476-1969.
7. Manufacture and marking gloves, shall be produced by a seamless process.
8. Electrical gloves shall be clearly marked as follows:
    - Class 00 equipment shall be marked Class 00 acceptable up to 500V
    - Class 0 equipment shall be marked Class 0 acceptable for use up to 1,000V
    - Class 1 equipment shall be marked Class 1 acceptable for use up to 7,500V
    - Class 2 equipment shall be marked Class 2 acceptable for use up to 17000V
    - Class 3 equipment shall be marked Class 3 acceptable for use up to 26500V
    - Class 4 equipment shall be marked Class 4 acceptable for use up to 36000V
    - Non-ozone-resistant equipment other than matting shall be marked Type I
    - Ozone-resistant equipment other than matting shall be marked Type II
9. Markings shall be non-conducting and shall be applied in such a manner as not to impair the insulating qualities of the equipment.
10. Markings on gloves shall be confined to the cuff portion of the glove.

In-service Care and Use of Gloves

1. Electrical gloves shall be maintained in a safe, reliable condition.
2. The following specific requirements apply to gloves made of rubber:
   - Gloves shall be inspected for damage before each day's use and immediately following any incident that can reasonably be suspected of having caused damage.
   - Insulating gloves shall be given an air test, along with the inspection.
3. Insulating gloves with any of the following defects may not be used:
   - A hole, tear, puncture, or cut;
   - Ozone cutting or ozone checking (the cutting action produced by ozone on rubber under mechanical stress into a series of interlacing cracks);
   - An embedded foreign object;
   - Any of the following texture changes: swelling, softening, hardening, or becoming sticky or inelastic.
   - Any other defect that damages the insulating properties.
4. Insulating gloves found to have other defects that might affect its insulating properties shall be removed from service and returned for testing.
5. Insulating gloves shall be cleaned as needed to remove foreign substances.
6. Insulating gloves shall be stored in such a location and in such a manner as to protect it from light, temperature extremes, excessive humidity, ozone, and other injurious substances and conditions.
7. Protector gloves shall be worn over insulating gloves, except as follows:
   - Protector gloves need not be used with Class 00 and Class 0 gloves, under limited-use conditions, where small equipment and parts manipulation necessitate high finger dexterity.

     Note: Extra care is needed in the visual examination of the glove and in the avoidance of handling sharp objects.

Reference

29 Code of Federal Regulations 1910.138, “Hand Protection”

29 Code of Federal Regulations 1910.137, “Electrical Protective Equipment”

TVA Safety Procedure 1022, “Arc Flash Hazard Calculation and Required Protection”

Appendix A

Workplace Hazard Assessment Hand Protection

Plant / Facility	Plant / Facility
Assessment Date:	[Date of Assessment]
Type Assessment:	Hand Protection
Potential Hazards:	[list work processes that may cause hand and finger injuries]
Assessment Results:	Gloves shall be required to be worn in any area or when performing tasks when there are known hazards that may cause a hand injury. [Add specifics]
Exceptions:	None [or list any exceptions]
Certification:	This certifies that a workplace hazard assessment has been performed for the hazards described and required personal protective equipement measures established.
Certified By:	[Name of TVA safety professional who conducted assessment]

Procedure 309 Head Protection

TVA Safety Manual

309 Head Protection

Procedure Number 309

TVA Safety Procedure

Head Protection

Revision 2

April 29, 2005

Purpose

The purpose of this procedure is to establish requirements for the use of hard hats.

General Requirements for Hardhats

1. Hard hats shall be required to be worn in any area or when performing tasks when there are known hazards that may cause a head injury.
2. Signs shall be posted in areas and at entrances to areas where the use of hard hats is required.
3. Hard hats shall comply with ANSI Z89-1-1997, “American National Standard for Industrial Protective Helmets”.
4. Defective hardhats shall not be used.
5. Hardhats shall always be worn with the integral suspension.
6. Hardhats shall not be modified or altered in any way. Hardhats used for protection against electrical hazards from voltages above 600 volts shall not have any holes through the protective shell.
7. Craft employees shall be provided hardhats with mounting lugs for faceshields and welding helmets as needed.
8. All hardhats must be worn with the cap brim to the front, except welders and others who must frequently attach manufacturers-supplied protective devices to the hardhat when the peak interferes with proper and safe fit of a full-face respirator or face mask. Only hardhats designed for and provided with reversible suspension are permitted to be reversed.
9. Hardhats shall not be painted.
10. Only the following decals, stickers, or markings are permitted on hardhats:
    - Employee’s name
    - Employee’s organization identification
    - TVA and / or organization logo
    - Safety decals and stickers
    - Special recognition or marking approved by the plant / facility manager or his / her designee.
11. Nothing shall be worn underneath hardhats except items specifically designed or approved for use under hardhats. Winter liners, welder’s hoods, contamination zone surgeon’s caps, and contamination zone canvas hoods are permitted. The wearing of baseball caps and other caps or hats under hardhats is prohibited.
12. TVA Police officers shall wear approved helmets when on bicycle patrol.

Hazard Assessment and Equipment Selection

1. Workplace Hazard Assessment Head Protection shall be conducted by qualified TVA safety professionals along with responsible plant / facility / organization managers.
2. Plants and facilities shall assess the workplace to determine if hazards are present, or are likely to be present, which necessitate the use of head protection. If such hazards are present, or likely to be present, the responsible manager shall:
   - Select, and have each affected employee use, the types of PPE that will protect the affected employee from the hazards identified in the hazard assessment;
   - Communicate selection decisions to each affected employee; and,
   - Verify that the required workplace hazard assessment has been performed through a written certification, (Appendix A, Workplace Hazard Assessment Head Protection).

Power Plant Requirements

1. A mandatory program for head protection requires that approved class "E" hard hats shall be worn in plant areas.
2. The following exceptions generally apply:
   - Control rooms, offices, computer rooms, training rooms, lunch areas, assembly and meeting areas, parking areas, shower and locker rooms, bathrooms and similar occupancies.
3. Any exemption to the general area hardhat requirements requires approval by the plant / facility manager and documentation in the site Workplace Hazard Assessment Head Protection.
   NOTE: TVAN use of head protection in the area of the spent fuel pit, fuel transfer canal, upender area, and refuel cavity on the refuel floor is at the discretion of the responsible manager and refuel floor coordinator. If hardhats are worn in the established control areas near these facilities, they shall be secured to the wearer.

Specifications

1. Hard hats used shall be selected from among those approved for use in the TVA Master List of Standards.
2. Hardhats shall be constructed of approved plastic, polycarbonate, or polyethylene materials. Skull Guard resin hats do not provide Type E protection and are prohibited.

Use, Care and Replacement

1. When wearing a welding helmet with a hard hat, people often turn the suspension around and wear the shell backward. The ANSI standard does not specifically address this issue, but does require that the hard hat be tested in the "as worn" position. If the hard hat was not successfully tested in that position, then the hat does not meet ANSI when worn in that position. Since the hat is not being worn as intended, it might not offer the level of protection for which it was designed. Employees who wear hard hats should wear them with the peak to the front, which is the tested position.
2. Drilling holes in the shell of a hat nullifies the Class E or G rating and may lessen its impact resistance. Hardhats altered as such shall be discarded.
3. The use of adhesives, paints, or cleaning solvents may attack and damage the shell, thereby reducing the level of protection.
4. A mild detergent and hot water (approximately 140°F) should be used to clean the shell. The hardhat should be inspected for damage or excess wear frequently. Suspensions and sweatbands should be replaced when damaged or excessive wear is noticed.
5. The entire hardhat should be replaced when the shell shows signs of damage, wear, or has been subjected to an impact that would lessen the integrity of the hardhat. If the shell is exposed to excessive sunlight and/or extreme hot or cold temperatures, its useful life will be reduced. There are no provisions in ANSI Z89.1 or OSHA

regulations that require a finite service life for hard hats. Inspect the hard hat frequently. Replace the hat and/or suspension at the first sign of excessive wear.

6. Hardhats, including all components, shall be regularly inspected by employees for signs of deterioration or damage. If signs of wear or damage are detected, replace the suspension or the hardhat. Inspections should include the following:
   - Examine for cracks, brittleness, discoloration, or chalky appearance
   - Check the suspension for wear, cracks, breaks, or frayed straps
   - Examine for signs of exposure to heat, chemicals, ultraviolet light, or other radiation

Classification of Hardhats

1. **Type 1 hardhats** - are intended to reduce the force of impact resulting from a blow to the top of the head.
2. **Type 2 hardhats** - a hat or cap that provides side impact protection as well as the top or vertical impact protection of a Type 1 device.
3. **Class G hardhats** - Class G head protectors reduce the danger of contact exposure to low voltage conductors and are proof-tested at 2,200 volts (phase to ground).
4. **Class E hardhats** - Class E hardhats reduce the danger of contact exposure to low voltage conductors and are proof-tested at 20,000 volts (phase to ground).
5. **Class C hardhats** - Class C hard hats do not provide protection against contact with electrical conductors.
6. **Bump Caps**- Bump caps do not meet ANSI requirements. They are not approved for use in TVA.

Reference

29 Code of Federal Regulations 1910.135, “Head Protection”

ANSI Z89-1-1997, “American National Standard for Industrial Protective Helmets”

Appendix A

Workplace Hazard Assessment Head Protection

Plant / Facility	[Plant / Facility]
Assessment Date:	[Date of Assessment]
Type Assessment:	Head Protection
Potential Hazards:	[list all work processes that include risk of head injury]
Assessment Results:	Hard hats shall be required to be worn in any area or when performing tasks whenthere are known hazards that may cause a head injury. The following areas are established as areas where hardhats shall be required to be worn to prevent head injuries. [Delete any not applicable] 1. Powerhouse 2. Plant Stores and Warehouses 3. Utility Building 4. Barge Unloader 5. Surge Hopper 6. Silos 1,2,3 7. All Belt Conveyors 8. Tugboats and Barges [list any other required areas]

Exceptions:	Exceptions to this requirement are control rooms, offices, computer rooms, training rooms, lunch areas, assembly and meeting areas, parking areas, shower and locker facilities, bathrooms and similar occupancies.
Certification:	This certifies that a workplace hazard assessment has been performed for the hazards described and required personal protective equipement measures established.
Certified By:	[Name of TVA safety professional who conducted assessment]

Procedure 310 Hearing Conservation

TVA Safety Manual

310 Hearing Conservation

Procedure Number 310

TVA Safety Procedure

Hearing Conservation

Revision 3

August 17, 2007

Purpose

The purpose of this procedure is to establish a TVA Hearing Conservation Program (HCP) to prevent employee hearing loss from exposure to high noise levels.

Roles and Responsibilities

1. Each plant / facility / organization manager shall establish a Hearing Conservation Program at their facility and ensure that the requirements of this procedure are implemented.
2. Managers and supervisors implement the HCP by assisting with noise surveys, personal noise monitoring, identifying employees to be included in the program, conducting training, monitoring their employees in the program, (including proper use of hearing protection) and assisting with personal counseling sessions as necessary.
3. The TVA Safety Consultant monitors the hearing conservation program at assigned plants / facilities and provides the plant / facility manager with reporting, tracking and support to ensure effective implementation of program requirements.
4. TVA Audiologist administers the requirements of the TVA hearing conservation program, maintains audiometric records, evaluates program effectiveness, and provides consultation in the conduct of surveys, monitoring, hearing protection selection and oversight of the audiometric testing performed by TVA personnel and contract providers.
5. TVA medical personnel assist with the audiometric testing program, maintain personnel medical data, assist with counseling programs, and review the results of tests with the audiologist. Audiometric testing may also be performed by contract providers who submit their data to the TVA Audiologist.
6. Employees actively participate in the hearing conservation program as set forth in this procedure. Employees shall use hearing protective devices in high noise areas as stipulated in site procedures and in areas identified as “High Noise Areas”.
7. All employees shall comply with the requirements of the hearing conservation program. Appropriate disciplinary action shall be taken whenever requirements of the hearing conservation program are violated.

Hearing Conservation Program

1. TVA shall establish a continuing, effective hearing conservation program whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level (TWA) of 85 decibels measured on the A scale (slow response) or, equivalently, a dose of fifty percent. For purposes of the hearing conservation program, employee noise exposures shall be computed without regard to any attenuation provided by the use of personal protective equipment.
2. Protection against the effects of noise exposure shall be provided when the sound level equal or exceed 85 decibels when measured on the A scale of a standard sound level meter at slow response.
3. When employees are subjected to sound equal to or above 85 decibels, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels below 85 decibels, personal protective equipment shall be provided and used to reduce employee exposure to levels below 85 decibels.
4. Unprotected exposure to impulse or impact noise will not exceed 140 dB peak sound pressure level. For impulse or impact noise levels below 140 dB, monitoring / evaluation must be performed to determine applicable controls.
5. All persons who enter an area where the noise level is 85 dBA or greater shall be required to wear approved hearing protection at all times.

Noise Exposure Monitoring

1. When information indicates that any employee's exposure may equal or exceed an 8-hour time-weighted average of 85 decibels, TVA shall develop and implement a monitoring program. Personal monitoring shall be utilized where circumstances such as high worker mobility, significant variations in sound level, or a significant component of noise impulse noise make area monitoring generally inappropriate.
2. Noise monitoring shall be used to identify employees for inclusion in the hearing conservation program and to enable the proper selection of hearing protectors.
3. Sound level surveys shall be conducted by qualified technicians using properly calibrated equipment to identify all high noise areas. All continuous, intermittent and impulsive sound levels from 80 decibels to 130 decibels shall be integrated into the noise measurements. Safety shall assist in the accomplishment of these surveys.
4. Locations identified as high noise areas shall be identified with signs, "Caution Hearing Protection Required in this Area" or "Caution Hearing Protection Required Beyond this Point". Areas with noise levels in excess of 100 dBA shall be identified with signs specifying that dual hearing protection is required.
5. Appendix A contains a Personal Noise Sampling Strategy that will be used for each site/organization.
6. Monitoring shall be repeated at least every five (5) years or whenever a change in production, process, equipment or controls changes noise exposures to the extent that:
   - Additional employees may be exposed at or above the action level; or
   - Attenuation provided by hearing protectors used by employees may be inadequate; or
   - Attenuation of noise levels through changes in equipment or process has eliminated the need for hearing protection permitting removal of signage.
7. TVA shall notify each employee exposed at or above an 8-hour time-weighted average of 85 decibels of the results of the monitoring.
8. TVA shall provide affected employees or their representatives with an opportunity to observe any noise measurements conducted.

Audiometric Testing Program

1. TVA shall establish and maintain an audiometric testing program for all employees whose exposures equal or exceed an 8-hour time-weighted average of 85 decibels.
2. The program shall be provided at no cost to employees.
3. Audiometric tests shall be performed by a licensed or certified audiologist, otolaryngologist, or other physician, or by a technician who is certified by the Council for Accreditation in Occupational Hearing Conservation, or who has satisfactorily demonstrated to the TVA Audiologist, competence in administering audiometric examinations, obtaining valid audiograms, and properly using, maintaining and checking calibration and proper functioning of the audiometers being used. A technician who performs audiometric testing must be responsible to an audiologist, otolaryngologist, or hysician.
4. Audiometric tests shall be conducted with audiometers that meet the specifications of, and are maintained and used in accordance with American National Standard Specification for Audiometers, S3.6
5. Audiometric tests shall be administered in a room meeting the background noise level requirements as listed in Appendix D of 29 Code of Federal Regulations 1910.95 Occupational Noise Standard.
6. Audiometric tests shall be pure tone, air conduction, hearing threshold examinations, with test frequencies including as minimum 500, 1000, 2000, 3000, 4000, and 6000 hertz. Tests at each frequency shall be taken separately for each ear.

Baseline Audiogram

1. Within 6 months of an employee's first exposure at or above the action level, Human Resources / TVA Medical shall establish a valid baseline audiogram against which subsequent audiograms can be compared.
2. "Mobile test van exception." Where mobile test vans are used to meet the audiometric testing obligation, TVA shall obtain a valid baseline audiogram within 1 year of an employee's first exposure at or above the action level. Where baseline audiograms are obtained more than 6 months after the employee's first exposure at or above the action level, employees shall wear hearing protectors for any period exceeding six months after first exposure until the baseline audiogram is obtained.
3. Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace noise. Hearing protectors may be used as a substitute for the requirement that baseline audiograms be preceded by 14 hours without exposure to workplace noise.
4. TVA shall notify employees of the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the baseline audiometric examination.

Annual Audiogram

1. Each employee included in the HCP shall receive an audiogram annually after obtaining the baseline audiogram.
2. Annual audiograms shall be compared to the employee's baseline audiogram according to protocol established by the TVA Audiologist to determine if a Standard Threshold Shift has occurred. If the annual audiogram shows that the employee has suffered a Standard Threshold Shift, the employee may be retested within 30 days and the results of this test may be considered the annual audiogram. TVA shall notify employees of the need to avoid high levels of non-occupational noise exposure during the 14 hour period immediately preceding the retest.
3. If a comparison of the annual audiogram to the baseline audiogram indicates a Standard Threshold Shift, the employee shall be notified in writing within 21 days of the determination.
4. An annual audiogram may be substituted for the baseline audiogram when, in the judgment of the audiologist, otolaryngologist or physician who is evaluating the audiogram:
    - The standard threshold shift revealed by the audiogram is persistent; or
    - The hearing threshold shown in the annual audiogram indicates significant improvement over the baseline audiogram.

5. Unless a physician determines that the standard threshold shift is not work related or aggravated by occupational noise exposure, the following steps shall be taken when a standard threshold shift occurs:
   - Employees not using hearing protectors shall be fitted with hearing protectors, trained in their use and care, and required to use them.
   - Employees already using hearing protectors shall be refitted and retrained in the use of hearing protectors and provided with hearing protectors offering greater attenuation if necessary.
6. If on-site medical personnel are not present, TVA shall verify that the above steps are performed and documented by either the contract medical provider or other designated personnel.

Rules for Recording Hearing Loss

1. Rules for recording work-related hearing loss are established in 29 Code of Federal Regulations 1904, “Recording and Reporting Occupational Injuries and Illnesses” and in Practices and Procedures, Safety Procedure 13, ” Report and Investigate Injuries and Illnesses”.
2. Audiometric testing is conducted annually for all TVA employees included in the Hearing Conservation Program. Upon completion of audiometric testing that identifies a potential recordable hearing loss, the TVA Audiologist reviews the results to determine if a Standard Threshold Shift (STS) has occurred.
3. As a result of the audiometric testing a hearing loss is recordable on the OSHA Log 300 if:
   - It is work-related and
   - It produces a Standard Threshold Shift (STS) averaging 10 decibels (dB) or more over the frequencies of 2000, 3000, and 4000 Hertz in one or both ears as measured against the baseline or revised baseline audiogram and
   - It also results in a total 25 dB level of hearing impairment above audiometric zero when averaged over frequencies of 2000, 3000, and 4000 Hertz in the same ear as the STS.
4. The TVA Audiologist adjusts the employee's audiogram to determine an STS by subtracting for hearing loss associated with age and gender. This is done by comparing the results of the current audiogram to the baseline audiogram in each ear using the tables in 29 CFR 1910.95, Appendix F, Calculations and Application of Age Correction to Audiograms.
5. A re-test shall be scheduled to make sure the hearing loss is persistent. TVA may seek and follow the advice of a physician or licensed health care professional in determining whether or not the hearing loss was work-related. The decision of work-relatedness is to be determined on a case by case basis.
6. There is no presumption that the hearing loss is work related if an employee works in a noisy environment. There are no special rules for determining work-relatedness. A case is work-related if one or more events or exposures in the work environment either caused or contributed to the hearing loss, or significantly aggravated a pre-existing hearing loss.
7. Record the STS loss on the OSHA Log 300 whenever a retest is done within 30 days and the shift is confirmed. If a retest is not done within 30 days the loss is considered "confirmed". The logging does not need to occur until after the 30-day retest. If a possible recordable hearing loss has occurred, you do not have to record if you are going to perform a retest. If the retest confirms the hearing loss is recordable you have seven (7) calendar days from the test to record.
   Note: The TVA Audiologist shall notify the custodian of the responsible establishment OSHA Log 300 that an STS has been identified and that based on review of the audiometric and medical history is recordable as required by Practices and Procedures, Safety Procedure 13, “Report and Investigate Injuries and Illnesses”.
8. If in the course of testing, the STS no longer appears or is not persistent, the case may be deleted from the OSHA Log 300. TVA does not have to maintain documentation concerning the removal. OSHA takes the position that documentation is in the audiometric test records.
9. If upon review of an employee’s audiometric record or medical history, the audiologist determines that the hearing loss is not work related, the case may be deleted from the OSHA Log 300.

10. If TVA obtains advice of a physician or licensed health care professional that the hearing loss was not work-related, the case may be deleted from the OSHA Log 300.

Termination Audiogram

1. Each employee included in the HCP shall receive an audiogram at termination, retirement, or upon transfer from a location with high noise levels to a work location without high noise levels.
   NOTE: Employees who participated previously in the HCP but are no longer participants due to changing position or work location shall receive an audiogram at termination. Employees who previously worked in locations where noise exposures were equal to or greater than an 8-hour time-weighted average sound level (TWA) of 85 decibels shall have a termination audiogram. The employee's supervisor may consult with human resources, or the TVA Audiologist regarding the decision in these situations. Employees who transfer within TVA, from a position/location with high noise levels to a position/location without high noise levels shall receive an audiogram at the time of transfer.
2. The termination audiogram must be preceded by at least **16 hours** (this is in conformance with the definition of "quiet period" by the Office of Worker's Compensation Programs OWCP) of no exposure to noise greater than 80 dBA.

Audiometer Calibration

1. The functional operation of the audiometer shall be checked before each day's use by testing a person with known, stable hearing thresholds, and by listening to the audiometer's output to make sure that the output is free from distorted or unwanted sounds. A bioacoustic simulator may be used for performing daily checks as an alternative to human testing. Deviations of 10 decibels or greater require an acoustic calibration.
2. Audiometer calibration shall be checked acoustically at least annually in accordance with Appendix E of 29 Code of Federal Regulations 1910.95 Occupational Noise Standard. Deviations of 15 decibels or greater require an exhaustive calibration.
3. An exhaustive calibration shall be performed at least every two years in accordance with the American National Standard Specification for Audiometers, S3.6

Engineering and Administrative Controls

1. Engineering evaluations shall be conducted as requested to determine feasibility of providing engineering controls to reduce noise exposure. Typical controls to evaluate are:
   - Reduce noise at its source (mufflers, sound absorbing materials, enclosures, etc.)
   - Interrupting the noise path (using acoustical enclosures, barriers, etc.)
   - Selecting new or replacement equipment with lower noise levels
   - Reducing reverberation (installing sound adsorbing materials)
   - Reducing structure-borne vibration (vibration mounts, proper lubrication, etc.)
2. Administrative controls shall be identified and established to reduce noise exposure of employees. These controls consist of:
   - Work scheduling
   - Rotating employees
   - Establishing quiet areas for breaks

Hearing Protection Devices

1. TVA shall provide a variety of suitable hearing protectors from which employees may choose. These should be selected from among those approved by the TVA Audiologist and listed on the Master List of Standards.
2. Hearing protectors must attenuate employee exposure at least to an 8-hour timeweighted average of 85 decibels or below. Whenever the noise level is greater than 100 decibels, double protection, ear muffs over ear plugs will be required
3. The adequacy of hearing protector attenuation shall be re-evaluated whenever employee noise exposures increase to the extent that the hearing protectors provided may no longer provide adequate attenuation. TVA shall provide more effective hearing protectors where necessary.
4. All personal hearing protection devices shall be kept in a clean and sanitary condition. Each employee is responsible for their equipment.
5. Employees required to use ear protection shall be properly trained in the types of protection available, proper use of the devices, and proper storage and sanitation of the devices.
6. Employees shall be encouraged to use company provided hearing protection devices off the job where noise exposures can cause hearing loss.
7. Employees shall use hearing protection devices as required and as posted at the plants.

Training

1. All employees who are exposed to noise at or above the 8-hour time weighted average of 85 decibels shall be required to receive annual training (“Hearing Conservation”, ATIS 00059129) that informs employees of the following:
   - The effects of noise on hearing; information about hearing protectors, including the advantages, disadvantages, attenuation, and instructions on the care, use, and fitting;
   - The purpose of audiometric testing; and
   - Information concerning the test procedures.
2. Provide information to employees that includes effective use of ear protection, employee concerns, employee hearing loss results, sampling and monitoring results, and progress on engineering and administrative controls to reduce noise exposure.
3. Personal counseling sessions shall be provided if necessary for employees having problems with the proper use of hearing protective devices, as well as those employees experiencing threshold shifts as determined by monitoring audiograms.
4. TVA shall make copies of 29 CFR 1910.95, “Occupational Noise Standard” available to affected employees or their representatives through the SRNet or by posting in the workplace.

Records

1. Records shall be kept of all audiometric testing, personal noise monitoring, or plant area monitoring, and training records.
2. Records of audiograms shall include:
   - Name and job classification of the employee;
   - Date of the audiogram;
   - The examiner's name;
   - Date of the last acoustic or exhaustive calibration of the audiometer; and
   - Employee's most recent noise exposure assessment.
3. Records of measurement of background sound pressure levels in audiometric test rooms shall be maintained.
4. Audiometric testing records shall be retained permanently. Exposure monitoring and training records shall have a minimum retention period of ten years following termination of employment.

5. Records kept shall be provided upon written request to employees, former employees, or their authorized (in writing) representative.

Definitions

Action Level - An exposure to an 8-hour time-weighted average of 85 decibels. The action level is the criterion for instituting noise surveys and employee participation in the Hearing Conservation Program.

Audiogram - A chart, graphs, or tables that result from an audiometric test obtained at least annually to detect shifts in an individual's threshold of hearing by comparison to a baseline audiogram.

Decibel (dB) - Unit of measurement of sound-pressure level.

Noise Dose - Noise dose is computed using 29 CFR 1910.95, Appendix A, Table G-16a (see 29 CFR 1910.95 for a copy of Table G-16a) as follows:

- When the sound level, L, is constant over the entire work shift, the noise dose, D, in percent, is given by: D=100 C/T where C is the total length of the work day, in hours, and T is the reference duration corresponding to the measured sound level, L, as given in Table G-16a or by the formula shown as a footnote to that table.
- When the workshift noise exposure is composed of two or more periods of noise at different levels, the total noise dose over the work day is given by:

  D = 100 (C(1)/T(1) + C(2)/T(2) + ... + C(n)/T(n)),

  where C(n) indicates the total time of exposure at a specific noise level, and T(n) indicates the reference duration for that level as given by Table G-16a.

Standard Threshold Shift (STS) - A standard threshold shift is a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear. An allowance may be made for the contribution of aging in determining if an STS has occurred using OSHA Calculations and Application of Age Corrections to Audiograms - 1910.95 App F. A threshold shift can be temporary or permanent. A temporary threshold shift is a change in hearing threshold, primarily due to exposure to high-intensity noise, which is usually recovered in 14 to 72 hours. Any loss that remains after an adequate recovery period is permanent and is termed a persistent threshold shift.

Sound-level meter (SLM) - An electronic instrument for the measurement of sound levels that conforms to the requirements as specified in ANSI S1.4-1971.

Reference

29 Code of Federal Regulations 1910.95, “Occupational Noise Exposure”

Practices and Procedures, Safety Procedure 13, “Report and Investigate Injuries and Illnesses”

Code of Federal Regulations 1904, “Recording and Reporting Occupational Injuries and Illnesses”

American National Standard Institute (ANSI) Specification for Audiometers, S3.6

American National Standard Institute (ANSI) S1.4-1971

Appendix A

Personal Noise Sampling Strategy

Purpose:

The purpose of this strategy is to identify sample populations of employees in the Hearing Conservation Program (HCP) to be included in the sampling program, and to identify the proper methods for conducting personal sampling.

Scope:

Applies to all TVA workplaces where the potential noise exposure meets the HCP requirements found in TVA Safety Procedure (TSP) 310, "Hearing Conservation". TSP 310, Paragraph Hearing Conservation Program states the following: "TVA shall establish a continuing, effective hearing conservation program whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level (TWA) of 85 decibels measured on the A scale (slow response) or, equivalently, a dose of fifty percent."

Procedure:

1. Perform and document area noise surveys to determine areas where the sound level equals or exceeds 85 dBA in the following manner. The survey should be conducted every five years.
   a. Using a floor plan, establish a uniform grid for the entire work area. Take sound level measurements (using the dBA weighted scale) at representative locations for each established grid area. The measured sound level is recorded at the location taken. The floor plan should identify major equipment and noise sources. Administrative and office areas should be included since workers' compensation claims for hearing loss have been awarded for office workers.
   b. Document Results. Documentation must include where samples were taken (shown on a facility floor plan); date performed; equipment used (serial number); calibration date of the equipment used; and a description of any condition that might affect the actual noise sampling results (for example on the day sampling was performed in the turbine bay unit 2 was down due to a forced outage). Every effort should be taken to establish worse case situations (all units or equipment in area running).
2. Determining personal noise sampling population:
   a. Any employee experiencing a Standard Threshold Shift (STS) within the previous five years will be included in the sample population. Additionally, if several employees of the same classification have experienced an STS, then 25% of that craft's population will be sampled.
   b. If several hearing loss claims accepted by Workers Comp have recently been submitted for the same worker classification, then 25% of that employee group will be included in the sample population.
   c. The area noise surveys performed in activity 1 above identifies the areas where the sound level equals or exceeds 85 dBA. For each of these areas perform the following actions:
      I. Determine the classification of employees who work in each of the areas where the sound level equals or exceeds 85 dBA. Example of results could be as follows: 5 Boilermakers, 2 Machinists, 15 Steamfitters, 3 Assistant Unit Operators, 2 technicians, and 2 foremen. While some information can be gathered from discussion with employees, foremen, and supervisors; observation of work performed will be necessary to obtain a more accurate determination of the classification of employees working in a given area.
      II. Ask questions of employees working in a given area about the type of work performed in that area and the duration of the work performed. While talking with employees determine if they work in other areas where the sound level equals or exceeds 85 dBA.
      III. Perform personal noise exposure sampling for a representative sample of each of the classification of employees that work in one or more areas where the sound level equals or exceeds 85 dBA. The representative sample size is equal to 25 percent of each classification of employees exposed to one or more areas where the sound level equals or exceeds 85 dBA. Note that at least two employees must be sampled if the calculation for 25 percent of a specific classification is less than two employees.

The employees to be sampled should be selected from those employees in the classification being considered that are judged most likely to have the highest noise exposures based on their job assignments. This should be based on consideration of the following types of information: observation, review of job history (work orders), previous claims filed, interviews, and any other source that provides information on the work history. The rationale used to select the sample to be used must be fully documented. The selection of the sample and the manner in which it is obtained must be determined by a qualified industrial hygienist or a safety professional trained in noise sampling.

IV. Include 10% of employees in classification groups that are not normally in areas exceeding 85 dBA, but may infrequently work in or travel through these high noise areas.

3. Personal noise exposure sampling conducted must be performed with the correct equipment that is in calibration (ensure that the date the instrument is due for calibration has not been exceeded). A qualified safety professional will provide oversight for selection of the proper instrumentation. See TVA Safety Procedure (TSP) 310, “Hearing Conservation” for requirements for equipment and equipment settings.
4. Personnel who conduct the personal noise exposure sampling must have the background and training to conduct this sampling. If personnel will be used that are not qualified by reason of training and experience then training must be provided by qualified persons.
5. Employees wearing personal noise dosimeters must be monitored to ensure that the dosimeters are being worn correctly and that they are working properly. Each employee being sampled will be checked every 1 to 1.5 hours which limits the number of dosimeters that one person can monitor. One person should not plan on monitoring more than 5 to 7 dosimeters.
6. Document the results of the personal noise exposure sampling conducted. Documentation must be consistent with the Industrial Hygiene Automated Database and include employee’s name; job classification; grid areas worked in during the sampling period; the time sampled; the actual noise dose (for the period sampled); and the projected/calculated 8-hour time weighted average (TWA). In addition, the documentation must include the rationale used to determine the persons being sampled.
7. Review the personal noise sampling results for each individual relative to the criteria contained in TSP 310 for inclusion in TVA’s hearing conservation program. Employees meeting the criteria contained in TSP 310 must be included in TVA’s hearing conservation program.
8. Notify employees sampled of the results. Use the typical employee exposure letter for a noise exposure measurement found in Practices and Procedures, Safety Procedure 5, “Implement Industrial Hygiene Activities,” Appendix F.
9. Repeat the process described in steps 1 through 4 every 5 years as a minimum. In addition, sampling will be repeated whenever a change in production, process, equipment or controls increases noise exposures to the extent that:
   a. Additional employees may be exposed at or above the action level; or
   b. The attenuation provided by hearing protectors being used by employees may be rendered inadequate.

The sampling required in this document will be supplemented by the noise dosimetry conducted in accordance with the annual industrial hygiene plan developed as required by Practices and Procedures, Safety Procedure 5, paragraph "Regulatory and Other Drivers".

Procedure 311 Ladder Climbing Safety Devices

TVA Safety Manual

311 Ladder Climbing Safety Devices

Procedure Number 311

TVA Safety Procedure

Ladder Climbing Safety Devices

Revision 2

August 15, 2008

Purpose

The purpose of this procedure is to establish specifications for new installations and requirements for the use of ladder-climbing safety devices.

Basic Requirements for Ladder Climbing Devices

1. Ladder-climbing safety devices shall be installed on any fixed ladder that exceeds 20 feet and that does not have a cage. A ladder climbing safety device shall be installed on any fixed ladder that exceeds 30 feet and having a cage but where floor landings have not been installed at least every 30 feet.
2. A warning sign stating, CAUTION: USE LADDER-CLIMBING SAFETY DEVICE, shall be installed near the access points to the ladder (top and bottom).
3. Any person using a fixed ladder equipped with a ladder-climbing safety device shall use an approved harness with the sliding climbing fixture properly attached to the ladder rail.

Inspection and Maintenance

1. All ladder-climbing safety devices used by TVA employees shall be inspected at least semiannually. A record shall be kept of these inspections for 3 years.
2. Body belts and integral hardware shall be inspected by any user prior to each use.
3. Defective ladder-climbing safety devices or defective components shall be removed from service and identified as defective equipment until the device is repaired or replaced.

Specifications

1. The ladder-climbing safety device rail shall be made of materials that meet the requirements of ANSI A14.3, Ladder Safety Devices, and latest revision.
2. Attachment devices to the ladder shall be fabricated of materials compatible to the ladder.
3. The rail of the ladder-climbing safety device shall extend a minimum of 48 inches above the top landing.
4. Clamps and sleeves shall not be able to function in an inverted position.
5. The ladder- climbing safety device shall be able to arrest a fall while keeping the climbers arms within reach of the ladder.
6. The ladder-climbing safety device shall allow the climber to rest at any point without using hands.
7. The device must operate in a manner that does not require the climber to operate clamps, sleeves, or other devices while ascending or descending.

   Note: For galvanized steel rail and stainless steel rail Saf-T-Climb systems, use both the Shock-Absorbing

Y -lanyard and the Saf-T-Climb system, including the sleeve and harness, as directed in the Saf-T-Climb Instruction Manual.

8. Ladder-climbing safety devices used in a corrosive environment shall be fabricated from corrosive resistant material.
9. All hardware used to secure the body belt to the rail shall be stainless steel of drop-forged steel or pressed steel and cadmium plated in accordance with, class B plating specified in Federal Specification QQ-P-416C. The surface smooth and free of sharp edges.

Definitions

Ladder-Climbing Safety Device - consists of a rigid rail securely attached to the center of a fixed ladder. The ladder user wears a body belt that attaches to a sliding fixture that travels along the rail. The fixture will firmly lock onto the rail and prevent a fall should the climber slip.

Procedure 312 Respiratory Protection

TVA Safety Manual

312 Respiratory Protection

Procedure Number 312

TVA Safety Procedure

Respiratory Protection

Revision 5

August 3, 2009

Purpose

This procedure establishes the respiratory protection program and defines requirements to ensure that employees are protected from exposure to respiratory hazards except for airborne radioactive contaminates. Protection from airborne radioactive hazards are addressed in Nuclear Power Group procedures and training.

Roles and Responsibilities

1. The plant / facility manager has overall responsibility for implementation of the requirements of this procedure and shall designate a Respiratory Protection Program Administrator for the plant / facility.
2. Managers and supervisors shall ensure employees have received medical approval for use of respiratory protective equipment, have been trained in the care, use, and limitations of the equipment provided, and have been fit-tested for the respirator needed. **Medical approval is required as a prerequisite for fit testing and training.**
3. Managers and supervisors shall ensure the use of respiratory protection by employees when required to protect against air contaminants.
4. The Respiratory Protection Program Administrator is responsible for:
   - Identifying and evaluating hazards that require workers to wear respirators
   - Selection of respiratory protection options
   - Selecting make, model, and manufacturer of respirators to be used on site, based on associated hazards, and in accordance with all OSHA standards.
   - Monitoring respirator use to ensure that respirators are used in accordance with their certifications
   - Arranging for and/or conducting training
   - Ensuring proper storage and maintenance of respiratory protection equipment
   - Ensuring grade D certification is maintained on plant / facility control air for supplied-air respirator use
   - Arranging for and/or conducting respirator mask fit testing
   - Administering the medical surveillance program, including distribution of medical questionnaires (see form TVA 17430, OSHA Respirator Medical Evaluation Questionnaire [1]) and contacts with medical professionals
   - Maintaining a list of qualified respirator users
   - Maintaining records required by the program
   - Evaluating the program
   - Updating written program, as needed (i.e. any time work process changes may potentially affect exposure)
5. Each employee is responsible for:
   - Wearing his or her respirator when and where required and in the manner trained.

- Caring for and maintaining respirators as instructed, and storing them in containers (such as plastic bags) in a clean and sanitary location, and properly disposing of spent filters, cartridges, and dust masks that have been contaminated.
- Reporting any malfunctions of the respirator to his/her supervisor immediately.
- Report respiratory ailments or medical/physical changes which could inhibit their use of respiratory protection to their supervisor.
- Informing their supervisor or the Respiratory Protection Program Administrator of any respiratory hazards that they feel are not adequately addressed and of any other concerns they have regarding the program.
- Informing their supervisor if the respirator no longer fits properly, and requesting a new one that fits properly.
- Informing their supervisor of any medical or respiratory problems or physical change (dentures, weight loss, weight gain, etc.) that would alter your ability to wear a respirator.

General Requirements

1. The respiratory protection program shall utilize engineering and administrative controls to the extent possible to meet Permissible Exposure Limits (PEL) and Short Term Exposure Limits (STEL) set out in 29 Code of Federal Regulations 1910, Subpart A, “Toxic and Hazardous Substances”. Contaminants shall be controlled by use of mechanical ventilation, work practices which minimize exposures, or administrative controls, such as worker rotation.
2. All respiratory protection equipment required to be used shall be furnished at no cost to employees.
3. Respirators shall be issued and used whenever employees are exposed to harmful concentrations of toxic vapors, gases, dust, or oxygen deficiency which cannot be controlled by other means.
4. Respirators for contaminant protection shall be assigned to individual employees for their exclusive use, whenever feasible.
5. All personnel required to wear respiratory protection equipment shall be clean-shaven on facial areas where the sealing surface of the respiratory devices contacts the skin.
6. If prescription glasses are necessary for respirator users, he/she shall use an appropriate mounting frame so the sealing area of the respirator is not penetrated.
7. Use of contact lenses is permitted with respirator wear for health hazards provided the individual has previously demonstrated he or she has had successful experience wearing contact lenses. The contact lens wearer is required to have practiced wearing the respirator while wearing the contact lenses.
8. Only those respirators listed as suitable for respiratory protection against oxygen deficiency shall be used when there is doubt about the concentration of oxygen or the type of hazardous material present in the atmosphere.
9. Only respiratory protection approved by National Institute for Occupational Safety and Health (NIOSH) shall be used. Respirators shall be properly labeled.
10. Facility airline couplings used to accommodate respiratory protection shall be incompatible with outlets for other gas systems.
11. Respirator use in hot areas (exceeding 80°F WBGT) shall be carefully controlled by the responsible supervisor because of the physiological stress on the wearer.
12. Employees shall use their respirators under conditions specified by this procedure and in accordance with the training they receive on the use of each particular model. In addition, the respirator shall not be used in a manner for which it is not certified by NIOSH or by its manufacturer.
13. All employees shall conduct user seal checks, (fit-checks), each time that they wear their respirator. Employees shall use either positive or negative pressure check, or both, (depending on which works best for them).
14. All employees should perform a pre-use visual inspection of respiratory equipment with each use.
15. Employees are not permitted to wear headphones, jewelry, or other articles that may interfere with the face-to-respirator seal.

16. TVA shall have a general policy that respirators will be provided to any employee that desires to "voluntarily" use a respirator while performing work functions that do not require respiratory protection, as long as the use of the respirator will not jeopardize the health or safety of the employee.
17. All voluntary users will be subject to the same requirements (such as medical evaluation, fittests, etc.) as the required users.
18. Employees that "voluntarily" use a **dust mask** are not subject to the requirements of this procedure. National Institute for Occupational Safety and Health (NIOSH) approved dust masks will be made available at no cost to employees who choose to use them. A copy of 29 Code of Federal Regulations 1910.134, Appendix D "Information for Employees Using Respirators When not Required Under the Standard (Mandatory)" shall be provided to employees who "voluntarily" use dust masks.

Workplace Hazards

1. Plants / facilities shall conduct a Workplace Hazard Assessment to identify and evaluate the respiratory hazard(s) in the workplace; this evaluation shall include a reasonable estimate of employee exposures.
2. Where the plant / facility cannot identify or reasonably estimate the employee exposure, the atmosphere shall be considered to be Immediately Dangerous to Life and Health.
3. The following approaches for estimating worker exposures to respiratory hazards may be used:
   - **Sampling** - Personal exposure monitoring is the best method for determining employee exposures because it is the most reliable approach for assessing how much and what type of respiratory protection is required in a given circumstance. Sampling data may be obtained utilizing the industrial hygiene contract services. Sampling should utilize methods appropriate for contaminants(s). Sampling should present the worst-case exposures; or sampling should represent enough shifts and operations to determine the range of exposure.
   - **Objective Information** - You may rely on information and data that indicate that use or handling of a product or material cannot, under worst-case conditions, release concentrations of a respiratory hazard above a level that would trigger the need for respirator use or require use of a more protective respirator. You can use data on the physical and chemical properties of air contaminants, combined with information on room dimensions, air exchange rates, contaminant release rates, and other pertinent data, including exposure patterns and work practices, to estimate the maximum exposure that could be anticipated in the workplace. You may also rely on data from industry-wide surveys by trade associations for use by their members, as well as from stewardship programs operated by manufacturers for their customers.
   - **Variation** - You should account for potential variation in exposure by using exposure data collected with a strategy that recognizes exposure variability, or by using worst-case assumptions and estimation techniques to evaluate the highest foreseeable employee exposure levels. The use of safety factors may be necessary to account for uneven dispersion of the contaminant in the air and the proximity of the worker to the emission source. Analysis of exposure data may be obtained utilizing the Industrial Hygiene contract services.

Criteria for Selecting Respirators

1. The Respiratory Protection Program Administrator will consider the following factors in the selection of a proper respirator:
   - Nature of the hazard
   - Type of hazard (oxygen deficiency or contaminant).
   - Physical and chemical properties.
   - Concentration of material and permissible exposure limits (refer to the American Conference governmental Industrial Hygienist Theshold Limit Values (TLVs) or
   - OSHA's permissible exposure limits (PELs).
   - Characteristics of the work process.

- Work area characteristics-confined space.
- Work duration.
- Location of the hazardous area with respect to a safe area having respirable air. Include travel distances and method of rescue.
- Physical characteristics, functional capabilities, and limitations of various types of respirators.

2. The Respiratory Protection Program Administrator can use the information in Appendix A, "Respirator Selection Guidelines" and Appendix B "Classes of Respirators" to identify respirators that should provide adequate respiratory protection.

Limitations of Respirators

1. The service life of all three categories of filters efficiency degradation (i.e., N-, R-, and Pseries) is limited by considerations of hygiene, damage, and breathing resistance.
2. All filters should be replaced whenever they are damaged, soiled, or causing noticeably increased breathing resistance (e.g., causing discomfort to the wearer).
3. R or P-series filters can be used for protection against oil or non-oil aerosols. N-series filters should be used only for non-oil aerosols.
4. Use and reuse of the P-series filters would be subject only to considerations of hygiene, damage, and increased breathing resistance.
5. The R-series filters should be used only for a single shift (or for 8 hours of continuous or intermittent use) when oil is present. However, service time for the R-series filters can be extended using the same two methods described above for N-series filters. These determinations would need to be repeated whenever conditions change or modifications are made to processes that could change the type of particulate generated in the user's facility.

Fit Testing

1. Employees shall be fit tested prior to being allowed to wear any respirator with a tight-fitting facepiece (except for voluntary use dust masks), and when there are changes in the employee's physical condition that could affect respiratory fit (e.g., obvious change in body weight, facial scarring, dentures, etc.). All employees that may wear a respirator, with the exception of voluntary use dust masks, shall be fit tested annually.
2. The plant/facility respiratory protection program administrator can typically arrange for fit testing from one of the following sources: TVA contract medical vendor, TVA contract mobile health station, TVA plant nurse, TVA industrial hygiene service provider, or by using plant/facility technicians trained to conduct fit testing.
3. Employees shall be fit-tested for the specific (manufacturer, model, and size) type of respirator they will use. The facepieces for the full-face respirator, continuous flow, and self-contained breathing apparatus have identical fitting characteristics, and fit test will be valid for all types by the same manufacturer.
4. A fit test shall be used to determine the ability of each individual respirator wearer to obtain a satisfactory fit with any air-purifying respirator. The fit test may be conducted using the quantitative or qualitative fit test method.
5. An additional fit test shall be conducted whenever the employee reports, or the Professional Licensed Health Care Provider (PLHCP), supervisor, or program administrator makes visual observations of changes in the employee's physical condition that could affect respirator fit.
6. Employees using half mask face pieces will be fit tested with the actual respirator they will wear, and should bring their respirator with them to the fit test. In the event that the employee does not have a respirator, respirators shall be provided in several sizes to ensure an optimal fit. Fit testing of air-supplied respirators / SCBA's will be conducted in a negative pressure mode. SCBA and full-face respirator users do not need to bring a respirator with them, there are special fit-test probed masks that will be used to fit test these employees. All fit tests will be conducted using the quantitative PortaCount Plus fit test machine.
7. No attempt shall be made to fit a respirator on an employee who has facial hair which comes between the sealing periphery of the facepiece and the face, or if facial hair interferes with normal functioning of the exhalation valve

of the respirator.

8. Proper fitting of a respiratory protective device facepiece for individuals wearing corrective eyeglasses or goggles, may not be established if temple bars or straps extend through the sealing edge of the facepiece. If eyeglasses, goggles, face shield or welding helmet must be worn with a respirator, they must be worn so as not to adversely affect the seal of the facepiece. If a full-facepiece respirator is used, special prescription glasses inserts are available if needed.

Facepiece Seal Protection

1. TVA shall not permit respirators with tight-fitting facepieces to be worn by employees when:
   - Facial hair that comes between the sealing surface of the facepiece and the face or that interferes with valve function; or
   - Any condition that interferes with the face-to-facepiece seal or valve function.
2. If an employee wears corrective glasses or goggles or other personal protective equipment, such equipment shall be worn in a manner that does not interfere with the seal of the facepiece to the face of the user.
3. For all tight-fitting respirators, employees shall perform a user seal check each time they put on the respirator.

Continuing Respirator Effectiveness

1. If an employee detects vapor breakthrough, changes in breathing resistance, or leakage of the facepiece, they must replace or repair the respirator before returning to work.
2. Employees shall leave the respirator use area:
   - To wash their faces and respirator facepieces as necessary to prevent eye or skin irritation associated with respirator use; or
   - If they detect vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece; or
   - To replace the respirator or the filter, cartridge, or canister elements.

Immediately Dangerous to Life or Health (IDLH) Atmospheres

1. Entry into IDLH areas are performed only in emergency situations.
2. For all IDLH atmospheres, the plant / facility shall ensure that:
   - One employee or, when needed, more than one employee is located outside the IDLH atmosphere;
   - Visual, voice, or signal line communication is maintained between the employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere;
   - The employee(s) located outside the IDLH atmosphere are trained and equipped to provide effective emergency rescue;
3. Employee(s) located outside the IDLH atmospheres shall be equipped with:
   - Pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied-air respirator with auxiliary SCBA; and either
   - Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres where retrieval equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry; or
   - Equivalent means for rescue where retrieval equipment is not required for interior structural firefighting.
4. In addition to the above requirements in interior structural fires, plants / facilities shall ensure that:
   - At least two employees enter the IDLH atmosphere and remain in visual or voice contact with one another at all times;
   - At least two employees are located outside the IDLH atmosphere; and
   - All employees engaged in interior structural firefighting use SCBAs.

5. One of the two individuals located outside the IDLH atmosphere may be assigned to an additional role, such as incident commander in charge of the emergency or safety officer, so long as this individual is able to perform assistance or rescue activities without jeopardizing the safety or health of any firefighter working at the incident.
6. TVA plants / facilities shall provide the following respirators for employee use in IDLH atmospheres:
   - A full facepiece pressure demand SCBA certified by NIOSH for a minimum service life of thirty minutes, or
   - A combination full facepiece pressure demand supplied-air respirator (SAR) with auxiliary self-contained air supply.
7. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.
8. All oxygen-deficient atmospheres shall be considered IDLH.
9. Air-purifying respirators cannot be used in IDLH atmospheres or in atmospheres containing less then 19.5% oxygen by volume. Gas masks (canister respirators) may be used for escape if the atmosphere is not oxygen-deficient.

Grade D Breathing Air

1. Comp
2. essed breathing air shall meet at least the requirements for Grade D breathing air described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989, to include:
   - Oxygen content (v/v) of 19.5-23.5%;
   - Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less;
   - Carbon monoxide (CO) content of 10 ppm or less;
   - Carbon dioxide content of 1,000 ppm or less; and
   - Lack of noticeable odor.
3. A semi-annual survey shall be conducted or air used for breathing. The TVA Industrial Hygiene provider can perform this survey at the request of plant / facility management.
4. See TVA Safety Procedure 301, “Breathing Air Systems” for additional requirements.

Maintenance / Cleaning of Respirators

1. The maintenance of respiratory protective devices involves a thorough visual inspection for cleanliness and defects (i.e., cracking rubber, deterioration of straps, defective exhalation and inhalation valves, broken or cracked lenses, etc.). (see Appendix C “Inspecting, Cleaning and Disinfecting Respirators”)
2. Worn or deteriorated parts shall be replaced prior to reuse.
3. No attempt shall be made to replace components, make adjustments or make repairs on any respirator beyond those recommended by the manufacturer.
4. Under no circumstances will parts be substituted as such substitutions will invalidate the approval of the respirator. Any repair to reducing or admission valves, regulators, or alarms will be conducted by either the manufacturer or a qualified trained technician.
5. Any respirator that malfunctions will immediately be removed from service, disposed of in a manner that will prevent someone else from using this respirator, and replaced with a new respirator of the same model and size. SCBA that malfunctions will be immediately removed from service, tagged with a defective equipment tag, and sent out for repair to the Safety and Emergency Response Training Academy (SERTA).
6. All respirators in routine use shall be cleaned and sanitized on a periodic basis. Respirators used non-routinely shall be cleaned and sanitized after each use and filters and cartridges replaced.
7. Routinely used respirators shall be maintained individually by the respirator wearer.
8. Cleaning and disinfecting of respirators must be done frequently to ensure that skinpenetrating and dermatitis-causing contaminants are removed from the respirator surface. Respirators maintained for emergency

use or those used by more than one person must be cleaned after each use by the user.

9. Plants / facilities shall provide each respirator user with a respirator that is clean, sanitary, and in good working order. The respirators shall be cleaned and disinfected at the following intervals:
   - Respirators issued for the exclusive use of an employee shall be cleaned and disinfected as often as necessary to be maintained in a sanitary condition;
   - Respirators issued to more than one employee shall be cleaned and disinfected before being worn by different individuals;
   - Respirators maintained for emergency use shall be cleaned and disinfected after each use; respirators used in fit testing and training shall be cleaned and disinfected after each use.

Storage

1. All respirators shall be stored to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals, and they shall be packed or stored to prevent deformation of the facepiece and exhalation valve.
2. Respirators placed at stations and work areas for emergency use shall be stored in compartments built for that purpose, shall be quickly accessible at all times and will be clearly marked.
3. Routinely used respirators, such as half-mask or full-face air-purifying respirators, shall be placed in sealable plastic bags.
4. Respirators may be stored in such places as lockers or tool boxes only if they are first placed in carrying cases or cartons.
5. Respirators shall be packed or stored so that the facepiece and exhalation valves will rest in a normal position and not be crushed.

Emergency Use of Respiratory Protective Equipment

1. Respiratory protection placed in work areas for emergency use shall be properly stored, readily accessible, and clearly identified with adequate signs. The organization required to maintain emergency respiratory protective equipment shall establish methods for the documentation of location, inspection, and maintenance of this equipment.
2. Respiratory protective equipment for emergency use shall be inspected after each use and at least monthly. Inspections shall be conducted by qualified personnel following manufacturer’s recommendations. Documentation of inspections shall be maintained for 12 months.
3. Self-contained breathing apparatus cylinders maintained for emergency use shall be kept fully charged.
4. Emergency escape-only respirators shall be inspected before being carried into the workplace for use.

Repairs

1. Respirators that fail an inspection or are otherwise found to be defective shall be removed from service, and discarded or repaired or adjusted.
2. Repairs or adjustments to respirators are to be made only by persons appropriately trained to perform such operations and shall use only the respirator manufacturer's NIOSH-approved parts designed for the respirator;

Training

1. Employees shall receive training course Respiratory Protection, ATIS Number 00059146 which provides training in the selection, limitations, and proper use of the specific respiratory protective equipment they will use before use of the equipment. NOTE: Training for airborne radioactive hazards ("Radiological Respiratory Training," RRT 010) is provided by NPG.
2. The training program includes the following:

- Nature and degree of respiratory hazard
- Respirator selection and use and limitations
- Respirator use in emergency situations
- Pre-use inspection and donning of respirators, including user seal fit checks prior to each use
- Respirator maintenance and storage
- Medical signs and symptoms limiting the effective use of respirators
- Donning procedures and fit tests including hand's-on practice
- Care of the respirator, e.g., need for cleaning, maintenance, storage, and/or replacement
- TVA Safety Procedure 312, Respiratory Protection
- 29 CFR 1910.134 Respiratory Protection Standard.
- 42 CFR Part 84, NIOSH requirements for respirator filters.
- Known respiratory hazards encountered at the plant / facility and their potential health effects

3. Respirator training will be properly documented and will include the type and model of respirator for which the individual has been trained and fit-tested.
4. Refresher training for employees required to wear respiratory protection will be conducted at least annually or sooner if workplace change affects respirator selection, if respirator styles available change or if the foreman or management deems the employee demonstrates the need in order to properly use a respirator.

Medical Evaluations

1. Employees that are either required to wear respirators, or choose to wear respirators voluntarily (except dust masks), must pass a medical evaluation before being permitted to wear a respirator on the job. The medical S3 examination is required every 3 years.
2. Employees shall not be permitted to wear respirators until a Professional Licensed Health Care Provider (PLHCP) has determined that they are medically able to do so.
3. Required and voluntary (except **dust masks**), respirator users will be provided, at no cost, a medical evaluation to determine their ability to use a respirator.
4. Evaluations will be conducted prior to expiration of S3/S4 physical exams which had previously qualified them to wear a respirator. The TVA Form 17430, OSHA Respirator Medical Evaluation Questionnaire may be used at the discretion of the PLHCP to obtain relevant information.
   Note: The TVA Form 17430, OSHA Respirator Medical Evaluation Questionnaire [1] is a screening tool to determine if a medical examination is required. TVA has elected to conduct a medical examination for respirator users in accordance with the TVA Medical Examiner's Guide, Section 2, Special Medical Approvals, which renders the use of the form as OPTIONAL **by the PLHCP.**
5. The examination will be conducted at a TVA or TVA vendor medical facility.
6. A written recommendation via form TVA 1444, Request for Medical Evaluation [2], regarding each employees ability to wear respiratory protection will be maintained in the employees medical file and a copy provided the employee if requested. The responsible manager will be provided information regarding employees who are physically qualified as well as employees who are not capable of wearing respiratory protection to enable appropriate work assignments.
7. After an employee has received clearance and begun to wear his or her respirator, additional medical evaluations will be provided under the following circumstances:
   - Employee reports signs and/or symptoms related to their ability to wear a respirator such as: shortness of breath, dizziness, chest pains, or wheezing.
   - The PLHCP or supervisor informs the Respiratory Protection Program Administrator that they need to be reevaluated.
   - Information obtained from observations made during fit testing and program evaluation, indicates a need for reevaluation.

Respirator Program Surveillance

1. An appraisal of the effectiveness of the respirator program shall be conducted at least annually by the plant / facility respiratory protection program administrator.
2. The evaluation of the respirator program will include investigating wearer acceptance of respirators, respirator fit, respirator selection, respirator program operation, appraising protection provided by the respirator and proper respirator maintenance.
3. Evidence of excessive exposure of respirator wearers to respiratory hazards will be followed up by investigation to determine why inadequate respiratory protection was provided.
4. The findings of the respirator program evaluation will be documented, and this documentation will list plans to correct faults in the program and target dates for the implementation of the plans.

Recordkeeping

1. Medical evaluations shall be maintained in each employee's medical file.
2. Each plant / facility performing respirator fit tests shall establish a record of the fit tests administered:
   - The name or identification of the employee tested;
   - Type of fit test performed;
   - Specific make, model, style, and size of respirator tested;
   - Date of test; and
   - The pass/fail results for QLFTs or the fit factor and strip chart recording or other recording of the test results for QNFTs.
   - Fit test records shall be retained for respirator users until the next fit test is administered.

   Note: All respirator fit tests performed for FPG Fire Brigade Leaders and Fire Brigade Members shall be entered into ATIS using number 0053276. The training roster shall include the annotation that the individual passed or failed the respirator fit test. This requirement is intended to ensure that additional insurance coverage provided to current Trades and Labor (T&L) FPG fire brigade members remains in affect correctly.

Definitions

Air-Purifying Respirator - A respirator which is designed to remove specific air contaminant(s) from the ambient air surrounding the respirator by passing air through an air-purifying element.

Cartridge - A container with a filter, sorbent, or catalyst, or combination thereof which removes specific contaminants from the air drawn through it.

Carcinogen - A substance known to cause cancer.

Ceiling Concentration - The concentration of an airborne substance that shall not be exceeded.

Confined Space - An enclosed space, vessel, or structure, which by virtue of its design and/or use could contain an environment harmful for human occupancy.

Contaminant - A harmful, irritating, or nuisance material that is foreign to the normal atmosphere.

Emergency Situation - A situation that requires the use of respirators due to the unplanned generation of a hazardous atmosphere (often of unknown composition) caused by an accident, mechanical failure, or other means and that requires evacuation of personnel or immediate entry for rescue or corrective action.

End of Service Life Indicator (ESLI) - Means a system that warns the user of the approach of the end of adequate respiratory protection.

Facepiece - The portion of a respirator that covers the wearer's nose and mouth in a quartermask (above the chin) or half-mask (under the chin) facepiece or that covers the nose, mouth, and eyes in a full facepiece. It is designed to make a gas-tight or particle-tight fit with the face and includes headbands, exhalation valve(s), and connections.

Hood - The portion of respirator which completely covers the head, neck, and portions of the shoulders.

Immediately Dangerous to Life or Health (IDLH) - An area is considered IDLH when an employee entering the area may suffer immediate irreversible health effects or death (examples: oxygen deficiency, highly toxic atmospheres, or a concentration of flammable vapors/gases above the lower explosive limit).

Material Safety Data Sheet (MSDS) - Written material prepared and issued by the manufacturer concerning the properties of a hazardous chemical.

Particulate - A suspension of fine solid or liquid particles in air, such as dust, fog, fume mist, smoke, or spray.

Permissible Exposure Limit (PEL) - The legally established time-weighted average concentration or ceiling concentration of a contaminant that shall not be exceeded.

Qualitative Fit Test - A pass/fail fit test that relies on the subject's sensory response to detect the challenge agent.

Quantitative Fit Test - A fit test that uses an instrument to measure the challenge agent inside and outside the respirator.

Reference

29 Code of Federal Regulations 1910.134, “Respiratory Protection”

29 Code of Federal Regulations 1926.103, “Respiratory Protection”

ANSI Z88.2-1980, “Practices for Respiratory Protection”

Appendices

Appendix A - Respirator Selection Guidelines

1. Is the respirator intended for use during fire fighting? If yes, only a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure demand or other positive pressure mode is recommended.
2. Is the respirator intended for use in an oxygen-deficient atmosphere, i.e., less than 19.5% oxygen at sea level ? If yes, any type of SCBA or supplied-air respirator (SAR) with an auxiliary SCBA is recommended. Auxiliary SCBA must be of sufficient duration to permit escape to safety if the air supply is interrupted.
3. Is the respirator intended for use during emergency situations? If yes, two types of respirators are recommended: a SCBA with a full facepiece operated in pressure demand or other positive pressure mode or an SAR with a full facepiece operated in pressure demand or other positive pressure mode in combination with an auxiliary SCBA operated in pressure demand or other positive pressure mode. Auxiliary SCBA must be of sufficient duration to permit escape to safety if the air supply is interrupted.
4. Is the contaminant regulated by the Department of Labor as a potential occupational carcinogen or identified by NIOSH as a potential human carcinogen in the workplace, and is the contaminant detectable in the atmosphere? If yes, two types of respirators are recommended: a SCBA with a full facepiece operated in pressure demand or other positive pressure mode or an SAR with a full facepiece operated in pressure demand or other positive pressure mode in combination with an auxiliary SCBA operated in pressure demand or other positive pressure mode. Auxiliary SCBA must be of sufficient duration to permit escape to safety if the air supply is interrupted.
5. Is the exposure concentration of the contaminant, as determined by acceptable industrial hygiene methods, less than the NIOSH REL or other applicable exposure limit? If yes, a respirator would not be required except for an escape situation.
6. Are conditions such that a worker who is required to wear a respirator can escape from the work area and not suffer loss of life or immediate or delayed irreversible health effects if the respirator fails, i.e., are the conditions not immediately dangerous to life or health (IDLH)? If yes, conditions are not considered to be IDLH. If no, conditions are considered to be IDLH. Two types of respirators are recommended: a SCBA with a full facepiece operated in pressure demand or other positive pressure mode or an SAR with a full facepiece operated in pressure demand or other positive pressure mode in combination with an auxiliary SCBA operated in pressure demand or

other positive pressure mode. The auxiliary SCBA must be of sufficient duration to permit escape to safety if the air supply is interrupted.

7. Is the contaminant an eye irritant, or can the contaminant cause eye damage at the exposure concentration? If yes, a respirator equipped with a full facepiece, helmet, or hood is recommended.
8. If the physical state of the contaminant is a particulate (solid or liquid) during periods of respirator use, use a particulate respirator; if it is a gas or vapor, use a Gas/Vapor Respirator; if it is a combination of gas or vapor and particulate, use a Combination Particulate and Gas/Vapor Respirator.

Appendix B - Classes of Respirators

1. The NIOSH regulation provides for nine classes of filters each with three categories of resistance. The three levels of filter efficiency are 95%, 99%, and 99.97%.
2. The three categories of resistance to filter efficiency degradation are labeled N, R, and P. The class of filter will be clearly marked on the filter, filter package, or respirator box.
3. Chemical cartridges that include particulate filter elements will carry a similar marking that pertains only to the particulate filter element.
4. The selection of N-, R-, and P-series filters depends on the presence or absence of oil particles, as follows:
   - If no oil particles are present in the work environment, use a filter of any series (i.e., N-,R-, or P-series).
   - If oil particles (e.g., lubricants, cutting fluids, etc.) are present, use an R- or P-series filter.

   Note: N-series filters cannot be used if oil particles are present.

   - If oil particles are present and the filter is to be used for more than one work shift, use only a P-series filter.
5. Note: To help you remember the filter series, use the following guide:
   - N for Not resistant to oil,
   - R for Resistant to oil
   - P for oil Proof
6. Selection of filter efficiency (i.e., 95%, 99%, or 99.97%) depends on how much filter leakage can be accepted. Higher filter efficiency means lower filter leakage.
7. The choice of facepiece depends on the level of protection needed--that is, the assigned protection factor (APF) needed.

Appendix C - Inspecting, Cleaning and Disinfecting Respirators

1. Remove filters, cartridges, or canisters.
2. Disassemble facepieces by removing speaking diaphragms, demand and pressure- demand valve assemblies, hoses, or any components recommended by the manufacturer.
3. Discard or repair any defective parts.
4. Wash components in warm (43 degrees C [110 degrees F] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.
5. Rinse components thoroughly in clean, warm (43 degrees C [110 degrees F] maximum), preferably running water. Drain.
6. When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:
7. Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 43 degrees C (110 degrees F); or,
8. Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of water at 43 degrees C (110 degrees F); or,

9. Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.
10. Rinse components thoroughly in clean, warm (43 degrees C [110 degrees F] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on facepieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.
11. Components should be hand-dried with a clean lint-free cloth or air-dried.
12. Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.
13. Test the respirator to ensure that all components work properly.
14. Place in a clean, dry plastic bag or other suitable container for storage after each cleaning and disinfection.

Respirators will be visually inspected for cleanliness and defects prior to usage. The following checklist will be used for inspecting respirators:

15. Facepiece: cracks, tears or holes, face mask distortion, cracked or loose lenses / faceshield
16. Headstraps: breaks or tears, broken buckles
17. Valves: residue or dirt, cracks or tears in valve material
18. Filters/Cartridges: approval designation, gaskets, cracks or dents in housing, proper cartridge for hazard
19. End of Service Life Indicator (ESLI)
20. Air supply systems: breathing air quality/grade, condition of supply hoses, hose connections, settings on regulators and valves

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072560609
[2] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072560192

Procedure 313 Special Protective Clothing

TVA Safety Manual

313 Special Protective Clothing

Procedure Number 313

TVA Safety Procedure

Special Protective Clothing

Revision 1

August 1, 2003

Purpose

1. The purpose of this procedure is to establish requirements for the use of special protective clothing including protective suits used by fossil plants with a Selective-Catalytic-Reduction (SCR) system involving anhydrous ammonia (NH3).
2. Personal protective clothing includes the following:
   - Fully encapsulating suits,
   - Nonencapsulating suits,
   - Gloves, boots, and hoods,
   - Firefighter's protective clothing,
   - Proximity, or approach clothing,
3. Firefighter turnout clothing, proximity gear, blast suits, and radiation suits by themselves are not acceptable for providing adequate protection from hazardous chemicals.
4. Refer to TVA Safety Procedure 1022, “Arc Flash Hazard Calculation and Required Protection”.

Clothing

1. Any person involved in burning and welding activities or working near open flames shall wear a type of shirt that has full sleeves and a collar that can be buttoned.
2. The shirt shall completely cover the upper body from neck to beltline. Natural fiber or natural fiber-blend clothing is recommended. Sleeveless shirts, mesh-type T-shirts, shorts, or cutoff pants are examples of types of clothing considered inappropriate and shall not be worn by employees.
3. Cotton undergarments and socks should be worn inside encapsulated chemical protective suits. Nomex coverall, or other suitable flame-resistant garment, should be worn inside chemical protective suits when an exposure to a flash fire is a concern.

Protective Clothing Applications

1. Protective clothing must be worn whenever potential hazards are present due to chemical exposure.
2. Within each application, there are several operations which require chemical protective clothing.
3. The initial investigation of a hazardous materials incident; these situations are usually characterized by a large degree of uncertainty and mandate the highest levels of protection.
4. Rescue: Entering a hazardous materials area for the purpose of removing an exposure victim; special considerations must be given to how the selected protective clothing may affect the ability of the wearer to carry out rescue and to the contamination of the victim.
5. Spill Mitigation: Entering a hazardous materials area to prevent a potential spill or to reduce the hazards from an existing spill (i.e., applying a chlorine kit on railroad tank car). Protective clothing must accommodate the required tasks without sacrificing adequate protection.
6. Emergency Monitoring: Outfitting personnel in protective clothing for the primary purpose of observing a hazardous materials incident without entry into the spill site. This may be applied to monitoring contract activity for spill cleanup.
7. Decontamination: Applying decontamination procedures to personnel or equipment leaving the site; in general a lower level of protective clothing is used by personnel involved in decontamination.

Selecting Clothing

1. The approach in selecting personal protective clothing must encompass clothing and equipment items which are easily integrated to provide both an appropriate level of protection and still allow one to carry out activities involving chemicals. In many cases, simple protective clothing by itself may be sufficient to prevent chemical exposure, such as wearing gloves in combination with a splash apron and faceshield (or safety goggles).
2. The type of equipment used and the overall level of protection should be reevaluated periodically as the amount of information about the chemical situation or process increases, and when workers are required to perform different tasks.
3. Factors to consider when selecting protective clothing include:
   - **Chemical Hazards**. Chemicals present a variety of hazards such as toxicity, corrosiveness, flammability, reactivity, and oxygen deficiency.
   - **Physical Environment**. Chemical exposure can happen anywhere; the environment may be extremely hot, cold, or moderate; the exposure site may be relatively uncluttered or rugged, presenting a number of physical hazards; chemical handling activities may involve entering confined spaces, heavy lifting, climbing a ladder, or crawling on the ground. The choice of ensemble components must account for these conditions.
   - **Duration of Exposure**. The protective qualities of ensemble components may be limited to certain exposure levels (e.g. material chemical resistance, air supply). The decision for ensemble use time must be made assuming the worst-case exposure so that safety margins can be applied to increase the protection available to the worker.
   - **Protective Clothing or Equipment Available**. Reliance on one particular clothing or equipment item may severely limit a facility's ability to handle a broad range of chemical exposures.
   - **Protective suits at fossil plants with SCR**. The TYCHEM® TK fully encapsulated Level A Deluxe chemical protective suit manufactured by Lakeland Industries has been selected for use at fossil plants with an SCR system involving NH3. TYCHEM® TK barrier fabric that was developed by DuPont.

Chemical Protective Clothing

1. The purpose of chemical protective clothing and equipment is to shield or isolate individuals from the chemical and physical hazards that may be encountered during hazardous materials operations.
2. No single combination of protective equipment and clothing is capable of protecting against all hazards. Thus protective clothing should be used in conjunction with engineering or administrative controls.
3. The use of protective clothing can itself create significant wearer hazards, such as heat stress, physical and psychological stress, in addition to impaired vision, mobility, and communication. In general, the greater the level of chemical protective clothing, the greater the associated risks.
4. Equipment and clothing should be selected that provides an adequate level of protection. Overprotection as well as under-protection can be hazardous and should be avoided.
5. Categorizing clothing by design is mainly a means for describing what areas of the body the clothing item is intended to protect.
6. In emergency response, hazardous waste site cleanup, and dangerous chemical operations, the only acceptable types of protective clothing include fully or totally encapsulating suits and non-encapsulating or "splash" suits plus accessory clothing items such as chemically resistant gloves or boots.
7. The National Fire Protection Association (NFPA) has classified suits by performance as:
   - Vapor-protective suits (NFPA Standard 1991) provide "gas-tight" integrity and are intended for response situations where no chemical or vapor contact is permissible.
   - Liquid splash-protective suits (NFPA Standard 1992) offer protection against liquid chemicals in the form of splashes, but not against continuous liquid contact or chemical vapors or gases. The use of duct tape to seal clothing interfaces does not provide the type of wearer encapsulation necessary for protection against vapors or gases.
8. Protective clothing may be labeled as:
   - Reusable, for multiple wearings; or
   - Disposable, for one-time use.

Physical Properties

1. End users in other applications may assess material physical properties by posing the following questions:
   - Does the material have sufficient strength to withstand the physical strength of the tasks at hand?
   - Will the material resist tears, punctures, cuts, and abrasions?
   - Will the material withstand repeated use after contamination and decontamination?
   - Is the material flexible or pliable enough to allow end users to perform needed tasks?
   - Will the material maintain its protective integrity and flexibility under hot and cold extremes?
   - Is the material flame-resistant or self-extinguishing (if these hazards are present)?
   - Are garment seams in the clothing constructed so they provide the same physical integrity as the garment material?
2. The degree of difficulty in decontaminating protective clothing may dictate whether disposable or reusable clothing is used, or a combination of both.

General Guidelines

1. Decide if the clothing item is intended to provide vapor, liquid-splash, or particulate protection.
2. Determine if the clothing item provides full body protection.
3. Always use a buddy system when wearing chemical protective suits to monitor each other for signs of distress and potential equipment failure.
4. TYCHEM® TK fully encapsulated chemical protective suits are worn during an emergency involving an NH3 release at a fossil plant under the following conditions:
   - Entry into a visible vapor cloud is required to attempt a rescue operation, or;
   - Entry into an area where the concentration is unknown in order to effect a rescue operation, or to isolate the release when remote isolation measures have failed or;
   - Entry into an area where the concentration has been determined to exceed 10,000 ppm (1%) in order to effect a rescue operations, or to isolate the release when remote isolation measures have failed, or;
   - If a life-threatening operation is performed where there is a possibility of coming in contact with liquid NH3.

Decontamination

1. Decontamination is the process of removing or neutralizing contaminants that have accumulated on personnel and equipment. This process is critical to health and safety at hazardous material response sites. Decontamination protects end users from hazardous substances that may contaminate and eventually permeate the protective clothing, respiratory equipment, tools, vehicles, and other equipment used in the vicinity of the chemical hazard; it protects all plant or site personnel by minimizing the transfer of harmful materials into clean areas; it helps prevent mixing of incompatible chemicals; and it protects the community by preventing uncontrolled transportation of contaminants from the site.
2. There are two types of decontamination:
   - Gross decontamination: To allow end user to safely exit or doff the chemical protective clothing.
   - Decontamination for reuse of chemical protective clothing.
3. The first step in decontamination is to establish procedures that minimize contact with chemicals and thus the potential for contamination. For example:
   - **Contact time**. The longer a contaminant is in contact with an object, the greater the probability and extent of permeation. For this reason, minimizing contact time is one of the most important objectives of a decontamination program.
   - **Concentration**. Molecules flow from areas of high concentration to areas of low concentration. As concentrations of chemicals increase, the potential for permeation of personal protective clothing increases.
   - **Temperature**. An increase in temperature generally increases the permeation rate of contaminants.
   - **Physical state of chemicals**. As a rule, gases, vapors, and low-viscosity liquids tend to permeate more readily than high-viscosity liquids or solids.

Cleaning

1. If the chemical protective suit and accessories were not cleaned following decontamination, perform the following in accordance with the manufacturer's requirements:
   - Wash down the suit with a solution of low sudsing powered detergent and warm to moderately hot water to cleanse the inside and outside of the suit.
   - Rinse suit thoroughly with warm to moderately hot water.
   - Hang to dry at room temperature to permit air flow through suit.
2. Do not use chemical protective suit or accessories that have not been thoroughly cleaned and dried.

Inspection

1. An effective chemical protective clothing inspection program should feature five different inspections:
   - Inspection and operational testing of equipment received as new from the factory or distributor.
   - Inspection of equipment as it is selected for a particular chemical operation.
   - Inspection of equipment after use or training and prior to maintenance.
   - Periodic inspection of stored equipment.
   - Periodic inspection when a question arises concerning the appropriateness of selected equipment, or when problems with similar equipment are discovered.
2. Personnel responsible for clothing inspection should follow the manufacturer's inspection checklist. Use Appendix B "Inspection and Air Pressure Test Log" for fully encapsulated suits. Following the inspection, document inspection results.

Testing Fully Encapsulated Chemical Protective Suits

1. Testing shall be performed on fully encapsulated suits in accordance with Appendix A "Instructions for Testing Fully Encapsulated Chemical Protective Suits", when initially received as new from purchase prior to placing in-service, after every use (unless suit is being disposed of, or not intended any longer for emergency response) and annually, whether the suit is used or not.
2. If suit is being tested after use, assure it has been decontaminated and cleaned prior to testing.
3. The air pressure test shall be conducted in compliance with ASTM F1052 "Practice for Pressure Testing of Totally Encapsulated Chemical Protective Suits."
4. The air pressure test kit specific for the suit shall be used to perform the testing. Test kit may be obtained from the suit manufacturer.
5. Always allow a chemical protective suit to reach room temperature before testing. Air expands or contracts depending on temperature. Do not test the suit near an air conditioner or a heater.
6. The air supply used for testing should be at the same temperature as the environment in which the suit is to be tested.

Storage

1. Clothing must be stored properly to prevent damage or malfunction from exposure to dust, moisture, sunlight, damaging chemicals, extreme temperatures (not to exceed 120oF) and impact.
2. Boots should be stored in a clean, dry location. Do not lay boots on side or stack materials on boots.
3. Ensure suit is completely dry before storing.
4. Suits should be stored lying flat, in a protective container, if feasible. If not feasible suits should be stored in the original carry-bag or on a hanger.
5. Store suit with zipper open to permit air circulation.
6. Do not force the material, seams or zipper when folding to the suit. Folds should be offset each time suit is returned to storage to prevent permanent creasing.

Appendices

Appendix A - Instructions for Testing Fully Encapsulated Chemical Protective Suits

The following procedure should be used to perform the test (consult the manufacturer's procedure for specific testing instructions):

1. Lay suit face down on a table, or comparable surface, clean and free of obstacles. Allow suit to reach room temperature.
2. Remove snap-on cover and diaphragm (flapper) from all exhaust valves.
3. Insert twist lock adapter from air source into exhaust valve located on the head of the suit; turn clockwise to secure.
4. Insert twist lock adapter connected to the test instrument gauge into exhaust valve located on the back, right of suit; turn clockwise to secure.
5. If your suit is an NFPA compliant ensemble, there will be a third exhaust valve. Insert twist lock plug adapter into the third exhaust valve located on the back, left of suit. This adapter serves as a plug to prevent air from escaping during the test.
6. Close all openings on the suit. Make sure the zipper is completely closed and sealed. If your suit is fitted for a supplied-air connection, check any pass-throughs to ensure they are sealed.
7. Place test kit gauge on level surface, preferably on the same plane as the suit.
8. Check dial calibration of gauge. Needle should be at zero; adjust if necessary to zero gauge. (Refer to manufacturer's instruction for zeroing).
9. Remove short and long tubing from test kit.
10. Connect short tubing with male connection to the female quick connect on the brass cross with ID and serial number). Connect other end of tubing to twist lock adapter in the head of the suit.
11. Connect long tubing with female coupling to male quick connect coupling on brass tee at gauge. Connect other end of tubing to twist lock adapter on the back, right of suit.
12. Turn the air flow control valve crosswise to the off position. Connect an outside air supply to the male quick connect fitting on brass manifold tee of the test kit. If male fitting is not compatible with the air supply connection, remove and replace with a comparable fitting that is compatible.
13. Slowly open the air control valve to begin inflating the suit. Pressurize the suit to five (5) inches of water column indicated on the gauge. Hold for one (1) minute to fill out wrinkles in the suit.
14. Close the air supply control valve to assure suit pressure does not exceed five (5) inches of water column pressure. Monitor gauge frequently to assure pressure does not exceed five (5) inches of water column pressure.
15. Set the countdown time (provided with the test kit) for exactly four (4) minutes.
16. Reduce the suit pressure to exactly four (4) inches of water column pressure by depressing the relief valve button located on the brass tee at the air inlet manifold.
17. Begin the test. **DO NOT MOVE OR TOUCH THE SUIT DURING THE TIMED TEST PERIOD. THIS MAY AFFECT THE SUIT PRESSURE RESULTING IN AN INACCURATE READING.**
18. At the end of the four (4) minute test period, record the suit pressure reading on the suit's "Inspections and Air Pressure Test Log."
19. A suit pressure reading of 3.2 inches of water or more indicates the suit has passed the pressure test. The suit has failed the pressure test if pressure is less than 3.2 inches of water after the four (4) minute test period.
20. If the suit fails the pressure test, the suit should be removed from service and checked for leaks.
21. To check for leaks, perform the following:
    a. Reinflate the suit to a pressure of four (4) inches water gauge.
    b. Using a mild soap solution in a squirt bottle (e.g., Snoop, or mild soap and water), apply the soap solution to the twist lock adapters in the exhaust valves, to all tube connections attached to the suit and attached to the test kit, and all other hardware connections of the test set up. If a leak is detected (soap bubbles), check that these

items are clean and reinstall them correctly and secured.

c. Reinflate the suit to a pressure of four (4) inches water gauge, and conduct the pressure test again in accordance with this procedure.
d. If suit fails again, reinflate the suit to a pressure of four (4) inches water gauge to continue checking for leaks.
e. Apply a mild soap solution over the entire suit, starting with areas around the visor, the zipper, seams, and to all interface points. Look for soap bubbles until the leak is found.
f. Mark the suit where the leak was found.
g. Return suit to manufacturer for repairs; or, remove suit from service as an emergency response chemical protective suit. Suits removed from service may be used for training. Training suits must be clearly marked for “Training Use Only”.
h. Deflate the suit by opening the relief valve until gauge reads at, or near, zero.
i. Open the suit zipper.
j. Disconnect tubing from the twist lock adapters.
k. Remove lock adapters from suit by turning counter clock wise. Reassemble the suit exhalation valves by re-installing the diaphragm and snap-on cover.
l. Return suit to proper storage location.

Appendix B - Inspection and Air Pressure Test Log

INSPECTION CHECKLIST

Manufactured By: _____ Date Purchased: _____
Serial Number: _____ Inspected By: _____
Style and Size: _____ Inspection Date: _____

Material	Check for any abrasions, holes, or tears.
Zipper	Check for overall condition, worn or damaged teeth, and ease of operation. Lubricate zipper lightly with paraffin (which is available from most grocery and hardware stores). Apply the paraffin lightly to the inner and outer element of the zipper. After cycling the fastener several times, excess flakes should be removed. Do not use a sticky lubricant, which could gather and hold particles of dirt, grease, or contaminant. Some lubricants can degradate the material.
Facepiece/Visor	Check that there are no splits, cracks, or deep scratches.
Gloves	Check glove integrity, PVC ring, quality of rubber bands, tightness of metal ring.
Exhalation Valve	Check for freedom from obstructions and dirt; if replacement of valves are needed, send back to the manufacturer for replacement.
Seams	Visually check for any split seams, tears, or separations of material.
Leak Test	Follow procedure in Appendix Z "Instructions for Testing Fully Encapsulated Chemical Protective Suits"
Log	Please mark log according to your findings. Date and sign, so that the status of the suit will be known at all times.

Inspections and Air Pressure Test Log

Inspection Date	Inspected By	Remarks	Inspection/Air Test Results

Date Removed From Service : _____
Person Removing From Service: _____
Reason Suit Removed From Service: _____

Procedure 314 Wearing Apparel and Conductive Articles

TVA Safety Manual

314 Wearing Apparel and Conductive Articles

Procedure Number 314

TVA Safety Procedure

Wearing Apparel and Conductive Articles

Revision 2

October 30, 2003

Purpose

This procedure establishes requirements for general wearing apparel and the wearing of conductive articles.

General Requirements

1. Employees are required to wear clothing appropriate for the type of work performed.
   NOTE: Shorts are not considered approved wearing apparel for industrial type work environments.
2. Exposed conductive articles, such as rings, metal wristwatches, bracelets, metal necklaces, key chains, and watch chains shall not be worn when working on or near exposed energized electrical conductors or surfaces or moving machinery.
3. Dangling jewelry or rings shall not be worn when climbing ladders or scaffolds. Consideration should be given during a pre-job safety briefing to any situation that could occur which could cause items such as jewelry to become caught or entangled and thus injure an employee.
4. Necklaces and neck cords used to hang or carry picture badges, dosimetry, ink pens, and similar items shall have at least two weak-link break points at divergent locations.

Reference

29 Code of Federal Regulations 1910.269, “Electric Power Generation, Transmission and Distribution"

TVA Safety Procedure 1022, “Arc Flash Hazard Calculation and Required Protection”

TVA Safety Procedure 313, “Special Protective Clothing”

Chapter 1 Section 4 Health and Safety Training

Procedure 401 Health and Safety Training

TVA Safety Manual

401 Health and Safety Training

Procedure Number 401

TVA Safety Procedure

Health and Safety Training

Revision 12

January 27, 2011

Purpose

This procedure establishes health and safety training requirements for organizations and employees and provides implementing instructions for TVA-SPP-18.008, Implement Safety Training Requirements [1].

Health and Safety Training

Each TVA employee shall receive health and safety training specific for the type of work they perform, or to qualify them to use or operate equipment, or as a result of exposure or potential exposure to chemicals and hazardous materials at or above action levels specified in applicable regulations and standards.

Health and Safety Training Courses

Health and safety training courses shall be established for employees necessary to safely perform required work and meet regulatory requirements.
All health and training courses shall be developed using standardized training materials.

Course List

Health and safety training courses are listed in Appendix A - Health and Safety Training Course Matrix. More information concerning specific safety training courses can be found by logging into the TVA “On Line learning” portal.

Training Assessments

Each organization shall be required to conduct a health and safety training needs assessment for all employees. Training requirements shall be established in the ATIS system.

Documentation of Training

All health and safety training shall be documented by the responsible organization in ATIS for TVA employees. Contractor safety training can be documented in ATIS or MARSH.

Evaluation of Training

Health and safety training compliance shall be evaluated periodically through assessments by TVA Safety and through Safety Self- Assessments.

Conduct of Training

Block training is an **option** that may be used for safety training courses to achieve economy in presentation by grouping several safety training courses into a single block. This allows the training listed under each block to be recorded using one class roster and a single ATIS number (a companion ID). Also, time economy is achieved in the block training by elimination of duplicate training material that is contained in some courses.
Appendix B - Health and Safety Block Training, provides a listing of the established block training.

Refresher Training Policy

Training which occurs periodically, i.e., annual refresher training, will expire at the end of the quarter in which it comes due unless there are regulatory requirements stipulating specific criteria for the expiration of the training. Note: Some regulatory requirements require retraining when specified conditions occur. Training to meet regulatory requirements for retraining must be done when the specified conditions are met.
Note: Some regulatory requirements require retraining when specified conditions occur. Training to meet regulatory requirements for retraining must be done when the specified conditions are met.

Reference

- TVA-SPP-18.008, Implement Safety Training Requirements [1]
- TVA-SPP-17.1, Training Metrics [1]
- Training Requirements in OSHA Standards and Training Guidelines, OSHA 2254 [2]

Appendices

Appendix A - Health and Safety Training Course Matrix

Appendix A - Health and Safety Training Course Matrix

Appendix B - Health and Safety Block Training

Appendix B - Health and Safety Block Training

References

[1] http://chapedmw2.cha.tva.gov/dms/pc/getdocument.asp?library=chaedmp^chachaedmp1&idmId=063040015

[2] http://www.osha.gov/Publications/osha2254.pdf

Procedure 402 Accident Investigation For Supervisors Course Standard

TVA Safety Manual

402 Accident Investigation for Supervisors Course Standard

Procedure Number 402

TVA Safety Procedure

Accident Investigation for Supervisors Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for employees who are managers, supervisors, and foremen, and are working in high risk work units.

ATIS Course Number

00059100

Reference

29 Code of Federal Regulations 1960.55, “Training Of Supervisors”

Topics

How to conduct accident investigations and prepare reports

Instruction Resources

Facilitator Guide Slide Program Slide Show

Instruction Time

2 hours

Frequency

Initial

Retraining Requirements

None

Target Audience

Supervisors and foremen of high risk work units.

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety / Facilities Management

Procedure 403 Aerial Lfts Course Standard

TVA Safety Manual

403 Aerial Lifts Course Standard

Procedure Number 403

TVA Safety Procedure

Aerial Lifts Course Standard

Revision 1

January 27, 2006

Purpose

This procedure establishes the certification and training requirements for employees operating aerial lifts. Training and skills certification require completion of the Aerial Lifts training and skills certification for the listed categories of aerial lift.

Note: Employees must complete both the training and the skills evaluation for certification as an aerial lift operator. Certification for operators shall be documented and tracked in ATIS using the ATIS numbers as specified below for each type / category aerial lift.

Training	ATIS
Skills	Certification

Skills Certification	
Articulating Boom Aerial Lift Platforms	00059200
Extendable / Telescoping Boom Aerial Platforms	00059201
Vehicle Mounted Aerial Lifts (Bucket Truck Type) Non-insulated	00059202
Scissor Lifts	00059203
Insulated Aerial Devices	00059204

Reference

TVA Safety Procedure 702, “Aerial Lifts”

29 Code of Federal Regulations 1910.67, “Vehicle Mounted Elevating and Rotating Work Platforms”,

ANSI 92.2

Topics

1. Training course includes design, principles of operation, inspection / testing, maintenance, personal protective equipment for operating aerial lifts, and specific operating instructions for the various categories of aerial lifts to be operated
2. Skills demonstration includes operating the specific type / category aerial lift using manufacturer’s operator instructions

Instruction Resources

- Facilitator Guide
- Slide Program
- Skills Demonstration

Instruction Time

Aerial Lifts	4 hours
Skills Certification Articulating Boom Aerial Lift Platforms	Skills
Skills Certification Extendable / Telescoping Boom Aerial Platforms	Skills
Skills Certification Vehicle Mounted Aerial Lifts (Bucket Truck Type) Non-insulated	Skills
Skills Certification Scissor Lifts	Skills
Skills Certification Insulated Aerial Devices	Skills

Frequency

Initial / 3 Years

Retraining Requirements

Aerial Lifts	3 Years
Skills Certification Articulating Boom Aerial Lift Platforms	3 Years
Skills Certification Vehicle Mounted Aerial Lifts (Bucket Truck Type) Non-insulated	3 Years
Skills Certification Scissor Lifts	3 Years
Skills Certification Insulated Aerial Devices	3 Years

Target Audience

Employees who operate aerial lifts

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

Heavy Equipment Division (Rex Neal) or qualified / designated plant instructor

Procedure 404 All Terrain Vehicle (ATV) Safety Course Standard

TVA Safety Manual

404 All Terrain Vehicle (ATV) Safety Course Standard

Procedure Number 404

TVA Safety Procedure

All Terrain Vehicle (ATV) Safety Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for employees that operate all-terrain vehicles

ATIS Course Number

00059102

Regulatory Standard

None

Topics

How to operate ATVs safely, personal protective equipment for ATV operators

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

1 hour

Frequency

Initial

Retraining Requirements

None

Target Audience

Employees who operate all-terrain vehicles (ATVs)

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety/TPS

Procedure 405 Ammonia Awareness Course Standard

TVA Safety Manual

405 Ammonia Awareness Course Standard

Procedure Number 405

TVA Safety Procedure

Ammonia Awareness Course Standard

Revision 1

November 5, 2004

Purpose

This procedure establishes the training requirements for employees that work at plants with ammonia.

ATIS Course Number

00059103

Regulatory Standard

TVA Safety Procedure 901, “Ammonia”

TVA Safety Procedure 220, “Process Safety Management”

29 Code of Federal Regulations 1910.120, “Hazardous Waste Operations and Emergency Response”

Topics

Hazards of ammonia, safe work requirements, personal protective equipment, emergency instructions and evacuation plans, process safety analysis of ammonia operations

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

1 hour

Frequency

Initial

Retraining Requirements

None

Target Audience

Employees that work at plants that have ammonia

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

TVAU On-line Learning or plant designee at fossil plants with SCR

Procedure 406 Boating Safety Course Standard

TVA Safety Manual

406 Boating Safety Course Standard

Procedure Number 406

TVA Safety Procedure

Boating Safety Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for employees who are drivers or passengers in small boats.

ATIS Course Number

00059104

Reference

TVA Safety Procedure 603, “Boating Safety”

Topics

Boating safety rules, safe operating procedures, loading the boat, pre-trip checklist, basic water safety, refueling

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

3 hours

Frequency

Initial

Retraining Requirements

None

Target Audience

Boar operators in Prop Maintenance

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

Facilities Management Safety

Procedure 407 Chain Saw Safety Course Standard

TVA Safety Manual

407 Chain Saw Safety Course Standard

Procedure Number 407

TVA Safety Procedure

Chain Saw Safety Course Standard

Revision 1

March 5, 2010

Purpose

This procedure establishes the training requirements for workers that use chain saws.

ATIS Course Number

Basic Chain Saw Safety 00059214

Chain Saw Safety 00059105

NOTE: The training course "Basic Chain Saw Safety," ATIS Number 00059214 has not been developed. Completion of this training course is not required until the course is available.

Reference

TVA Safety Procedure 704, "Chain Saw Operations

29 Code of Federal Regulations 1910.266(e), "Logging Operations"

29 Code of Federal Regulations 1910.269(r), "Line-Clearance Tree Trimming"

ANSI B175.1-1991 "Safety Requirements for Gasoline-Powered Chain Saws"

Topics

Safe operating procedures, inspection and care of chain saws, refueling

Instruction Resources

- Basic Chain Saw Safety - CBT / Practical Exercise
- Chain Saw Safety – Lesson Plan -Instructor Led / Practical Exercise

Instruction Time

Basic Chain Saw Safety / 4 hours

Chain Saw Safety / 32 hours

Frequency

Basic Chain Saw Safety / Initial

Chain Saw Safety / Initial

Retraining Requirements

Basic Chain Saw Safety / None

Chain Saw Safety / None

Target Audience

“Basic chain saw operation” includes the occasion (non-daily) need to utilize a chain saw to cut dunnage, railroad ties, construction grade lumber, general landscape maintenance, rubber/plastic pipe, and storm restoration.

“Chain saw operation” includes daily use of chain saws as a primary daily part of an employee’s job that may include among other tasks felling trees, limbing, etc.

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

Basic Chain Saw Safety - CBT / Practical Exercise

Chain Saw Safety – Instructor Led / Practical Exercise

Procedure 408 Chemical Cleaning of Boilers Course Standard

TVA Safety Manual

408 Cleaning of Boilers Course Standard

Procedure Number 408

TVA Safety Procedure

Chemical Cleaning of Boilers Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for employees involved in the chemical cleaning of boilers.

ATIS Course Number

00059107

Reference

29 Code of Federal Regulations 1910.269

Topics

Hazards of acid handling, safe procedures for handling, storage, transfer and use of acids, personal protective equipment

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

½ hour

Frequency

Prior to boiler cleaning

Retraining Requirements

Annual

Target Audience

All employees involved in acid cleaning of boilers

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

Plant designee

Procedure 409 Chemical Hygiene Orientation Course Standard

TVA Safety Manual

409 Chemical Hygiene Orientation Course Standard

Procedure Number 409

TVA Safety Procedure

Chemical Hygiene Orientation Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for employees working in laboratories where chemicals are stored or handled.

ATIS Course Number

00059108

Reference

29 Code of Federal Regulations 1910.1450, “Occupational Exposure to Hazardous Chemicals in Laboratories”

Topics

Observation techniques used to detect the presence or release of hazardous chemicals, physical and health hazards of chemical, signs and symptoms of chemical exposure, laboratory protective safeguards, Material Safety Data Sheets (MSDS), TVA Chemical Hygiene Plan, emergency procedures.

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

2 ½ hours

Frequency

Initial

Retraining Requirements

None

Target Audience

Employees who work in laboratories where hazardous chemicals are present.

Course Prerequisites

None

Medical Requirements

Medical S-3 Special Respiratory Examination

Recommended Delivery Resource

Facilitator led (plant designee); Self-study; or Computer Based Training (CBT)

Procedure 410 Confined Space Entry Course Standard

TVA Safety Manual

410 Confined Space Entry Course Standard

Procedure Number 410

TVA Safety Procedure

Confined Space Entry Course Standard

Revision 3

April 16, 2004

Purpose

This procedure establishes the training requirements for employees involved in work associated with permitted confined spaces.

ATIS Course Number

00059109 "Confined Space Entry"

00059159 "Confined Space Test Instruments"

Reference

29 Code of Federal Regulations 1910.146, "Confined Space Entry"

29 Code of Federal Regulations 1910.269 (e) "Electric Power Generation, Transmission, and Distribution"

Topics

"Confined Space Entry", ATIS 00059109, covers hazard recognition / evaluation, confined space entry procedures, classification of confined spaces, test equipment / atmospheric monitoring, communication, personal protective equipment (PPE), entry authorization, entry permits, entrant / attendant and supervisor responsibilities. See Target Audience for specific requirements.

"Confined Space Test Instruments", ATIS 00059159, covers operating instructions on how to use the test instrument as provided by each instrument manufacturer and instructions on issuing the Confined Space Entry Permit.

NOTE: Plants and organizations must keep a site specific record or list identifying the type and model of each instrument that the employee is trained to use. An evaluation must also be conducted to ensure that individuals responsible for conducting confined space tests can demonstrate to proper use of the instrument.

Instruction Resources

“Confined Space Entry” Facilitator Guide Slide Program

“Confined Space Test Instruments” Facilitator Guide Slide Program

Instruction Time

“Confined Space Entry” 3 hours

“Confined Space Test Instruments” 2 hours

Frequency

“Confined Space Entry” Initial / 5 years

“Confined Space Test Instruments” Initial / 5 years or if instrument is changed

Retraining Requirements

5 years

Target Audience

Confined Space Entry is required for all employees who work in serve as an attendant or supervise work by other employees in permitted confined spaces. “Confined Space Test Instruments” is required for all employees who conduct atmospheric testing of confined spaces using gas testing instruments.

Course Prerequisites

None for “Confined Space Entry”

“Confined Space Test Instruments” requires that employees receive “Confined Space Entry” as a prerequisite.

Medical Requirements

None

Recommended Delivery Resource

COO Safety / Facilitator led (plant designee)

Procedure 411 Crane Safety (Mobile) Course Standard

TVA Safety Manual

411 Crane Safety (Mobile) Course Standard

Procedure Number 411

TVA Safety Procedure

Crane Safety (Mobile) Course Standard

Revision 3

April 18, 2008

Purpose

This procedure lists the certification and training requirements for mobile crane operators, crane evaluators, and crane inspectors.

TVA Safety Procedure (TSP) 802, “Requirements for Safe Operation of Cranes,” establishes the certification requirements for crane operators. To be certified a crane operator must pass a written exam, skills test, and medical examination as specified below. Completion of Crane Safety (Mobile) training course is not required unless the individual needs training to be able to pass the written examination. Exception: National Crane operators must complete the Crane Safety (Mobile) training course prior to taking the written and skills tests.

Certification for crane operators, evaluators, and inspectors must be documented and tracked in ATIS using the ATIS numbers as specified below for each category of crane. Certification for contractor personnel who can not be entered into ATIS will have documentation maintained in an alternate system.

Mobile Crane Training	ATIS #
Crane Safety (Mobile)	00059110

Skills Certification	
0-20 Ton Hydraulic Telescoping Boom Crane	00059167
21-90 Ton Hydraulic Telescoping Boom Crane	00059168
91 Ton & Larger Hydraulic Telescoping Boom Crane	00059169
Crawler Mounted Hydraulic Crane	00059170
Commercial Truck Mounted Hydraulic Crane	00059171
Articulating Boom Hydraulic Crane	00059172
Fixed Boom Truck Mounted Friction Crane	00059173
Fixed Boom Truck Mounted Friction Crane with Tower Attachment	00059174
Fixed Boom Crawler Mounted Friction Crane	00059175
Fixed Boom Crawler Mounted Hydraulic Crane	00059176
Fixed Boom Crawler Mounted Friction Crane with Tower Attachment	00059177

Fixed Boom Crawler Mounted Hydraulic Crane with Tower Attachment	00059178
Fixed Boom Crawler Mounted Friction Crane with Ringer Attachment	00059179
Fixed Boom Crawler Mounted Hydraulic Crane with Ringer Attachment	00059180
Fixed Boom Crawler Mounted Friction Crane with Luffer Attachment	00059181
Fixed Boom Crawler Mounted Hydraulic Crane with Luffer Attachment	00059182
Mobile Crane Skills Evaluator	00059184
Mobile Crane Annual Inspector	00059185

Reference

TVA Safety Procedure 802, “Requirements for the Safe Operation of Cranes”, 29 Code of Federal Regulations 1910.180, “Crawler, Locomotive, and Truck Cranes”, 1926.550, “Cranes and Derricks”

Topics

Operating principals and procedures, crane set-up, load charts, pre-operational and frequent inspections, flagging, written examination toward certification, field skills examination for crane operator certification making actual lifts.

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show
- Skills Examination

Instruction Time

24 hours

Frequency

Crane Safety (Mobile) – 00059110: Initial if required
Written Test and Skill Certifications: Every 3 years

Retraining Requirements

Recertification to include written exam and skills test is required for all mobile crane operators, evaluators, inspectors every 3 years

Target Audience

Mobile crane operators, evaluators, and inspectors

Course Prerequisites

None

Medical Requirements

Medical S-8 examination each 2 years

Recommended Delivery Resource

Primary- Heavy Equipment Division (423) 365-8702

Procedure 412 Crane Safety (Overhead) Course Standard

TVA Safety Manual

412 Crane Safety (Overhead) Course Standard

Procedure Number 412

TVA Safety Procedure

Crane Safety (Overhead) Course Standard

Revision 1

March 17, 2003

Purpose

This procedure establishes the training requirements for overhead crane operators.

ATIS Course Number

00059111

Reference

29 Code of Federal Regulations 1910.179, “Overhead and Gantry Cranes 1926.550, “Cranes and Derricks”

Topics

Overview of safe lifting principles, hand signals, pre-operational check, written test toward certification, functional makeup & operating characteristics, inspection and maintenance, safe operating practices, field test lifting and moving a load for certification

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

8 hours

Frequency

Initial / 5 years

Retraining Requirements

Every 5 years maximum for recertification

Target Audience

Overhead crane operators

Course Prerequisites

None

Medical Requirements

S-8 Medical examination every 2 years

Recommended Delivery Resource

Power Service Shops, Muscle Shoals

Procedure 413 Crane Safety (Pendant) Course Standard

TVA Safety Manual

413 Crane Safety (Pendant) Course Standard

Procedure Number 413

TVA Safety Procedure

Crane Safety (Pendant) Course Standard

Revision 1

March 17, 2003

Purpose

This procedure establishes the training requirements for employees that operate pendant type cranes.

ATIS Course Number

00059112

Reference

29 Code of Federal Regulations 1910.179, “Overhead and Gantry Cranes 1926.550, “Cranes and Derricks”

Topics

Identification of crane components, inspecting the bridge and trolley, understanding pendant controls, test running the crane, pre-operational check list, hand signals for cranes, crane operation

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

1 hour

Frequency

Initial / 3 years

Retraining Requirements

3 years

Target Audience

Employees required to operate pendant type cranes and hoists

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety / Facilities Management Safety / plant designee

Procedure 414 Defensive Driving Course Standard

TVA Safety Manual

414 Defensive Driving Course Standard

Procedure Number 414

TVA Safety Procedure

Defensive Driving Course Standard

Revision 1

April 16, 2004

Purpose

This procedure establishes training requirements for employees who drive TVA vehicles.

ATIS Course Number

00059113

Reference

TVA Safety Procedure 610, “Motor Vehicle Operations”

Topics

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

6 hours

Frequency

Initial

Retraining Requirements

None

Target Audience

Optional for employees who drive TVA vehicles as designated by management

Course Prerequisites

Valid state driver license

Medical Requirements

None

Recommended Delivery Resource

TVA Police

Procedure 415 Arc Flash Hazard Calculation & Required Protection Course Standard

TVA Safety Manual

415 Arc Flash Hazard Calculation & Required Protection Course Standard

Procedure Number 415

TVA Safety Procedure

Arc Flash Hazard Calculation & Required Protection Course Standard

Revision 4

April 30, 2007

Purpose

This procedure establishes the training requirements for employees who perform work on / or near energized electrical equipment with potential electric arc flash hazards. This course is designed to provide participants with an understanding of TVA's safety requirements for performing work in the presence of exposed, energized conductors and parts. It provides the knowledge necessary to limit extent of injury as a result of being subjected to arc flash burns from electric flash.

ATIS Course Number

Arc Flash Hazard Calculation & Required Protection	ATIS 00059114
Care and Cleaning of TVA Protective / Flame Resistant Garments	ATIS 00059192 Optional

Reference

TVA Safety Procedure 1022, "Arc Flash Hazard Calculation and Required Protection"

29 Code of Federal Regulations 1910.269 – "Power Generation, Transmission, and Distribution"

NFPA 70E - Standard for Electrical Safety Requirements for Employee Workplaces, 2000 Edition

Topics

Hazards of electric arc flash, analyzing electric arc flash energy potential, personal protective equipment for protecting against electric arc, safe clearance, use of fire retardant (FR) clothing

Care and Cleaning of TVA Protective Flame Resistant Garments

Instruction Resources

This course is available through TVAU On-line learning. Employee ID number and 4-digit PIN are needed to access this course.

Care and cleaning information is obtained from TVA Safety Procedure 1022, "Arc Flash Hazard Calculation and Required Protection" Appendix E, Care and Cleaning of TVA Protective Flame Resistant Garments. Employees may be provided with a copy of this information. Organizations may choose to document employee receipt of these

instructions using ATIS number 00059192. Optional only

Instruction Time

1 hour Arc Flash Hazard Calculation & Required Protection

Use optional handout for “Care and Cleaning of TVA Protective Flame Resistant Garments”

Frequency

Initial

Retraining Requirements

None

Target Audience

Required for all employees and contractors who may be exposed to the hazards of flames or electric arcs while performing work in the presence of exposed, energized conductors and parts, or involved in the calculation of arc flash hazards

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

Arc Flash Hazard Calculation & Required Protection TVAU On-line Learning

Handout Care and Cleaning of TVA Protective Flame Resistant Garments

Procedure 416 Electrical Safety per OSHA 1910. 269 Course Standard

TVA Safety Manual

416 Electrical Safety per OSHA 1910.269 Course Standard

Procedure Number 416

TVA Safety Procedure

Electrical Safety per OSHA 1910.269 Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for electricians and those who may perform work on/ or near energized electrical equipment.

ATIS Course Number

00059115

Reference

29 Code of Federal Regulations 1910.269, “Electric Power Generation, Transmission, and Distribution”

Topics

Hazards from work on energized electrical equipment, requirements for use of fire retardant clothing

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

2 hours

Frequency

Initial

Retraining Requirements

None

Target Audience

Electricians and helpers

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety / Supervisor / Competent Person

Procedure 417 General Employee Safety Orientation Course Standard

TVA Safety Manual

417 General Employee Safety Orientation Course Standard

Procedure Number 417

TVA Safety Procedure

General Employee Safety Orientation Course Standard

Revision 1

April 29, 2005

Purpose

This procedure establishes the basic safety training requirements for new employees.

NOTE: “General Employee Safety Orientation” has been established as an on-line computer based course. This on-line course includes “Employee Safety Orientation” ATIS 00059116 and “Personal Protective Equipment” ATIS 00059140. Employees taking this on-line course will receive course credit as ATIS 00059164.

ATIS Course Number

00059164	General Employee Safety Orientation
00059116	Employee Safety Orientation

NOTE: Employee Safety Orientation will continue to be an active course offering, however all new training should be conducted as part of the new “General Safety Orientation”

Reference

29 Code of Federal Regulations 1960.59 “Training of Employees and Employee Representatives”

Topics

Review of the occupational health and safety program, employee rights and responsibilities, specialized workplace health and safety information, minimum approach distances, live-line work, appropriate apparel for energized work, working around water, general population clearance training, personal protective equipment, housekeeping.

Instruction Resources

General Employee Safety Orientation	Computer Based Training – TVA On-line Learning
Employee Safety Orientation	Facilitator led
Personal Protective Equipment	Facilitator led

Instruction Time

General Employee Safety Orientation - 2 hours
Employee Safety Orientation - 3 hours
Personal Protective Equipment - 2 hours

Frequency

Initial

Retraining Requirements

None

Target Audience

All employees

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

TVA On-line Learning or facilitator led

Procedure 418 Ergonomics Course Standard

TVA Safety Manual

418 Ergonomics Course Standard

Procedure Number 418

TVA Safety Procedure

Ergonomics Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for employees exposed to potential injury from repetitive motion activities.

ATIS Course Number

00059117

Reference

TVA Safety Procedure 604, “Ergonomics Guidelines”

DRAFT OSHA Standard

Topics

Manual lifting and handling, workplace configuration to reduce injuries from repetitive motion or cumulative trauma

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

3 hours

Frequency

Initial

Retraining Requirements

None

Target Audience

Employees involved in regular lifting and handling activities and those performing repetitive motion tasks.

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety / Facilities Management Safety / facilitator led (plant designee); Self-study; or Computer Based Training (CBT)

Procedure 419 Excavating & Trenching (Affected Person) Course Standard

TVA Safety Manual

419 Excavating & Trenching (Affected Person) Course Standard

Procedure Number 419

TVA Safety Procedure

Excavating & Trenching (Affected Person) Course Standard

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish training requirements for employees involved in excavating and trenching operations.

ATIS Course Number

00059118

Reference

TVA Safety Procedure 804, “Excavations and Trenching”
29 Code of Federal Regulations 1926.650-653
29 Code of Federal Regulations 1910.269

Topics

Sloping and shoring requirements, inspection of excavations, atmospheric testing, walking and working surfaces, access and egress, personal protective equipment (PPE)

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

1 hour

Frequency

Initial

Retraining Requirements

None

Target Audience

All employees who may be involved in excavation and trenching work

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety / facilitator led (plant designee); Self-study; Computer Based Training (CBT)

Procedure 420 Excavating & Trenching (Competent Person) Course Standard

TVA Safety Manual

420 Excavating & Trenching (Competent Person) Course Standard

Procedure Number 420

TVA Safety Procedure

Excavating & Trenching (Competent Person) Course Standard

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish training requirements for employees who supervise and plan excavating and trenching work.

ATIS Course Number

00059119

Reference

TVA Safety Procedure 804, “Excavations and Trenching”
29 Code of Federal Regulations 1926.650
29 Code of Federal Regulations 1926.653

Topics

Duties of the Competent Person, OSHA standard requirements, requirements of protective systems, soil classifications, hands-on soil analysis classification, excavation permits and workplace standard.

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

4 hours

Frequency

Initial

Retraining Requirements

None

Target Audience

Persons responsible for trenching and excavations

Course Prerequisites

Excavating and Trenching (Affected Person)

Medical Requirements

None

Recommended Delivery Resource

COO Safety / facilitator led (plant designee); Self-study; Computer Based Training (CBT)

Procedure 421 Fall Protection Systems Course Standard

TVA Safety Manual

421 Fall Protection Systems Course Standard

Procedure Number 421

TVA Safety Procedure

Fall Protection Systems Course Standard

Revision 1

May 3, 2011

Purpose

This procedure establishes the training requirements for employees who use fall protection equipment or who work from temporary elevated work platforms, aerial lifts or scaffolds.

ATIS Course Number

00059120

Reference

TVA Safety Procedures 305, “Fall Protection Systems”; 702, “Aerial Lifts”; and 813, “Scaffolds and Temporary Work Platforms”
29 Code of Federal Regulations 1910.23, “Guarding Floor and Wall Openings and Holes”
29 Code of Federal Regulations 1910.24, “Fixed Industrial Stairs”
29 Code of Federal Regulations 1910.28, “Safety Requirements for Scaffolding”
29 Code of Federal Regulations 1910.269, “Electric Power Generation, Transmission, and Distribution”

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Topics

Guard rails on scaffolds, walking and working surfaces, fall arrest systems: harnesses, lanyards and lifelines, selection of fall protection, inspection and care of fall protection equipment

Instruction Time

1.5 hour

Frequency

Initial

Retraining Requirements

None

Target Audience

All employees whose job requires the use of fall arrest equipment or who work from temporary elevated work platforms, aerial lifts or scaffolds.

Course Prerequisites

None

Medical Requirements

None

===Recommended Delivery Resource===

Procedure 422 Flagging Motor Vehicle Traffic Course Standard

TVA Safety Manual

422 Flagging Motor Vehicle Traffic Course Standard

Procedure Number 422

TVA Safety Procedure

Flagging Motor Vehicle Traffic Course Standard

Revision 1

October 30, 2003

Purpose

This procedure establishes the training requirements for employees who flag vehicle traffic.

ATIS Course Number

00059121

Regulatory Standard

29 Code of Federal Regulations 1910.269, “Electric Power Generation, Transmission, and Distribution”

Topics

How to flag vehicle traffic, regulations concerning the flagging of vehicle traffic

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

1 hour

Frequency

Initial

Retraining Requirements

None

Target Audience

Employees who flag vehicle traffic

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety or Facilities Management Safety

Procedure 423 Forklift Operations Course Standard

TVA Safety Manual

423 Forklift Operations Course Standard

Procedure Number 423

TVA Safety Procedure

Forklift Operations Course Standard

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is establish training requirements forklift truck operators

ATIS Course Number

00059122

Reference

TVA Safety Procedure 805, “Forklift Operations” 29 Code of Federal Regulations 1910.178, “Powered Industrial Trucks”

Topics

Regulatory standard, basic requirements for forklifts, types of forklifts, forklift accidents and statistics, inspections and maintenance, forklift capacities, pivot points, stability.

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

4 hours

Frequency

Initial / 3 years

Retraining Requirements

3 years

Target Audience

All forklift operators.

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety / facilitator led (plant designee); Self-study; Computer Based Training (CBT)

Procedure 424 Grounding Safety Procedures Course Standard

TVA Safety Manual

424 Grounding Safety Procedures Course Standard

Procedure Number 424

TVA Safety Procedure

Grounding Safety Procedures Course Standard

Revision 3

April 30, 2007

Purpose

This procedure establishes training requirements for employees involved with temporary protective grounding (protective grounding) on de-energized electrical conductors or equipment for generating stations and other non-transmission electrical conductors and equipment.

Note: Employees must complete both the training and the appropriate skills evaluation for certification to place temporary protective grounds on the equipment listed. This certification shall be documented and tracked in ATIS.

ATIS Course	ATIS #
INACTIVE - Grounding Safety Procedures	INACTIVE - 00059123
Temporary Protective Grounding for Generating Stations	00059213
Grounding Safety Procedures – Refresher	00059189
Skills Certification	
Placing & Removing Grounds in 4160 & 6900 Volt Cubicles	00059207
Note: This skills evaluation demonstrates the participant's knowledge and performance while placing and removing protective grounding jumpers inside a medium voltage electrical cubicle. It is not recommended that a live cubicle be used to complete the skills evaluation, rather a grounding simulator or de-energized cubicle should be used. Training course 00059213 and the skills certification 00059207 must both be successfully completed in initial training prior to any work involving the placing and removing of protective grounds inside medium voltage cubicles at fossil and nuclear generating stations.	
Placing & Removing Grounds on Hydroelectric & Combustion Turbines	00059208
Note: This skills evaluation demonstrates participant's knowledge and performance while placing and removing grounds on a hydro electric or combustion turbine generator. The training course 00059213 and the skills certification 00059208 must both be successfully completed in initial training prior to any work involving the placing and removing of protective grounds on a hydro electric or combustion turbine generator.	
Placing & Removing Temporary Protective Grounding Devices in 4160 & 6900 Cubicles	00059210

Note: This skills evaluation demonstrates the participant's knowledge and performance while placing and removing a temporary protective grounding device (grounding breaker) inside a medium voltage electrical cubicle. It is not recommended that a live cubicle be used to complete this skills evaluation, rather a grounding simulator should be used. Training course 00059213 and the skills certification 00059210 must both be successfully completed in initial training prior to any work involving the placing and removing of grounding devices inside medium voltage cubicles at fossil and nuclear generating stations.	
Placing & Removing Protective Grounds on Hydro Plant Main Transformers	00059211
Note: This skills evaluation demonstrates participant's knowledge and performance while placing and removing grounds on a main transformer. The training course 00059213 and the skills certification 00059211 must both be successfully completed in initial training prior to any work involving the placing and removing of protective grounds on a main transformer.	

Reference

TVA Safety Procedure 1008, "Temporary Protective Grounding for Generating Stations and Other Non-Transmission Facilities"

Topics

When to install grounds, how to install and removal of safety grounds, selecting proper safety grounds, fault and clearing time, inspection of safety grounds, use of signs and barricading, de-energization of electrical equipment and accountability for grounds

Instruction Resources

Temporary Protective Grounding for Generating Stations ------ Facilitator
Grounding Safety Procedures – Refresher TVA --------- On-line Learning

Instruction Time

Temporary Protective Grounding for Generating Stations ------ 4 hours
Grounding Safety Procedures – Refresher ------ 2 hours

Frequency

Temporary Protective Grounding for Generating Stations	Initial
Grounding Safety Procedures – Refresher	Annual
Placing & Removing Grounds in 4160 & 6900 Volt Cubicles	Initial
Placing & Removing Grounds on Hydroelectric & Combustion Turbines	Initial
Placing & Removing Temporary Protective Grounding Devices in 4160 & 6900 Cubicles	Initial

Target Audience

Employees and supervisors involved with temporary protective grounding on de-energized electrical conductors or equipment at generating stations and other non-transmission facilities. Only trained and qualified electrical workers or technicians may apply protective grounds in accordance with TVA Safety Procedure 1008, “Temporary Protective Grounding for Generating Stations and Other Non-Transmission Facilities”.

Course Prerequisites

Electrical Safety per OSHA 1910.269, ATIS Number 00059115.

Note: Temporary Protective Grounding for Generating Stations 00059213 is required as a prerequisite for Grounding Safety Procedures – Refresher.

Medical Requirements

None

Recommended Delivery Resource

Employee Technical Training & Organizational Effectiveness has trained qualified instructors for operating organizations. Contact the training organization at the responsible facility to arrange for initial training. Employee Technical Training & Organizational Effectiveness is responsible for training to qualify instructors. Refresher training is available through TVA On-line Learning.

Procedure 425 Hand & Portable Power Tools Course Standard

TVA Safety Manual

425 Hand & Portable Power Tools Course Standard

Procedure Number 425

TVA Safety Procedure

Hand & Portable Power Tools Course Standard

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is establish training requirements for employees using hand and portable power tools.

ATIS Course Number

00059124

Reference

29 Code of Federal Regulations 1910.242, “Hand and Portable Powered Tools and Equipment General”
29 Code of Federal Regulations 1910.243, “Guarding of Portable Powered Tools”
29 Code of Federal Regulations 1910.269, “Electric Power Generation, Transmission and Distribution”

Topics

Electrical power tools, pneumatic power tools, grinding and cutting tools, principles of operation, guarding inspection, maintenance, personal protective equipment (PPE)

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

1 hour

Frequency

Initial

Retraining Requirements

None

Target Audience

Employees who use hand and portable power tools

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety / facilitator led (plant designee); Self-study; Computer Based Training (CBT)

Procedure 426 Handling & Storage of Compressed Gas/Glammable/Combustible Liquids Course Standard

TVA Safety Manual

426 Handling & Storage of Compressed Gas / Flammable / Combustible Liquids Course Standard

Procedure Number 426

TVA Safety Procedure

Handling & Storage of Compressed Gas / Flammable / Combustible Liquids Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for employees who work with compressed gases and / or flammable or combustible liquids.

Course Number

00059125

Reference

TVA Safety Procedure 706, “Compressed Gas Cylinders”
TVA Safety Procedure 906, “Combustible and Flammable Liquids”
29 Code of Federal Regulations 1910 Subpart H, “Hazardous Materials”

Topics

Compressed gas cylinders, handling and storage; types and classifications of flammable and combustible liquids, handling and storage.

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

1 hour

Frequency

Initial

Retraining Requirements

Refresher whenever a new type of chemical is introduced into the workplace.

Target Audience

Employees who work with compressed gases and / or flammable or combustible liquids

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO safety / facilitator led (plant designee); Self-study; Computer Based Training (CBT)

Procedure 427 Hazard Communication Course Standard

TVA Safety Manual

427 Hazard Communication Course Standard

Procedure Number 427

TVA Safety Procedure

Hazard Communication Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for employees who may handle chemicals and hazardous materials.

ATIS Course Number

00059126

Reference

TVA Safety Procedure 216, “Hazard Communication”
29 Code of Federal Regulations 1910.1200, “Hazard Communication”

Topics

Methods and observations that may be used to detect the presence of hazardous chemicals in the work place, physical and health hazards of chemicals in the work place, OSHA Hazard Communication standard, Material Safety Data Sheets (MSDS), chemical labeling, hazard protection, Hazard Communication Program, emergency procedures

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

2 hours

Frequency

Initial

Retraining Requirements

Whenever a new hazardous substance is introduced into the work place

Target Audience

All production managers, supervisors, and employees

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

Facilitator led (plant designee); Self-study; Computer Based Training (CBT)

Procedure 428 Hazard Recognition and Control Course Standard

TVA Safety Manual

428 Hazard Recognition and Control Course Standard

Procedure Number 428

TVA Safety Procedure

Hazard Recognition and Control Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for employees in the methods and techniques to recognize and control workplace hazards.

ATIS Course Number

00059127

Reference

TVA Safety Procedure 6, “Plan Jobs Safely”
TVA Safety Procedure 218, “Pre-job Briefing / Post-job Review”

Topics

Overview of TVA Safety Procedures, how to recognize hazards in the work place

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

1 hour

Frequency

Initial

Retraining Requirements

None

Target Audience

Managers, supervisors and foremen

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety

Procedure 429 Health and Safety Committee Course Standard

TVA Safety Manual

429 Health and Safety Committee Course Standard

Procedure Number 429

TVA Safety Procedure

Health and Safety Committee Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for employees who are representatives on Certified Health and Safety Committees.

ATIS Course Number

00059128

Reference

TVA Safety Procedure 7, “Operate Certified Health and Safety Committees”
29 Code of Federal Regulations 1960.58, “Training of Collateral Duty Safety and Health Personnel and Committee Members”

Topics

Overview of the TVA Safety Program, OSHAct, Executive Order 12196, 29 CFR 1960, Committee Charter, TVA safety procedures, understanding workplace safety, safety inspections, role and function of the health and safety committee, recognition of hazardous conditions

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

1 hour

Frequency

Initial

Retraining Requirements

None

Target Audience

All managers and employees serving on certified health and safety committees.

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety / Facilities Management Safety / facilitator led (plant designee); Self-study; or Computer Based Training (CBT)

Procedure 430 Hearing Conservation Course Standard

TVA Safety Manual

430 Hearing Conservation Course Standard

Procedure Number 430

TVA Safety Procedure

Hearing Conservation Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for employees exposed to high noise levels 85 decibels 8 hour time-weighted average.

ATIS Course Number

00059129

Reference

TVA Safety Procedure 310, “Hearing Conservation”
29 Code of Federal Regulations 1910.95, “Occupational Noise Exposure”

Topics

OSHA noise standard, TVA Hearing Conservation Program, Noise effects on hearing, Hearing protection / protectors, audiometric testing

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

½ hour

Frequency

Initial / Annual

Retraining Requirements

Annual

Target Audience

All employees exposed to high noise levels 85 decibels 8 hour time-weighted average.

Course Prerequisites

None

Medical Requirements

Annual audiogram for employees in hearing conservation program

Recommended Delivery Resource

COO Safety / plant or facility nurse or medical practitioner / facilitator led (plant designee); Selfstudy / (CBT)

Procedure 431 Heat Stress

TVA Safety Manual

431 Heat Stress Course Standard

Procedure Number 431

TVA Safety Procedure

Heat Stress Course Standard

Revision 2

November 5, 2004

Purpose

This procedure establishes the training requirements employees who work in hot areas where they may be subject to heat related illness, heat exhaustion, heat stroke.

ATIS Course Number

00059130	Heat Stress
00059163	Heat Stress Monitor (IST Sensor Lynx)
00059186	Heat Stress Monitor (Metrosonics hs-32)
00059187	Heat Stress Monitor (WIBGet RSS-214)

Reference

TVA Safety Procedure 806, “Heat Stress”

Topics

“Heat Stress”, ATIS 00059130, covers hazards related from working in hot environments, engineering, administrative, and personal protective equipment controls to protect employees from heat related illness.
“Heat Stress Monitor (IST Sensor Lynx)”, ATIS 00059163, covers operating instructions on how to obtain Wet Bulb Globe Temperature (WBGT) measurements using the IST Sensor Lynx monitor.
“Heat Stress Monitor (Metrosonics hs-32)”, ATIS 00059186, covers operating instructions on how to obtain Wet Bulb Globe Temperature (WBGT) measurements using the Metrosonics hs-32 monitor.
“Heat Stress Monitor (WIBGet)”, ATIS 00059187, covers operating instructions on how to obtain Wet Bulb Globe Temperature (WBGT) measurements using the WIBGet RSS-214 monitor.

Instruction Resources

Heat Stress	CBT TVAU On-line Learning
Heat Stress Monitor (IST Sensor Lynx)	CBT + Instructor
Heat Stress Monitor (Metrosonics hs-32)	CBT + Instructor
Heat Stress Monitor (WIBGet RSS-214)	CBT + Instructor

Instruction Time

Heat Stress	1 hour
Heat Stress Monitor (IST Sensor Lynx)	1 hour
Heat Stress Monitor (Metrosonics hs-32)	1 hour
Heat Stress Monitor (WIBGet RSS-214)	1 hour

Frequency

Heat Stress	Initial
Heat Stress Monitor (IST Sensor Lynx)	Initial
Heat Stress Monitor (Metrosonics hs-32)	Initial
Heat Stress Monitor (WIBGet RSS-214)	Initial

Retraining Requirements

Retraining is required for employees that are required to conduct temperature measurements whenever instruments change. Whenever any new model instruments are added a course will be established for the specific instruments and listed in this procedure.

Target Audience

“Heat Stress”, ATIS 00059130, is required for all employees who work in hot areas where they may be subject to heat related illness.

“Heat Stress Monitor (IST Sensor Lynx)”, ATIS 00059163, is required for all employees who conduct Wet Bulb Globe Temperature (WBGT) testing using the IST Sensor Lynx monitor.

“Heat Stress Monitor (Metrosonics hs-32)”, ATIS 00059186, is required for all employees who conduct testing using the Metrosonics hs-32 monitor

“Heat Stress Monitor (WIBGet)”, ATIS 00059187, is required for all employees who conduct testing using the WIBGet RSS-214 monitor

Course Prerequisites

“Heat Stress”, ATIS 00059130, is required as a prerequisite for employees who conduct Wet Bulb Globe Temperature (WBGT) testing using any heat stress monitor.

Medical Requirements

There are no medical requirements to attend training however medical screening may be required for employees who work in areas where the Wet Bulb Globe Temperature (WBGT) is 90 degrees or greater (See TSP 806, Appendix B, Special Requirements).

Recommended Delivery Resource

Heat Stress Training is available by CBT through TVAU On-line Learning or COO Safety / Facilitator led (plant designee).

All Heat Stress Monitor training is conducted by a plant facilitator using a computer based presentation and a skills demonstration plus an evaluation of each employees skills in using the specific instrument.

Procedure 432 Herbicide/Pesticide Applicator Course Standard

TVA Safety Manual

432 Herbicide / Pesticide Applicator Course Standard

Procedure Number 432

TVA Safety Procedure

Herbicide / Pesticide Applicator Course Standard

Revision 1

November 5, 2004

Purpose

This procedure establishes the training requirements for employees who apply herbicide or pesticide in switchyards.

ATIS Course Number

00059131

Reference

TVA Safety Procedure 911, “Pesticides and Herbicides”

29 Code of Federal Regulations 1910.269(a)(2) “Electric Power Generation, Transmission, and Distribution”

Topics

Safe handling and storage of herbicides and pesticides

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

1 hour

Frequency

Initial

Retraining Requirements

None

Target Audience

Applicators who enter switchyards

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety -TPS Safety Staff

Procedure 433 Inorganic Arsenic Course Standard

TVA Safety Manual

433 Inorganic Arsenic Course Standard

Procedure Number 433

TVA Safety Procedure

Inorganic Arsenic Course Standard

Revision 1

August 1, 2003

Purpose

This procedure establishes the training requirements for employees exposed or potentially exposed to inorganic arsenic above the action level.

ATIS Course Number

00059132

Reference

TVA Safety Procedure 902, “Arsenic”

29 Code of Federal Regulations 1910.1018, “Inorganic Arsenic”

29 Code of Federal Regulations 1926.1118 “Inorganic Arsenic”

Topics

TVA safety procedures, OSHA inorganic arsenic standard, respiratory protection, personal protective equipment (PPE), protective clothing, hygiene facilities and practices, signs and labels, medical exam requirements, monitoring requirements, sources of exposure, specific work operations involving arsenic, engineering controls and work practices.

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

2.5 hours

Frequency

Initial / Annual

Retraining Requirements

Annual

Target Audience

Employees exposed to inorganic arsenic above the OSHA action level or for whom the possibility of skin or eye irritation from inorganic arsenic exists.

Course Prerequisites

None

Medical Requirements

(S-3) Special Medical Approval for Ability to Wear Special Respiratory Equipment, Frequency Preplacement, annual, termination.

Recommended Delivery Resource

COO Safety / facilitator led (plant designee); Self-study; or Computer Based Training (CBT)

Procedure 434 Inorganic Lead Course Standard

TVA Safety Manual

434 Inorganic Lead Course Standard

Procedure Number 434

TVA Safety Procedure

Inorganic Lead Course Standard

Revision 1

August 1, 2003

Purpose

This procedure establishes the training requirements for employees exposed or potentially exposed to inorganic lead above the action level.

ATIS Course Number

00059133

Reference

TVA Safety Procedure 909, “Lead”

29 Code of Federal Regulations 1910.1025, “Lead”

Topics

TVA safety procedures, OSHA inorganic lead standard, respiratory protection, personal protective equipment (PPE), protective clothing, health effects of lead exposure, hygiene facilities and practices, signs and labels, medical exam requirements, monitoring requirements, sources of exposure, specific work operations involving lead, engineering controls and work practices, compliance plans, use of chelating agents.

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

2.5 hours

Frequency

Initial / Annual

Retraining Requirements

Annual

Target Audience

Employees exposed to inorganic lead above the OSHA action level or for whom the possibility of skin or eye irritation from lead exists.

Course Prerequisites

None

Medical Requirements

(S-3) Special Medical Approval for Ability to Wear Special Respiratory Equipment, Frequency Preplacement, annual, termination.

Recommended Delivery Resource

COO Safety / facilitator led (plant designee); Self-study; Computer Based Training (CBT)

Procedure 435 Safety Coaching Visits Course Standard

TVA Safety Manual

435 Safety Coaching Visits Course Standard

Procedure Number 435

TVA Safety Procedure

Safety Coaching Visits Course Standard

Revision 1

August 14, 2008

Purpose

This procedure establishes the training requirements for managers, supervisors and foremen who are assigned to perform Safety Coaching Visits

ATIS Course Number

00059134	Interlocking Safety Audits	COURSE IS INACTIVE
00059217	Safety Coaching Visits	NEW

Reference

TVA Safety Procedure 217, “Safety Coaching Visits”

Topics

What are safety coaching visits, who is required to conduct, how are safety coaching visits performed, how to identify correct behaviors, how to correct unsafe behaviors, how to provide feedback and perform interventions

Instruction Resources

TVA On-line learning of facilitator led powerpoint slide show

Instruction Time

1 ½ hours

Frequency

Initial

Retraining Requirements

None

Target Audience

Managers, supervisors and foremen

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

TVA On-line Learning or TVA Safety / facilitator (plant designee)

Procedure 436 Job Safety Analysis Course Standard

TVA Safety Manual

436 Job Safety Analysis Course Standard

Procedure Number 436

TVA Safety Procedure

Job Safety Analysis Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for managers supervisors and foremen responsible for developing Job Safety Analysis.

ATIS Course Number

00059135

Reference

29 Code of Federal Regulations 1960.55(b), “Training of Supervisors”

Topics

How to prepare JSA’s

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

3 hours

Frequency

Initial

Retraining Requirements

None

Target Audience

Managers and supervisors of employees engaged in high hazard work

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety

Procedure 437 Ladder Safety Course Standard

TVA Safety Manual

437 Ladder Safety Course Standard

Procedure Number 437

TVA Safety Procedure

Ladder Safety Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements and curriculum for employees who use ladders.

ATIS Course Number

00059136

Reference

29 Code of Federal Regulations 1910.25, “Portable Wood Ladders” and 1910.26, “Portable Metal Ladders”

Topics

Types of ladders, how to select the proper ladder, how to properly set up and secure ladders, inspection and safe storage

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

1 hour

Frequency

Initial

Retraining Requirements

None

Target Audience

All employees who use ladders

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

Supervisor

Procedure 438 Lockout/Tagout (FM) Course Standard

TVA Safety Manual

438 Lockout / Tagout (FM) Course Standard

Procedure Number 438

TVA Safety Procedure

Lockout / Tagout (FM) Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for employees that perform work under a clearance and all employees responsible for isolating equipment from service for maintenance. This training applies to Facilities Maintenance.

ATIS Course Number

00059137

Reference

29 Code of Federal Regulations 1910.269, “Electrical Power Generation, Transmission and Distribution

Topics

Knowledge necessary to perform work on equipment under a hold order, recognizing clearance boundaries and tagging system, precautions and planning necessary before performing a job task

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

2 hours

Frequency

Initial

Retraining Requirements

None

Target Audience

All Facilities Maintenance employees that perform work under a clearance and all employees responsible for isolating equipment from service for maintenance using the lockout / tagout

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

Facilities Management Safety

Procedure 439 Machine & Equipment Safety Course Standard

TVA Safety Manual

439 Machine & Equipment Safety Course Standard

Procedure Number 439

TVA Safety Procedure

Machine & Equipment Safety Course Standard

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish training requirements for employees who operate shop machinery and equipment.

ATIS Course Number

00059138

Reference

29 Code of Federal Regulations 1910.212, “General Requirements for all Machines”

29 Code of Federal Regulations 1910.215, “Abrasive Wheel Machinery”

Topics

Safe operation of stationary and bench tools and equipment and guarding

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

1 hour

Frequency

Initial

Retraining Requirements

None

Target Audience

All employees who operate stationary and bench machinery and equipment

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety / facilitator led (plant designee); Self-study; or Computer Based Training (CBT)

Procedure 440 Mercury Awareness Course Standard

TVA Safety Manual

440 Mercury Awareness Course Standard

Procedure Number 440

TVA Safety Procedure

Mercury Awareness Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for employees who are involved in mercury handling operations.

ATIS Course Number

00059139

Reference

TVA Safety Procedure 910, “Mercury”

Topics

Hazards of mercury exposure, safe handling and storage of mercury, spill clean-up procedures

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

1 hour

Frequency

Initial

Retraining Requirements

None

Target Audience

All employee who may have potential exposure to mercury

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety / facilitator led (plant designee)

Procedure 441 Personal Protective Equipment Course Standard

TVA Safety Manual

441 Personal Protective Equipment Course Standard

Procedure Number 441

TVA Safety Procedure

Personal Protective Equipment Course Standard

Revision 1

April 29, 2005

Purpose

The purpose of this procedure is to establish training requirements for employees required to wear personal protective equipment.

Note: Personal Protective Equipment is included in the on-line learning, General Employee Safety Orientation, ATIS 00059164. Employees completing this on-line training have met their requirements for Personal Protective Equipment training.

ATIS Course Number

00059140

Reference

29 Code of Federal Regulations 1910.269

Topics

Discusses requirements for selection, use, and care of eye protection, head protection, hand protection, hearing protection, foot protection

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

2 hours

Frequency

Initial

Retraining Requirements

None

Target Audience

All employees who use personal protective equipment eye and face protection, head protection, hand protection, foot protection, etc.

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

TVA Safety / facilitator led (plant designee); Self-study; or Computer Based Training (CBT)

Procedure 442 Powder Actuated Tools Course Standard

TVA Safety Manual

442 Powder Actuated Tools Course Standard

Procedure Number 442

TVA Safety Procedure

Powder Actuated Tools Course Standard

Revision 1

July 15, 2006

Purpose

This procedure establishes the training requirements for employees who operate powder actuated tools.

ATIS Course Number

00059141

Note: TVA organizations coordinating training shall ensure that successful completion of training is recorded in ATIS using number 00059141.

Reference

TVA Safety Procedure 720, “Powder Actuated Tools”

Topics

Explosive Activated: types, principles of operation, guarding techniques, personal protective equipment, inspection / maintenance, safety measures

Instruction Resources

Instructional materials are obtained from the powder actuated tool manufacturer.

Instruction Time

1 hour

Frequency

Initial

Retraining Requirements

Supplemental training shall be conducted if inspections, observations, or accident investigations indicate that these tools are not being properly used or maintained.

Target Audience

All employees who operate powder actuated tools

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

Training is provided by the manufacturer of the powder actuated tool or by a qualified instructor using training materials provided by the manufacturer.

Procedure 443 Radiation Boundary Course Standard

TVA Safety Manual

443 Radiation Boundary Course Standard

Procedure Number 443

TVA Safety Procedure

Radiation Boundary Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for employees who are work at locations where radiography operations are conducted.

ATIS Course Number

00059142

Reference

TVA Safety Procedure 811, “Radiography Operations”

10 Code of Federal Regulations 20, 10 Code of Federal Regulations 19

Topics

Principles and practices of radiation protection, radioactivity measurements and monitoring techniques, calculations and techniques, biological effects of radiation

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

1 hour

Frequency

Initial

Retraining Requirements

None

Target Audience

NRC by-product materials license, radiation users, employees who work in areas where radiography operations are performed

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety / Facilitator led (plant designee)

Procedure 444 Radio Frequency (RF) and EMF Course Standard

TVA Safety Manual

444 Radio Frequency (RF) and EMF Course Standard

Procedure Number 444

TVA Safety Procedure

Radio Frequency (RF) and EMF Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for employees exposed to Radio Frequency (RF) and Electromagnetic Fields (EMF).

ATIS Course Number

00059143

Reference

TVA Safety Procedure 1013, “Radio Frequency (RF) Safety

Topics

Hazards and safe work requirements when working near radio frequency radiation aor electromagnetic fields

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

½ hour

Frequency

Initial

Retraining Requirements

None

Target Audience

Employees exposed to Radio Frequency (RF) and Electromagnetic Fields (EMF)

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety - TPS Safety / Facilities Management Safety

Procedure 445 Railroad Safety Course Standard

TVA Safety Manual

445 Railroad Safety Course Standard

Procedure Number 445

TVA Safety Procedure

Railroad Safety Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for employees involved in railroad operations.

ATIS Course Number

00059144

Reference

TVA Safety Procedure 812, “Railroad Operations”

Topics

Safe railroad operating practices, hand signals for railroad operations

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

2 hours

Frequency

Initial

Retraining Requirements

None

Target Audience

All employees involved in railroad operations.

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety / facilitator led (plant designee)

Procedure 446 Refractory Ceramic Fibers Course Standard

TVA Safety Manual

446 Refractory Ceramic Fibers Course Standard

Procedure Number 446

TVA Safety Procedure

Refractory Ceramic Fibers Course Standard

Revision 0

January 6, 2003

Purpose

This procedure establishes the training requirements for employees who may be exposed to refractory ceramic fiber dust concentrations.

ATIS Course Number

00059145

Reference

TVA Safety Procedure 912, “Refractory Ceramic Fiber Guidelines”

Topics

Silica dust hazards, safe work practices

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

2 hours

Frequency

Initial

Retraining Requirements

None

Target Audience

All employees who may be exposed to refractory ceramic dust concentrations

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety

Procedure 447 Respiratory Protection Course Standard

TVA Safety Manual

447 Respiratory Protection Course Standard

Procedure Number 447

TVA Safety Procedure

Respiratory Protection Course Standard

Revision 3

August 3, 2009

Purpose

The purpose of this procedure is to establish training requirements for all employees who may be required to wear respiratory protection. Employees exposed to airborne radioactive hazards will require Nuclear Power Group Radiological Respiratory Training course RRT 010.

ATIS Course Number

00059146

Reference

TVA Safety Procedure 312, “Respiratory Protection”

29 Code of Federal Regulations 1910.134, “Respiratory Protection”

Topics

OSHA Regulations, respiratory hazards, types of respirators, Self-Contained Breathing Apparatus (SCBA) Airline, Air Purifying, respirator selection, fit test

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

2 hours

Frequency

Initial / Annual

Retraining Requirements

Annual

Target Audience

All employees required to wear respirators to protect against non-nuclear related air contaminants.

Course Prerequisites

Respirator fit test

Medical Requirements

(S-3) Special Medical Approval for Ability to Wear Special Respiratory Equipment (S3 exam is required every 3 years)

Recommended Delivery Resource

Facilitator led (plant designee); Self-study; Computer Based Training (CBT)

Procedure 448 Rigging Course Standard

TVA Safety Manual

448 Rigging Course Standard

Procedure Number 448

TVA Safety Procedure

Rigging Course Standard

Revision 2

August 18, 2008

Purpose

The purpose of this procedure is to establish the training requirements for employees engaged in rigging.

Course Number

Non-Nuclear

00059147, Safe Rigging Principles and Requirements

00059218, Safe Rigging Principles and Requirements Refresher (Each rigger must demonstrate skill by making a lift as part of this training)

00059215, Rigging Labs (optional)

00059219, Advanced Rigger Training

Advanced Riggers are also required to complete 00059110, “Mobile Crane Training,” if rigging will be performed for mobile crane lifts.

Nuclear

MTS 037.002, “Rigging Fundamentals” (Initial) – Equivalent to 00059147

MTS 037.002R, “Rigging Fundamentals Retraining”

MTS 037.009, “Rigging Inspection” Note: This course or MTS 037.002 is used to qualify a person as a rigging inspector.

MTS 037.002A, “Advanced Rigging Training”

Advanced Riggers also are required to complete 00059110, “Mobile Crane Training.

All NPG rigging training requires passing a Job Performance Measure (JPM)

Reference

TVA Safety Procedure 721 A, “Rigging (Non-Nuclear)”

TVA Safety Procedure 721 B, “Rigging (Nuclear)”

TVA Safety Procedure 721 C, “TVA Rigging Manual”

TVA Safety Procedure 721 D, “Rigging Equipment – Standard Procurement Specifications

29 Code of Federal Regulations 1910.184, “Slings”

29 Code of Federal Regulations 1926.251, “Rigging Equipment for Material Handling”

Applicable ASME standards

Topics

Basic rigging methodology, load weight determination, rigging hardware, analysis of rigging accidents, inspection requirements, maintenance procedures, how to rig

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

00059147 and MTS 037.002 – 16 hours

00059218 and MTS 037.002R – 4 hours

MTS 037.009 – 4 hours

Frequency

Non-Nuclear

00059147 – Initial
00059218 – Annual
00059215 – Initial
00059219 – Initial

Nuclear

MTS 037.002 - Initial
MTS 037.002R – Every three years

Target Audience

All employees who rig loads for lifting

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

Non-Nuclear

Instructors Certified by TVA Training and Development
Central Support and Repair
Power Service Shops

Nuclear

Nuclear Training

Procedure 449 Rivers and Decks Skills Course Standard

TVA Safety Manual

449 Rivers and Decks Skills Course Standard

Procedure Number 449

TVA Safety Procedure

Rivers and Decks Skills Course Standard

Revision 1

April 30, 2007

Purpose

This procedure establishes the training requirements for employees who are involved in barge handling and tugboat operations.

ATIS Course Number

Initial 00059148

Refresher 00059149

Reference

TVA Safety Procedure 810, “Marine Operations for Tugboats and Deckhands”

Topics

Water hazards, Water rescue, flotation devices

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

Initial 24 hours

Refresher 3 hours

Frequency

Initial / Annual

Retraining Requirements

Annual

Target Audience

All employees who are involved in barge handling and tugboat operations.

Course Prerequisites

Participants must have the ability to swim.

Medical Requirements

Participants must successfully pass the Pilot / Deckhand medical evaluation

Recommended Delivery Resource

Yard Operations Training Manager, TVA or authorized contractor

Procedure 450 Scaffolds (Built-up & Suspended) Course Standard

TVA Safety Manual

450 Employees Who Work from Scaffolds

Procedure Number 450

TVA Safety Procedure

Employees Who Work from Scaffolds

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish training requirements for employees who build and use scaffolds.

ATIS Course Number

00059150

Reference

TVA Safety Procedure 813, “Scaffolds and Temporary Work Platforms”

29 Code of Federal Regulations 1910.28, “Safety Requirements for Scaffolding”

29 Code of Federal Regulations 1926.451, “General Requirements for Scaffolds”

Topics

OSHA Regulations, basic safety requirements, fall protection, types of scaffolds, duty ratings structural limitations safety factors, specific requirements for each type, permit system, personal protective equipment.

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

2 hours

Frequency

Initial

Retraining Requirements

None

Target Audience

All employees required to build and / or use scaffolds.

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO safety / facilitator led (plant designee); Self-study; Computer Based Training (CBT)

Procedure 451 Supervisory Safety Orientation Course Standard

TVA Safety Manual

451 Supervisory Safety Orientation Course Standard

Procedure Number 451

TVA Safety Procedure

Supervisory Safety Orientation Course Standard

Revision 1

November 01, 2005

Purpose

The purpose of this procedure is to establish training requirements for managers, supervisors, foremen and dual rate foremen concerning responsibilities and safety program requirements.

ATIS Course Number

00059151

Reference

29 Code of Federal Regulations 1960.50

Topics

TVA Safety Manual, safety leadership, health and safety responsibilities, job safety planning, building and expanding the plant safety culture, central safety management review teams, health and safety committees, hazard recognition, safety inspections, safety meetings.

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

3 hours

Frequency

Initial

Retraining Requirements

None

Target Audience

All managers, supervisors and foremen

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

COO Safety / facilitator led (plant designee); Self-study; Computer Based Training (CBT)

Procedure 452 Introduction to the TVA Safety Manual Course Standard

TVA Safety Manual

452 Introduction to the TVA Safety Manual Course Standard

Procedure Number 452

TVA Safety Procedure

Introduction to the TVA Safety Manual Course Standard

Revision 0

January 16, 2003

Purpose

The purpose of this procedure is to establish requirements for providing an introduction and overview of the TVA Safety Manual to employees.

ATIS Course Number

00059152

Reference

TVA Safety Procedure 201, TVA Safety Manual”

Topics

Introduction to the TVA Safety Manual

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

1/2 hour

Frequency

Initial

Retraining Requirements

None

Target Audience

All TVA employees

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

Facilitator led (plant / facility / organization designee)

Procedure 453 How to Use the TVA Safety Manual Course Standard

TVA Safety Manual

453 How to Use the TVA Safety Manual Course Standard

Procedure Number 453

TVA Safety Procedure

How to Use the TVA Safety Manual Course Standard

Revision 1

August 1, 2003

Purpose

The purpose of this procedure is to establish training requirements for managers, supervisors and foremen concerning use of the TVA Safety Manual.

ATIS Course Number

00059153

Reference

TVA Safety Procedure 201, “TVA Safety Manual”

Topics

How to Use the TVA Safety Manual and management responsibilities and expectations for using the safety manual

Instruction Resources

- Facilitator Guide
- Slide Program
- Slide Show

Instruction Time

1/2 hour

Frequency

Initial

Retraining Requirements

None

Target Audience

All TVA managers, supervisors, foremen, and lead engineers

Course Prerequisites

None, “How to Use the TVA Safety Manual” also provides equivalent training for “Introduction to the TVA Safety Manual”, ATIS number 00059152

Medical Requirements

None

Recommended Delivery Resource

Computer Based Training (CBT)

Procedure 454 Serious Accident Investigation Course Standard

TVA Safety Manual

454 Serious Accident Investigation Course Standard

Procedure Number 454

TVA Safety Procedure

Serious Accident Investigation Course Standard

Revision 0

August 1, 2003

Purpose

This procedure establishes the training requirements for managers, supervisors or other employees who participate as a member of a TVA Serious Accident Investigation Team (AIT).

ATIS Course Number

00059160

Reference

TVA Safety Procedure 111, “Conduct Serious Accident Investigation”

29 Code of Federal Regulations 1960.55, “Training Of Supervisors”

Topics

How to conduct a serious accident investigation, obtaining and analyzing evidence, role of the AIT

Instruction Resources

Facilitator Guide

Instruction Time

8 hours

Frequency

Initial

Retraining Requirements

Members of TVA Serious Accident Investigation Teams shall receive an overview of the team responsibilities from the assigned TVA Safety professional at the beginning of any serious accident investigation.

Target Audience

Managers, supervisors, engineers, specialists or others who may be assigned as a member of a serious accident investigation team

Course Prerequisites

“Accident Investigation for Supervisors”, ATIS Number 00059100

Medical Requirements

None

Recommended Delivery Resource

TVA Corporate Safety shall be contacted to arrange for this training. Training is provided by contract.

Procedure 455 OSHA Safety Training Course Standard

TVA Safety Manual

455 OSHA Safety Training Course Standard

Procedure Number 455

TVA Safety Procedure

OSHA Safety Training Course Standard

Revision 1

November 5, 2004

Purpose

This procedure establishes minimum safety training requirements for trades and labor employees employed by partners / contractors or sub-contractors. This includes staff augmented employees. All those referred will be expected to present evidence that they have completed this training prior to their employment and/or their assignment to perform TVA work or provide evidence that they are scheduled for the training within fourteen (14) calendar days from the date that their work begins.

Exceptions to the requirements of this procedure include trades and labor employees of TVA partners / contractors or sub-contractors providing some special or unique service such as, but not limited to deslagging, special valve maintenance, special welding, hydro-blasting, operation of high temperature cameras, underwater diving, etc.

The employing TVA organization will assess the need for granting exceptions from the training for special or unique services based upon the hazard exposure of the work to be performed and TVA's ability to award contracts to insure that needed work is performed reliably and on time.

Note: TVA will evaluate the need to further define the training requirement for special or unique services. Trades and labor employees of partners / contractors or sub-contractors given an exception to the training will be asked to voluntarily comply with the training.

ATIS Course Number

OSHA Construction Safety Training	00059165
OSHA General Industry Safety Training	00059166

Reference

29 Code of Federal Regulations 1926

29 Code of Federal Regulations 1910

Topics

Construction Safety Training: Introduction to OSHA, Cranes and Hoists, Electrical Construction, Excavations, Fall Protection, Material Handling, Power Tool Safety, Personal Protective Equipment, Scaffolds and Temporary Work Platforms, Stairs and Ladders

General Industry Safety Training: Introduction to OSHA, Safety and Health Programs, Bloodborne Pathogens, Egress-Fire Protection, Electrical Safety-General, Flammable and Combustible Liquids, Hazard Communication, Personal Protective Equipment, Machine Guarding, Walking and Working Surfaces

Instruction Resources

OSHA 10 hour Construction Safety Training program

OSHA 10 hour General Industry Safety Training program

Instruction Time

OSHA Construction Safety Training	10 hours
OSHA General Industry Safety Training	10 hours

Frequency

OSHA Construction Safety Training	Initial
OSHA General Industry Safety Training	Initial

Retraining Requirements

None

Target Audience

All TVA trades and labor partner / contractor / subcontractor and staff augmented employees (union and non-union) shall receive the OSHA Construction Safety Training. Exceptions to the training are described in Purpose. This training is the responsibility of the respective contractor.

Trades and labor employees failing to meet the training requirements as established in this procedure will not be permitted to work on TVA property.

OSHA General Industry Safety Training is an available option for selected employees.

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

TVA partner or contractor or subcontractor provides OSHA Construction Safety Training. OSHA certifies trainers from the OSHA Training Institute or from OSHA Training Education Centers. TVA Safety may be contacted for suggested sources for this training.

Procedure 456 Formaldehyde Awareness Course Standard

TVA Safety Manual

456 Formaldehyde Awareness Course Standard

Procedure Number 456

TVA Safety Procedure

Formaldehyde Awareness Course Standard

Revision 1

April 30, 2007

Purpose

This procedure establishes the training requirements for employees that work at plants where formaldehyde may be present.

ATIS Course Number

00059188

Regulatory Standard

29 Code of Federal Regulations 1910.1048, “Formaldehyde”

Topics

Properties of formaldehyde, hazards of formaldehyde, safe work requirements, first aid procedures and evacuation plans

Instruction Resources

Computer Based Training Course

Instruction Time

½ hour

Frequency

Initial / Annual

Retraining Requirements

Annual and / whenever a new exposure to formaldehyde is introduced into the work area

Target Audience

Employees that work at plants where formaldehyde may be produced and employee exposure is greater than 0.1 parts per million

NOTE: The known likely locations where formaldehyde may be produced are in the containment areas at Sequoyah and Watts Bar Nuclear Plant. Employees that enter into containment at these locations are included in the target audience for this training course.

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

On-line Learning Computer Based Training

Procedure 457 Recording - Reporting - Classifying Occupational Injuries and Illnesses Coursed Standard

TVA Safety Manual

457 Recording - Reporting - Classifying Occupational Injuries and Illnesses Course Standard

Procedure Number 457

TVA Safety Procedure

Recording - Reporting - Classifying Occupational Injuries and Illnesses Course Standard

Revision 0

April 29, 2005

Purpose

This procedure establishes the training requirements for managers and supervisors and employees involved in the recording and reporting of occupational injuries and illnesses.

ATIS Course Number

00059191

Regulatory Standard

29 Code of Federal Regulations 1904, “Recording and Reporting Occupational Injuries and Illnesses”

Topics

How to report injuries on the TVA Form 17719, “Notice of Injury / Illness – OSHA 301” [1] How to record injuries on the OSHA Log 300, “Log of Work-Related Injuries and Illnesses” Posting requirements for OSHA Form 300A, “Summary of Work-Related Injuries and Illnesses”

Instruction Resources

- Facilitator Guide
- Slide Program
- Computer Based Training Course

Instruction Time

3 hours

Frequency

Initial

Retraining Requirements

None

Target Audience

Managers, supervisors, foremen, safety professionals, nurses, workers' compensation employees and administrative employees involved in the recordkeeping associated with work-related injuries and illnesses.

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

TVA Safety or TVA On-line Learning - Computer Based Training

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072561006

Procedure 458 Safety Orientation for Staff Augmented Contractors Course Standard

TVA Safety Manual

458 Safety Orientation for Staff Augmented Contractors Course Standard

Procedure Number 458

TVA Safety Procedure

Safety Orientation for Staff Augmented Contractors Course Standard

Revision 0

April 30, 2007

Purpose

This procedure establishes the basic safety training requirements for staff augmented contractors.

ATIS Course Number	ATIS #
Safety Orientation for Staff Augmented Contractors	00059193

Reference

TVA Safety Procedure 4, “Implement Labor Contract Safety”

Topics

Provide a brief description of the TVA organization, provide a brief description of the employee's work organization, discuss the type, severity, and frequency of accidents that have occurred in the business unit and in the employee's organization, explain TVA's health and safety principles, discuss employee safety responsibilities, employee rights, general rules of conduct, use of personal protective equipment (ppe), review vehicle safety requirements, review requirements on tools and equipment, discuss manual material handling

Instruction Resources

Computer Based Training – TVA On-line Learning Powerpoint slide presentation

Instruction Time

1 hour

Frequency

Initial

Retraining Requirements

None

Target Audience

All staff augmented contractors working under the supervision of a TVA manager / supervisor

Course Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

TVA on-line Learning or facilitator led

Procedure 459 Clearance Procedure Course Standard

TVA Safety Manual

459 Clearance Procedure Course Standard

Procedure Number 459

TVA Safety Procedure

Clearance Procedure Course Standard

Revision 0

April 30, 2007

Purpose

This procedure establishes training requirements for employees involved with requirements defined in TVA Safety Procedure 613, “Clearance Procedure to Safely Control Hazardous Energy Using Group Tagout”.

Employees and/or contractors are trained and examined annually relative to their responsibilities. The initial and re-training courses for each of the courses listed below are the same course. The training course is specific to the individual’s responsibilities to carryout the clearance functions assigned to their level of authorization in the organization in which they work.

Roles and Responsibilities

There are five primary clearance functions/activities assigned to employees. These functions/activities are only assigned to employees who have been trained within their area of responsibility to qualify them to perform their assigned clearance functions/activities. The five functions/activities are as follows:

Responsible Employee (RE): Writes and issues clearances. A person trained as a RE may also perform the role of a QE, PAE or Authorized Employee.

Qualified Employee (QE): Implements the clearance by operating energy-isolating devices in accordance with the clearance instructions to de-energize equipment and installing clearance tags at each isolation point. A person trained as a QE may also perform the role of a PAE or Authorized Employee.

Primary Authorized Employee (PAE): Holds a clearance by name on the equipment that servicing, maintenance, and/or modification will be performed and holds the clearance for the Authorized Employee(s) who performs the servicing, maintenance, and/or modification. A person trained as a PAE may also perform the role of an Authorized Employee.

Authorized Employee: Performs servicing, maintenance, and/or modification on equipment that is under a clearance.

Affected Employee: Anyone in the area of components under a clearance, but not involved in the work activities covered by a clearance.

ATIS Course Number	ATIS #
Clearance Procedure (Responsible / Qualified Employee)	00059194
Clearance Procedure (Primary Authorized Employee)	00059195
Clearance Procedure (Authorized Employee)	00059196
Clearance Procedure (Affected Employee)	00059199

Reference

TVA Safety Procedure 613, “Clearance Procedure"

Topics

Purpose & scope of the TVA clearance procedure, role and responsibilities of employees in the clearance process, identification and purpose of the tags used in clearance process, identification and purpose of the forms used to document clearances, recognizing the potential dangers associated with equipment that is under clearance.

Instruction Resources	
Clearance Procedure (Responsible / Qualified Employee)	Facilitator
Clearance Procedure (Primary Authorized Employee)	Facilitator
Clearance Procedure (Authorized Employee)	Facilitator
Clearance Procedure (Affected Employee)	Facilitator

Instruction Time	
Clearance Procedure (Responsible / Qualified Employee)	8 hours
Clearance Procedure (Primary Authorized Employee)	4 hours
Clearance Procedure (Authorized Employee)	1 hour
Clearance Procedure (Affected Employee)	1 hour

Frequency	
Clearance Procedure (Responsible / Qualified Employee)	Initial / Annual
Clearance Procedure (Primary Authorized Employee)	Initial / Annual
Clearance Procedure (Authorized Employee)	Initial / Annual
Clearance Procedure (Affected Employee)	Initial / Annual

Target Audience

Employees and supervisors and contractors involved group tagout.

Prerequisites

None

Medical Requirements

None

Recommended Delivery Resource

Employee Technical Training & Organizational Effectiveness has trained qualified instructors for operating organizations. Contact the training organization at the responsible facility to arrange for initial and refresher training. Employee Technical Training & Organizational Effectiveness is responsible for training qualified instructors.

Clearance Procedure (Authorized Employee) and Clearance Procedure (Affected Employee) are also available through TVA On-line Learning

Procedure 460 Hexavalent Chromium Course Standard

TVA Safety Manual

460 Hexavalent Chromium Course Standard

Procedure Number 460

TVA Safety Procedure

Hexavalent Chromium Course Standard

Revision 0

April 30, 2007

Purpose

This procedure establishes the training requirements for employees and staff augmented contractors exposed or potentially exposed to hexavalent chromium above the action level.

ATIS Course Number	ATIS #
Hexavalent Chromium	00059205

Reference

TVA Safety Procedure 915, “Hexavalent Chromium”

29 Code of Federal Regulations 1910.1026, “Hexavalent Chromium”

Topics

TVA safety procedures, location, use and release of Hexavalent Chromium in the workplace, the hazards associated with exposure to Hexavalent Chromium and its effects on health, safe work practices and engineering controls to minimize exposure, respirator selection and proper use, medical surveillance program, measures employees can take to protect themselves, including modification of personal hygiene and habits such as smoking, emergency procedures

Instruction Resources

- TVA On-line Learning
- Slide Presentation

Instruction Time

2 hours

Frequency

Initial / Annual

Retraining Requirements

Annual

Target Audience

TVA employees or staff augmented contractors that may be exposed to hexavalent chromium levels greater than the action level of 2.5 μg/m3 for 30 or more days a year.

Course Prerequisites

None

Medical Requirements

Employees who are or may be occupationally exposed to hexavalent chromium at or greater than the action level shall pass a medical examination as described in OSHA 29 CFR 1910.1026(k)

(S-3) Special Medical Approval for Ability to Wear Special Respiratory Equipment, Frequency Pre-placement, annual, termination.

Recommended Delivery Resource

TVA On-line Learning, TVA Safety / facilitator led (plant designee)

Procedure 461 Grounding Safety Procedures for Transmission Lines and Equipment Course Standard

TVA Safety Manual

461 Grounding Safety Procedures for Transmission Lines and Equipment Course Standard

Procedure Number 461

TVA Safety Procedure

Grounding Safety Procedures for Transmission Lines and Equipment Course Standard

Revision 0

April 30, 2007

Purpose

This procedure establishes training requirements for employees involved with temporary protective grounding on de-energized transmission lines and equipment.

Note: Employees must complete both the training and the skills evaluation for certification to establish an equipotential work zone on a transmission line. Training course 00059206 and the skills certification 00059212 must both be successfully completed during initial training prior to any work involving the placing and removing of protective grounds on transmission lines. For personnel currently authorized and qualified to place and remove grounds as of March 1, 2007, the skills certification would be completed during their annual refresher training. The skills certification shall be documented and tracked in ATIS using the ATIS numbers as specified below for each equipment type.

ATIS Course Number	ATIS #
Equipotential Grounding	00059206
Equipotential Grounding - Refresher	00059209

Skills Certification	
Transmission Line Equipotential Work Zone	00059212

Note: This skills evaluation demonstrates the participant's knowledge and performance for establishing an equipotential work zone on a transmission line simulator.

Reference

TVA Safety Procedure 1109, "Protective Grounding"

Topics

When to install protective grounds, equipotential grounding, grounding devices, inspection of grounds, multiple sets of grounds, step and touch potentials, voltage detection devices, application and removal of safety grounds, temporary ground rods, equipment grounding, substation grounding, and accountability for protective grounds.

Instruction Resources

- Equipotential Grounding
- Facilitator Guide
- Slide Program
- Equipotential Grounding Refresher
- Facilitator Guide
- Slide Program

Instruction Time

Equipotential Grounding	5 hours
Equipotential Grounding - Refresher	4 hours

Frequency

Equipotential Grounding	Initial
Equipotential Grounding Refresher	2 years

Target Audience

Employees and supervisors involved with the temporary protective grounding on de-energized transmission lines and equipment.

Prerequisites

Electrical Safety per OSHA 1910.269, ATIS Number 00059115

Medical Requirements

None

Recommended Delivery Resource

Employee Technical Training & Organizational Effectiveness has trained qualified instructors for operating organizations. Contact the training organization at the responsible facility to arrange for initial and refresher training. Employee Technical Training & Organizational Effectiveness is responsible for training qualified instructors.

Chapter 1 Section 5 SERTA/Fire Training

Procedure 501 Fire Brigade Membership Course Standard

501 Fire Brigade Membership Course Standard can be accessed at the All Courses Webpage [1].

References

[1] http://insidenet.tva.gov/org/cao/educ/tvau/coursed/allcourse.htm

Chapter 2 General Safety

Chapter 2 Section 6 General

Procedure 601 All Terrain Vehicles

TVA Safety Manual

601 All Terrain Vehicles

Procedure Number 601

TVA Safety Procedure

All Terrain Vehicles

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish requirements for the use of All-terrain Vehicles (ATVs).

Requirements

1. ATVs equipped with a single front tire shall not be used on transmission line rights-of-way.
2. ATVs shall be equipped with roll over protection, bench seat, and seat belts for each passenger.
3. Personal Protective Equipment (PPE) shall include a hard hat and safety eyewear.
4. ATVs are for off-road operations and should not be driven on public streets and roads.
5. When tools or equipment are transported, they should be properly secured on the vehicle.
6. A personal flotation device should be worn when fording streams that could cause the tires to float.
7. ATVs are intended to be operated at safe speeds, depending on terrain and conditions. At no time should an ATV be operated in an unsafe manner or used for purposes other than its intended use.
8. Passengers shall only be permitted when the vehicle is equipped with the manufacturersapproved seating for passengers except in the event of a medical emergency.

Definitions

All-terrain vehicles are vehicles that are operated off the road are not licensed vehicles and include such as Gators, Mules.

Training

Employees who operate ATVs shall receive the safety training course “All Terrain Vehicle (ATV) Safety”, ATIS Number 00059102.

Procedure 602 Barricades and Barriers (Temporary)

TVA Safety Manual

602 Signs and Barricades

Procedure Number 602

TVA Safety Procedure

Signs and Barricades

Revision 5

October 7, 2011

Purpose

The following specifications apply to the design, application, and use of signs/symbols and barricades intended to indicate and to define specific hazards of a nature such that failure to designate them and control access may lead to accidental injury to employees or the public, or to property damage. The following specifications are intended to cover all safety signs and barricades except those designed for streets, highways, railroads, marine regulations, specific regulators (i.e., radiography, asbestos/lead) and means of egress (exit) signage. These specifications DO NOT apply to plant bulletin boards or to safety posters.

Roles and Responsibilities

1. The temporary barrier and barricade system shall be administered by a responsible designated manager.
2. The responsible foreman, supervisor, or person in charge (PIC) must notify the appropriate operations personnel before any barrier is installed that could block the access to equipment or otherwise interfere with plant operations.
3. Foreman, supervisors, or PIC are responsible for ensuring that adequate temporary barrier/barricades are installed.

General Requirements

1. When the hazard for which the barricade exists is no longer present, the temporary barricade shall be removed. The last supervisor responsible for the work in eliminating the hazard is responsible for the removing of the temporary barricade.
2. The type of barricade to be erected and maintained is dependent upon the degree of the hazard and the expected duration of the work to be performed.
3. The foreman, supervisor, or PIC of employees required to enter an area defined by a barricade shall ensure that employees understand the hazards and mitigation required.
4. For extreme hazards or hazards requiring complex mitigation steps, the foreman, supervisor, or PIC shall perform a job / site safety assessment before allowing entry into the area.
5. Handwritten signs are NOT allowed even as temporary signs, Exception - Handwriting of applicable "contact information" as required for Danger signs is allowed.
6. CAUTION - Paper or plastic/acrylic polymer type signs should NOT be installed within six inches of any component surface such as motors, piping, etc., which exceeds 300 degrees Fahrenheit.

7. Computer generated paper signs shall be protected by some type of protective sheathing such as a plastic folder or lamination prior to installation.
8. Temporary signs are signs posted in a location for less than 60 days. All personnel are responsible for the proper use and removals of temporary signs, such as those attached to barricade tapes or to metal surfaces by means of magnetic tape strips.
9. Permanent signs may be of any type appropriate to the application, but may NOT be handwritten or computer generated paper signs. They are most often of metal or plastic/acrylic polymer, and may be attached by adhesives, screws, rivets or cable.
10. Safety signs or tags used to warn of a specific hazard should be consistent in language and design (i.e., a specific hazard located in various parts of the plant, should have the same signage at each location).
11. Never use conductive barricades around energized electrical equipment or components.

Safety Signs, Barricades and Barriers

1. USE DANGER signs to indicate an imminently hazardous situation, which, if NOT avoided will result in death or serious injury.
    1. All employees must be instructed that danger signs indicate imminent/immediate danger(s) and that special precautions are necessary.
    2. Red and black (danger) barricade tape (or equivalent to meet intent) is used to identify imminent hazards which, if NOT avoided, will result in death or (acute)serious injury. A DANGER sign(s) identifying the person in charge, the hazard, and contact phone number must be posted in areas where red and black barrier tape is used if the area is NOT immediately occupied and controlled by the work group using the barricade tape. Signs shall be placed to be readily visible at all points of potential access. Personnel shall cross the boundary ONLY be specific permission of personnel working on the job and are to be authorized and briefed by the posting work-group on the job and are to be authorized and briefed by the posting work-group as to what hazards exist and how to avoid them.
    3. Red and black barricade tape shall NOT be used as a substitute for approved railing, floor hole covers, or a hole watch.
    4. Red and black barricade tape will normally NOT be used for demarcating areas (requiring DANGER signs) that are considered an occupational illness (i.e., high noise areas.)
    5. Work-groups employing the use of red and black barricade tape along with DANGER signs shall remove the tape and signs when the hazard creating the imminent danger has been removed or is NO longer applicable.
    6. Physical hazards due to fall potential, floor or wall openings (floor opening being defined as any opening measuring 10 inches or more in its least dimension through which persons may fall and wall opening being defined as an opening at least 30 inches high and 18 inches wide through which a person may fall 4 feet or more) which will be left unattended for any reason must be identified by a barrier using DANGER tape.
2. USE orange sag resistant barrier tape wit the black legend "DANGER: Electrical Hazard - Authorized Personnel Only" to designate electrical hazards such as; electric shock/burns, failure of electrical equipment, exposed energized conductors or parts, guarding of electrical areas. It means "DO NOT CROSS" for all persons except those designated to work in the area enclosed by the tape. Reference TVA Safety Procedure 1022, “Arc Flash Hazard Calculation and Required Protection”.
    1. Orange tape shall be used to designate energized electrical or areas containing such equipment which pose an electrical hazard. The tape shall be installed, preferably at a height of four (4) feet (1.2m) above ground level and at other locations both vertically and horizontally where necessary to fully identify the hazard.
    2. Orange tape shall be installed surrounding the test set and equipment under test when a high potential is being used to test equipment. This would include high-potential testing of generators, synchronous condensers, and cables; insulation dielectric tests; and other similar types of work.

3. When substation equipment such as circuit breakers and transformers are removed from service for maintenance and/or tests, orange tape shall be installed approximately four (4) feet (1.2m) from the ground outlining the adjacent items of energized equipment.
4. In high-potential testing, the employee in charge of the tests shall agree with maintenance employees involved about who will enter the area enclosed by the orange tape. The employee in charge shall be sure that all persons who enter the area are acquainted with the test procedures and safety precautions.
5. The orange tape should be properly maintained and removed immediately following the completion of the work for which it was installed.
6. Orange tape should not be used for any purpose other than designating areas of danger from electrical hazards.

3. USE CAUTION signs **to indicate a potentially hazardous situation, which, if NOT avoided, may result in a minor or moderate injury. Caution signs may also be used to alert against unsafe practices.**
   1. All employees must be instructed that caution signs indicate a possible hazard against which proper precaution must be taken.
   2. Yellow and black barricade tape or equivalent may be used to demarcate affected areas that contain a CAUTION sign(s). A CAUTION sign(s) identifying (minimally) the hazard must be posted in areas where yellow and black barrier tape is used if the area is NOT immediately occupied and controlled by the work group using the barricade tape. Signs shall be placed readily visible at all points of potential access.
4. USE General Safety Signs (i.e., SAFETY FIRST, BE CAREFUL, THINK SAFETY, etc.) to indicate general instructions relative to safe work practices, to remind of proper safety procedures, and to indicate the location of safety equipment.
   1. Other physical hazards, including but not limited to high noise areas, chemical spill and leak areas, overhead work areas, steam leak areas, and areas where loose lagging is present, may require temporary barriers/barricades.
   2. Where the barricade/barrier must remain in place for an extended period of time or exposure to environmental conditions dictate the tape used for barricades/barriers must be replaced with substantial materials such as wood, metal, plastic color coded chain, etc. The same color code requirements apply and can be met by attaching the correct color tape to the more substantial barricade/barrier material
   3. Safety signs which can be printed are available at the following link: http://tvanweb.cha.tva.gov/industrialsafe/docs/Industrial%20Safety%20Signs/
5. **Accident Prevention Signs**

   Handwritten signs are NOT allowed even as temporary signs.

   Exception - Hand writing of applicable "contact information" as required for Danger signs is allowed.

   CAUTION - Paper or Plastic/Acrylic polymer type signs should NOT be installed within six inches of any component surface such as motor, piping, etc. which exceeds 300 degrees F.

   Computer generated paper signs shall be protected by some type of protective sheathing such as a plastic folder or lamination prior to installation.

   Temporary signs are signs posted in a location for less than 60 days. All personnel are responsible for the proper use and removals of temporary signs, such as those attached to barricade tapes or to metal surfaces by means of magnetic tape strips.

   Permanent Signs may be of any type appropriate to the application, but may NOT be handwritten or computer generated paper signs. They are most often of metal of Plastic/Acrylic polymer, and be attached by adhesives, screws, rivets, or cable.

   Safety Signs or Tags used to warn of a specific hazard should be consistent in language and design. (IE, a specific hazard located in various parts of the plant, should have the same signage at each location.)

Reference

29 Code of Federal Regulations 1910.23 - “Guarding Floor and Wall Openings and Holes”

29 Code of Federal Regulations 1926.202 - “Barricades

Procedure 603 Boating Safety

TVA Safety Manual

603 Boating Safety

Procedure Number 603

TVA Safety Procedure

Boating Safety

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish the safety requirements for safe boating operations in TVA organizations.

Basic Requirements for Boating

1. The vehicle trailer hitch, boat trailer, and boat shall be visually inspected for damage before each use. Damaged equipment shall be removed from service.
2. The required number of Coast Guard approved fire extinguishers shall be on board.
3. Boats shall be equipped with running lights if operated in pre-dawn and night conditions.
4. Boats shall be equipped with a distress signal device.
5. All drain plugs shall be visually inspected for proper installation before launching the boat.
6. Battery terminals shall be covered to prevent contact with tools and gas cans.
7. Gasoline vapors will accumulate at the bottom or bilge of the boat, therefore, matches or other open flames shall not be used until gasoline vapors have been removed either by natural or forced ventilation.
8. Only persons authorized by the supervisor in charge shall operate a boat. The person piloting the boat shall be qualified to safely operate the craft where the boat will be operated. The authorized person shall know the water safety rules, the meanings of buoys, and the various distress signals.
9. Boats shall be operated in accordance with water safety rules.
10. An approved Coast Guard Personal Floatation Device (PFD) shall be worn by each person in the boat at all times. PFDs shall be inspected annually by February 1 and if defective removed from service. Reference TVA Safety Procedure 306, “Flotation Devices”.
11. Employees shall not stand up while starting the boat’s motor.
    Exception: TVA Police have boats designed for the operator to stand.
12. The weather forecast should be checked before getting the boat under way. Weather conditions hazardous to boat operations should be avoided.
13. The boat’s speed should be reduced when operating in unfamiliar waters due to possible hazardous conditions, i.e., shallow spots, rocks, and strong current.
14. An outboard motor boat or an inboard motor boat without a cabin should not be operated unless the boat is equipped with an engine kill switch. The kill switch cord should be attached to the operator when operating the motor.
15. In boats 16 feet or less, occupants should not stand up or move about when the boat is under way.
16. A secondary means of propulsion, e.g. a small engine, oars, or paddles, should be carried in the boat.

Pre-Trip Checklist

1. Have plenty of fuel for the entire trip.
2. Make sure drain plugs are installed and secure.
3. Check the weather and forecast.
4. Check the planned route and be alert to any hazardous conditions along the way (shallow spots, rocks, strong currents, etc.)
5. Make sure the supervisor or other responsible person knows the planned route and expected time of return. The person that has been notified of the planned route shall remain at their work location or available by cell phone until verification is made that the boaters are off the water.

Loading the Boat

1. Distribute the load evenly.
2. Keep the load low and secure it when necessary.
3. Do not exceed the manufacturer's recommended capability for material and personnel.

On the Water

1. Do not stand up while starting the motor.
2. Be sure motor is out of gear before cranking.
3. Do not stand up or move about in a small boat when in motion.
4. Do not operate an outboard motor boat or an inboard boat unequipped with a cabin unless the boat features an engine kill switch.
5. Never operate a boat in a reckless or negligent manner, always be alert for your own safety and the safety of others, and do not operate a boat alone –without approval of your supervisor or responsible manager.
6. The person piloting the boat shall be able to safely operate the craft an be able to cope with conditions. Only authorized personnel shall operate boats. Everyone who operates a boat is required to take training course Boating Safety, ATIS Number 00059104.
7. The authorized person operating the boat shall know and obey the water safety rules, know the meanings of buoys—what they mark and indicate, and know the various distress signals.
8. Give right of way to vessels approaching in your danger zone on the starboard (right) side. If necessary, slow down, stop or reverse, or turn right so as to cross the stern (rear) of the other craft.
9. Hold course and speed when being passed or when approached by another boat from your port (left) side.
10. Do not turn a small craft at high speeds. It could be swamped by its own wash.
11. Avoid large vessels—they aren't as maneuverable as smaller craft (to avoid collision), and their wash could swamp or upset a small boat.
12. Tilt the engine when running in shallow water and travel slowly. Shut the engine off immediately if the propeller strikes any obstruction.
13. Approach the dock or mooring against the wind or current, whichever is strongest. In rough water, keep bow of the boat into the wind, maintain sufficient throttle to control boat, and get to shore as quickly as possible.
14. At least two people are required to be in the boat while on open water.

    NOTE: Any exceptions require approval from the immediate supervisor.

Refueling

1. When refueling, the following practices should be adhered to:
2. Stop the engine.
3. Do not smoke while filling fuel tanks.
4. Use a filler spout or a funnel to avoid gasoline spills.
5. Gasoline vapors will accumulate at the bottom or bilge of the boat.
6. Do not light matches until all vapors have been removed either by natural or forced ventilation.
7. Cover battery terminals to prevent contact with tools and gas cans.

Reminders

1. Complete a pre-trip boat and vehicle checklist.
2. Always carry a secondary means of propulsion, e.g., a small second engine, oars, or paddles.
3. If the boat capsizes, try to float and stay with the watercraft.
4. Know how to avoid hypothermia and how to treat it.
5. Use river current to save fuel and time. Going downstream, use the center of the channel and tend toward the outside of bends (faster current). Going upstream, use the edge of the channel (slow current) but be cautious and watch for shallow water and obstructions.
6. Always use the kill switch when operating the motor. The cord shall be attached to the operator during operation.

Procedure 604 Ergonomics Guidelines

TVA Safety Manual

604 Ergonomics Guidelines

Procedure Number 604

TVA Safety Procedure

Ergonomics Guidelines

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to provide guidelines to protect employees from ergonomic health risks by identifying potential high-risk jobs, conducting job evaluations, and establishing control measures.

Basic Requirements

1. Each TVA plant / facility / area should determine which jobs pose the highest risk of jobrelated ergonomic concerns (such as strains and sprains, carpal tunnel syndrome, or other repetitive motion disorders).
2. The identified jobs will be evaluated with commonly used ergonomic evaluation tools by an individual with specific knowledge in ergonomic evaluations and control. This service can be provided to TVA organization through existing Industrial Hygiene (IH) contracts.

High-Risk Job Identification

1. A TVA safety professional, along with facility staff, will identity jobs considered the highest risk for ergonomic injury by evaluating occupational injury and illness records, incident investigations, interviewing employees, or other means of data collection.
2. Identified jobs will be prioritized in order of perceived risk. This prioritization will include consideration of the magnitude of the risk, and number of individuals potentially impacted.
3. A “Job” may be a specific work task, but if the evaluation is task-specific, the evaluators should take into account other activities conducted by all positions that may perform that task – some hazards are minimal when considered by themselves, but the accumulation of several hazardous activities over the course of the shift may result in an unacceptable degree of risk.
4. An ergonomic evaluation of a job may also be conducted as part of an incident investigation.

Job Evaluation

1. The responsible supervisor will evaluate the highest priority jobs using the Screening Tool provided in Appendix A - Workplace Ergonomic Screening Evaluation Tool and Job Evaluation template in Appendix B - Workplace Ergonomic Job Evaluation.
2. Any job found to exceed the criteria may be further reviewed using other tools, depending on the particular situation and job. Not all identified jobs may be evaluated at one time.
3. Each Job Evaluation Report will include at least the following elements:
   - A BRIEF discussion of the job, as well as the number of individuals performing that job or task;
   - A description of the evaluation tools used;

- Identification of the individual(s) conducting the evaluation;
- A qualitative assessment of the degree of hazard associated with the job or task;
- Recommendations with options for controlling the hazard. Example recommendations include job rotation, modifying processes to reduce the number of repetitions or necessary force, training, tool redesign, and the use of ergonomic aids such as wrist rests. The "Hierarchy of Controls" (engineering, work practice, administrative, personal protective equipment) should be applied for controlling ergonomic risks.

Resolution Tracking

1. The responsible supervisor will provide comments on the Job Evaluation report; typical comments may include other potential control measures or a determination of feasibility for presented recommendations.
2. Items that are identified as requiring implementation of controls shall be tracked on an action item matrix with completion dates and assignments of responsibility.
3. The plant / facility / area manager will determine assignments for plan implementation.

Resolution Follow-up

1. After control measures are implemented (if applicable), a follow-up review will be conducted to determine the effectiveness of the control measure, as well as its impact on facility operations.
2. Lessons learned from this review will be added to the Job Evaluation Report as an addendum to be used as a reference for future Job Evaluations.

Training

The health and safety training course "Ergonomics" (ATIS # 00059117) can be provided for applicable employees and their immediate supervisors.

Roles and Responsibilities

Plant / Facility / Area Manager - is responsible for providing the resources for the ongoing evaluation and control of workplace ergonomic hazards. Also responsible for assigning responsibilities and holding assigned parties accountable for ergonomic tasks.

Central Safety Management Review Team (CSMRT) - will review the ergonomic evaluations on a periodic basis during normally scheduled CSMRT meetings. Will provide general oversight for facility ergonomic efforts.

Safety Consultant - shall provide technical guidance with regard to ergonomic evaluations. Also responsible for addressing employee concerns and retaining documentation of ergonomic evaluations.

Supervisors - responsible for ensuring that all employees under their direction are aware of identified ergonomic hazards and control measures. Also responsible for addressing and communicating employee ergonomics concerns to Regional Safety Manager and CSMRT.

Employees - responsible for adhering to the requirements of any adopted ergonomic controls and associated programs. Also responsible for reporting any ergonomic concerns to their supervisor.

Documentation

All Job Evaluation Reports will be made available to plant employees.

Appendices

Appendix A - Workplace Ergonomic Screening Evaluation Tool

====Appendix B - Workplace Ergonomic Job Evaluation====

Procedure 605 Stairs and Guarding Floor and Wall Openings

TVA Safety Manual

605 Stairs and Guarding Floor and Wall Openings

Procedure Number 605

TVA Safety Procedure

Stairs and Guarding Floor and Wall Openings

Revision 1

January 4, 2010

Purpose

The purpose of this procedure is to establish requirements for construction of stairs as well as guarding floor and wall openings. These requirements apply to both temporary and permanent installations.

Protection for Floor Openings

1. Stairway floor openings shall be guarded by a standard railing. The railing shall be provided on all exposed sides (except at entrance to stairway). For infrequently used stairways where traffic across the opening prevents the use of fixed standard railing (as when located in aisle spaces, etc.), the guard shall consist of a hinged floor opening cover of standard strength and construction and removable standard railings on all exposed sides (except at entrance to stairway).
2. Every ladderway floor opening or platform shall be guarded by a standard railing with standard toeboard on all exposed sides (except at entrance to opening), with the passage through the railing either provided with a swinging gate or so offset that a person cannot walk directly into the opening.
3. Every hatchway and chute floor opening shall be guarded by one of the following:
   - Hinged floor opening cover of standard strength and construction equipped with standard railings or permanently attached thereto so as to leave only one exposed side. When the opening is not in use, the cover shall be closed or the exposed side shall be guarded at both top and intermediate positions by removable standard railings.
   - A removable railing with toeboard on not more than two sides of the opening and fixed standard railings with toeboards on all other exposed sides. The removable railings shall be kept in place when the opening is not in use.
   - Where operating conditions necessitate the feeding of material into any hatchway or chute opening, protection shall be provided to prevent a person from falling through the opening.
4. Every skylight floor opening and hole shall be guarded by a standard skylight screen or a fixed standard railing on all exposed sides.
5. Every pit and trapdoor floor opening, infrequently used, shall be guarded by a floor opening cover of standard strength and construction. While the cover is not in place, the pit or trap opening shall be constantly attended by someone or shall be protected on all exposed sides by removable standard railings.
6. Every manhole floor opening shall be guarded by a standard manhole cover which need not be hinged in place. While the cover is not in place, the manhole opening shall be constantly attended by someone or shall be protected by removable standard railings.

7. Every temporary floor opening shall have standard railings, or shall be constantly attended by someone.
8. Every floor hole into which persons can accidentally walk shall be guarded by either:
   - A standard railing with standard toeboard on all exposed sides, or
   - A floor hole cover of standard strength and construction. While the cover is not in place, the floor hole shall be constantly attended by someone or shall be protected by a removable standard railing.
9. Every floor hole into which persons cannot accidentally walk (on account of fixed machinery, equipment, or walls) shall be protected by a cover that leaves no openings more than 1 inch wide. The cover shall be securely held in place to prevent tools or materials from falling through.
10. Where doors or gates open directly on a stairway, a platform shall be provided, and the swing of the door shall not reduce the effective width to less than 20 inches.

Protection for Wall Openings and Holes

1. Every wall opening from which there is a drop of more than 4 feet shall be guarded by one of the following:
   - Rail, roller, picket fence, half door, or equivalent barrier. Where there is exposure below to falling materials, a removable toeboard or the equivalent shall also be provided. When the opening is not in use for handling materials, the guard shall be kept in position regardless of a door on the opening. In addition, a grab handle shall be provided on each side of the opening with its center approximately 4 feet above floor level and of standard strength and mounting.
   - Extension platform onto which materials can be hoisted for handling, and which shall have side rails or equivalent guards of standard specifications.
2. Every chute wall opening from which there is a drop of more than 4 feet shall be guarded by one or more of the barriers.
3. Every window wall opening at a stairway landing, floor, platform, or balcony, from which there is a drop of more than 4 feet, and where the bottom of the opening is less than 3 feet above the platform or landing, shall be guarded by standard slats, standard grill work or standard railing.
4. Where the window opening is below the landing, or platform, a standard toeboard shall be provided.
5. Every temporary wall opening shall have adequate guards.
6. Where there is a hazard of materials falling through a wall hole, and the lower edge of the near side of the hole is less than 4 inches above the floor, and the far side of the hole more than 5 feet above the next lower level, the hole shall be protected by a standard toeboard, or an enclosing screen either of solid construction.

Protection of Open-sided Floors, Platforms, and Runways

1. Every open-sided floor or platform 4 feet or more above adjacent floor or ground level shall be guarded by a standard railing or the equivalent on all open sides except where there is entrance to a ramp, stairway, or fixed ladder. The railing shall be provided with a toeboard wherever, beneath the open sides,
   - Persons can pass,
   - There is moving machinery, or
   - There is equipment with which falling materials could create a hazard.
2. Every runway shall be guarded by a standard railing or the equivalent on all open sides 4 feet or more above floor or ground level. Wherever tools, machine parts, or materials are likely to be used on the runway, a toeboard shall also be provided on each exposed side.
3. Runways used exclusively for special purposes may have the railing on one side omitted where operating conditions necessitate such omission, providing the falling hazard is minimized by using a runway of not less than 18 inches wide. Where persons entering upon runways become exposed to machinery, electrical equipment, or other danger not a falling hazard, additional guarding may be essential for protection.

4. Regardless of height, open-sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment shall be guarded with a standard railing and toeboard.

Stairway Railings and Guards

Every flight of stairs having four or more risers shall be equipped with standard stair railings or standard handrails. The width of the stair to be measured clear of all obstructions except handrails:

- On stairways less than 44 inches wide having both sides enclosed, at least one handrail, preferably on the right side descending.
- On stairways less than 44 inches wide having one side open, at least one stair railing on open side.
- On stairways less than 44 inches wide having both sides open, one stair railing on each side.
- On stairways more than 44 inches wide but less than 88 inches wide, one handrail on each enclosed side and one stair railing on each open side.
- On stairways 88 or more inches wide, one handrail on each enclosed side, one stair railing on each open side, and one intermediate stair railing located approximately midway of the width.
- Winding stairs shall be equipped with a handrail offset to prevent walking on all portions of the treads having width less than 6 inches.

Railing, Toeboards and Cover Specifications

1. A standard railing shall consist of top rail, intermediate rail, and posts, and shall have a vertical height of 42 inches nominal from upper surface of top rail to floor, platform, runway, or ramp level. The top rail shall be smooth-surfaced throughout the length of the railing. The intermediate rail shall be approximately halfway between the top rail and the floor, platform, runway, or ramp. The ends of the rails shall not overhang the terminal posts except where such overhang does not constitute a projection hazard.
2. A stair railing shall be of construction similar to a standard railing but the vertical height shall be not more than 34 inches nor less than 30 inches from upper surface of top rail to surface of tread in line with face of riser at forward edge of tread.
3. For wood railings, the posts shall be of at least 2-inch by 4-inch stock spaced not to exceed 6 feet; the top and intermediate rails shall be of at least 2-inch by 4-inch stock. If top rail is made of two right-angle pieces of 1-inch by 4-inch stock, posts may be spaced on 8-foot centers, with 2-inch by 4-inch intermediate rail.
4. For pipe railings, posts and top and intermediate railings shall be at least 1 1/2 inches nominal diameter with posts spaced not more than 8 feet on centers.
5. For structural steel railings, posts and top and intermediate rails shall be of 2-inch by 2-inch by 3/8-inch angles or other metal shapes of equivalent bending strength with posts spaced not more than 8 feet on centers.
6. The anchoring of posts and framing of members for railings of all types shall be of such construction that the completed structure shall be capable of withstanding a load of at least 200 pounds applied in any direction at any point on the top rail.
7. Other types, sizes, and arrangements of railing construction are acceptable provided they meet the following conditions:
    - A smooth-surfaced top rail at a height above floor, platform, runway, or ramp level of 42 inches nominal;
    - A strength to withstand at least the minimum requirement of 200 pounds top rail pressure;
    - Protection between top rail and floor, platform, runway, ramp, or stair treads, equivalent at least to that afforded by a standard intermediate rail;
    - A standard toeboard shall be 4 inches nominal in vertical height from its top edge to the level of the floor, platform, runway, or ramp. It shall be securely fastened in place and with not more than 1/4-inch clearance above floor level. It may be made of any substantial material either solid or with openings not over 1 inch in greatest dimension.

8. Where material is piled to such height that a standard toeboard does not provide protection, paneling from floor to intermediate rail, or to top rail shall be provided.
9. A handrail shall consist of a lengthwise member mounted directly on a wall or partition by means of brackets attached to the lower side of the handrail so as to offer no obstruction to a smooth surface along the top and both sides of the handrail.
10. The handrail shall be of rounded or other section that will furnish an adequate handhold for anyone grasping it to avoid falling. The ends of the handrail should be turned in to the supporting wall or otherwise arranged so as not to constitute a projection hazard.
11. The height of handrails shall be not more than 34 inches nor less than 30 inches from upper surface of handrail to surface of tread in line with face of riser or to surface of ramp.
12. The size of handrails shall be:
    - When of hardwood, at least 2 inches in diameter;
    - When of metal pipe, at least 1 1/2 inches in diameter.
    - The length of brackets shall be such as will give a clearance between handrail and wall or any projection thereon of at least 3 inches.
    - The spacing of brackets shall not exceed 8 feet.
13. The mounting of handrails shall be such that the completed structure is capable of withstanding a load of at least 200 pounds applied in any direction at any point on the rail.
14. All handrails and railings shall be provided with a clearance of not less than 3 inches between the handrail or railing and any other object.
15. Floor opening covers may be of any material that meets the following strength requirements:
    - Trench or conduit covers and their supports, when located in plant / facility roadways, shall be designed to carry a truck rear-axle load of at least 20,000 pounds.
    - Manhole covers and their supports, when located in plant / facility roadways, shall comply with local standard highway requirements if any; otherwise, they shall be designed to carry a truck rear-axle load of at least 20,000 pounds.
    - The construction of floor opening covers may be of any material that meets the strength requirements. Covers projecting not more than 1 inch above the floor level may be used providing all edges are chamfered to an angle with the horizontal of not over 30 degrees. All hinges, handles, bolts, or other parts shall set flush with the floor or cover surface.
16. Skylight screens shall be of such construction and mounting that they are capable of withstanding a load of at least 200 pounds applied perpendicularly at any one area on the screen. They shall also be of such construction and mounting that under ordinary loads or impacts, they will not deflect downward sufficiently to break the glass below them. The construction shall be of grillwork with openings not more than 4 inches long or of slatwork with openings not more than 2 inches wide with length, unrestricted.
17. Wall opening barriers (rails, rollers, picket fences, and half doors) shall be of such construction and mounting that, when in place at the opening, the barrier is capable of withstanding a load of at least 200 pounds applied in any direction (except upward) at any point on the top rail or corresponding member.
18. Wall opening grab handles shall be not less than 12 inches in length and shall be so mounted as to give 3 inches clearance from the side framing of the wall opening. The size, material, and anchoring of the grab handle shall be such that the completed structure is capable of withstanding a load of at least 200 pounds applied in any direction at any point of the handle.
19. Wall opening screens shall be of such construction and mounting that they are capable of withstanding a load of at least 200 pounds applied horizontally at any point on the near side of the screen. They may be of solid construction, of grillwork with openings not more than 8 inches long, or of slatwork with openings not more than 4 inches wide with length unrestricted.

Stairs

Stairs shall be constructed in accordance with 29 CFR 1910.24 until such time as a TVA Safety Procedure on stairs can be developed.

Reference

29 Code of Federal Regulations 1910.23, “Guarding Floor and Wall Openings and Holes”

Procedure 606 Hand Tools

TVA Safety Manual

606 Hand Tools

Procedure Number 606

TVA Safety Procedure

Hand Tools

Revision 0

January 6, 2003

Purpose

This procedure establishes requirements for the use of hand tools in the workplace and to ensure that hand tools are used and maintained in a safe manner.

Roles and Responsibilities

All managers, supervisors and foremen are responsible for providing needed hand tools and complying with the requirements of this procedure.

Employees have the responsibility for properly using and maintaining tools.

Basic Requirements for Hand Tools

1. Use the right tool for the job and keep tools in good condition with regular maintenance.
2. All hand tools shall be of drop-forged steel.
3. Inspect each tool for damage before use.
4. Defective tools shall be removed from service.
5. Use appropriate personal protective equipment (PPE) as specified in Section 3 of the Safety Manual for the tool used and task performed. PPE may include protective eye wear with side shields, hard hats, gloves, etc.
6. All employees who use hand tools shall be trained in their proper use.

Wrenches

1. Wrenches are used to hold or turn threaded fasteners. Types of wrenches include adjustable, box end, open end, socket, spanner, allen, slug wrenches and pipe wrenches.
2. Adjustable wrenches have the advantage of fitting any size fastener but do not fit tightly to prevent slipping when applying pressure.
3. Do not use an adjustable wrench to free a “frozen” nut or in any other situation requiring a lot of force.
4. Socket or box type wrenches are generally safer and more secure than open ended or adjustable wrenches of the same size.
5. When using an open ended, box or socket wrench, ALWAYS select a wrench with an opening that fits the fastener exactly.
6. NEVER use a cheater bar to extend the handle of any wrench. When there is a choice always pull the wrench rather than push it.
7. Never strike an ordinary wrench to free a bolt or nut. Use penetrating oil to help free up “frozen” nuts or bolts and a slugging wrench.

Pliers

1. Always use the appropriate size and style for the job. Do not use pliers on nuts or bolts as they will round the heads.
2. Never use pliers for cutting hardened wire unless they have been manufactured for this purpose.
3. Do not extend the handles on a pair of pliers or use force beyond hand pressure.
4. Never use pliers as a hammer or strike them with a hammer.

Snips, Shears and Cutters

1. The right type of snips or cutters to use depends upon the size, or gauge, and the hardness of the metal to be cut.
2. Do not extend the handles with a cheater to increase leverage. If snips or cutters will not cut with hand pressure, get a larger pair or use a different type.
3. Metal bands under tension, when cut, release pressure and may strike an employee resulting in severe injuries.

Files

1. Use the correct size, shape and style of file for each job. Do not use a file without a handle.
2. When sharpening tools with files use a file guard to minimize contact with sharp edges.

Knives, Axes and Other Cutting Tools

1. When using a knife do not cut toward your body or toward your other hand.
2. Store and carry knives correctly-with the blade covered or closed. If you use a knife sheath carry it on your side or back.
3. Keep knife blades sharp. This requires less pressure when cutting.
4. Do not use knives to cut electrical tie-wraps, use snips for this purpose.
5. Do not use an ax to drive a wedge and do not use an ax as a wedge. The metal is too soft and material may break off.
6. Dangerous, glancing blows can result when an ax is dull. Keep axes and other cutting tools sharp. Axes and other cutting tools, such as brush hooks, shall be secured in place while being sharpened.

Hammers

1. Hammers include ball peen, claw, sledge and mallets. Use the correct type for the work.
2. Misuse of a hammer can result in dangerous flying shrapnel.
3. Do not use a hammer, or other striking tool, if the handle is damaged or if the head is not securely on the handle. Wood handles that are loose, cracked, or splintered must be replaced.

Chisels, Punches etc.

1. The most common type of chisel is the cold chisel. There are numerous other types available for use depending on the type of work. Chisels will generally cut any metal softer than they are or any metal that can be filed.
2. Avoiding injuries when using struck tools like chisels, punches, star drills, etc, depends upon using the proper tool for the material being worked, striking the tool with the correct hammer and keeping tools in good condition.
3. Keep hands away from danger zones by holding struck tools with guards or tool holders.
4. Damaged struck tools should be redressed or replaced. The points or cutting edges must not be dull, chipped or cracked.
5. The struck face must not be cracked or mushroomed. Remove all mushroomed areas of a tool before striking.

Screwdrivers

1. Do not use a screwdriver with a damaged tip.
2. Match the screwdriver tip to the slot in the head of the screw.
3. Never hold the work in one hand while using a screwdriver with the other hand.
4. Make sure the screwdriver shank is in line with the screw.
5. Never use a screwdriver in place of a struck tool.
6. The purpose of plastic or rubber covered handles is to make a screwdriver more comfortable to use. These covers do not provide electrical insulation unless the tool is designed as an insulated tool.
7. Do not use screwdrivers as pry bars, chisels or scrapers.

Non-sparking Tools

1. "Non-sparking", "spark-resistant" or "spark-proof" tools are tools made of metals such as brass, bronze, Monel metal (copper-nickel alloy), copper-aluminum alloys (aluminum bronze), copper-beryllium alloys (beryllium bronze), and titanium.
2. Preferred "non-sparking" metals have less tensile strength than steels usually used to make tools. A lower tensile strength means that these tools are softer, wear down more quickly than ordinary steel tools, and have to be dressed more frequently.
3. Tools made from stainless steel also have a lower tendency to generate sparks than those made from steel commonly used for making tools (tool steels). The term "nonsparking" is misleading because these tools are capable of producing a spark: the term "reduced-sparking tools" better describes these tools.
4. All metal tools can produce sparks. While "non-sparking" tools may lower the risk of a spark, they do not eliminate the possibility of sparks. Non-metals like wood, leather, and plastic are suitable for some tools like shovels, scrapers or scoops and do not pose a friction spark hazard.
5. Non-sparking tools are not certified for work in hazardous environments. Electric motors, can be certified as "explosion-proof" for use in hazardous work locations.
6. Always evaluate a job to be done in a hazardous environment (even the simplest one)! Keep in mind that there are no completely non-sparking tools.
7. In any work where flames are used, or sparks are produced, make sure that an explosive atmosphere does not develop. Such atmospheres include flammable vapor-air mixtures (natural gas) and organic dust like coal dust. Isolation, ventilation and purging should be used to insure a safe working atmosphere.

Reference

29 Code of Federal Regulations 1910 Subpart P “Hand and Portable Powered Tools and Other Hand-Held Equipment”

29 Code of Federal Regulations 1926 Subpart I “Tools - Hand and Power”

29 Code of Federal Regulations 1910.269(I), “Electric Power Generation, Transmission, and Distribution, Hand and Portable Power Tools”

Procedure 607 Housekeeping

TVA Safety Manual

607 Housekeeping

Procedure Number 607

TVA Safety Procedure

Housekeeping

Revision 0

January 6, 2003

Purpose

This procedure describes the TVA housekeeping philosophy, policy, expectations, and basic requirements for assurance and maintenance of good housekeeping. Embedded in the philosophy and policy is a strong belief that performance excellence is directly related to material condition which includes housekeeping excellence.

Housekeeping Expectations

1. Good housekeeping includes maintaining clean and orderly areas; prompt removal of debris, tools, and equipment following completion of work activities; proper storage of material, equipment, and tools in designated areas; preventing accumulation of material; maintenance of access/egress paths; and correction of plant equipment deficiencies.
2. Under no circumstances is material that is of unknown origin and potentially hazardous to be disposed of without approval from the site environmental coordinator.
3. Work areas shall be kept sufficiently clean and orderly to allow work activities to proceed in a safe and efficient manner.
4. Lighting and ventilation shall meet design requirements.
5. Electrical panels, cabinets, and junction boxes shall have approved covers securely fastened in place with no exposed wiring or connections. This is especially critical in Class 2 areas and defects in these areas shall be considered imminent hazards.
6. Extension cords, air hoses, welding leads and similar equipment shall not be allowed to create a tripping hazard. They must be routed at least 7 feet overhead or appropriate hazard mitigation measures used.
7. Leaks that cannot be immediately repaired shall be controlled by applicable means including barriers, shields, temporary drainage paths, etc.; and routed to appropriate drainage or capture facilities.
8. Storage locations, waste collection container locations and eating places, shall be designated as required to support good housekeeping.
9. All employees (permanent, temporary, and contractors) are expected to maintain good housekeeping practices during all work activities and clean up areas during and following completion of the activity.
10. The responsible supervisor shall manage this aspect of the work consistent with other quality of work standards including safety and environmental compliance. Likewise, all personnel are expected to report equipment problems, personnel hazards, and other housekeeping deficiencies to their supervisor when conditions cannot be corrected on the spot. The supervisor shall cause the deficiency to be corrected.
11. Supervisors and managers are expected to routinely monitor work activities for which they are responsible for housekeeping conditions. This applies not only to the immediate work area but also to field locations, office spaces, storage areas, and equipment areas.

12. At power plants the manager or supervisor on shift may direct the correction of any deficiency not promptly remedied including removal of tools, parts, and equipment not meeting housekeeping requirements. A similar approach shall be used at other facilities with accountabilities assigned as appropriate for that facility. Excessive accumulations of coal, coal dust, or other potentially dangerous material shall be reported immediately to the responsible shift supervisor. Excessive amounts shall be cleaned up immediately and the source identified and corrected. If immediate correction is not feasible, a work request or work order shall be written and conditions actively monitored and controlled until correction can be made.
13. Housekeeping conditions in areas such as offices and shops (including corporate offices) are important to the health and safety of employees and to efficient work performance. Housekeeping in these areas is the responsibility of the users and residents of the area, and shall be monitored by the responsible manager or supervisor.

Training

1. Persons involved in work activities within the plant shall be made aware of housekeeping condition requirements and expectations. Special emphasis should be placed on temporary employees, contractors, and their supervision.
2. Persons involved in specific work activities requiring special housekeeping practices shall be trained in these requirements.
3. Managers and supervisors should regularly include their subordinates on area walk-downs to reinforce expectations and convey high standards.

Procedure 608 Identification of Piping Systems

TVA Safety Manual

608 Identification of Piping Systems

Procedure Number 608

TVA Safety Procedure

Identification of Piping Systems

Revision 1

October 1, 2003

Purpose

The purpose of this procedure is to establish guidelines for identification of piping systems.

Issued design drawings take precedence over this procedure with regard to markings and color codes until such drawings are revised to comply with this procedure.

Roles and Responsibilities

1. All employees should be familiar with the warning color system for piping.
2. Employees shall know the contents of piping systems prior to starting work.

Guidelines for Piping Identification

1. Piping and piping systems shall be clearly marked as to identify direction of flow and content.
2. All valve and valve operators shall be marked so they are visible from normal point of access.
3. ANSI Standard A13.1-1981 and the system design drawings should be used as references to identify all piping containing potentially hazardous material.
4. Equipment and systems conform to the following method of identification. Piping systems shall be positively identified by written titles if they contain any of the following materials:
   - Flammable or easily ignited materials.
   - Toxic, poisonous, or asphyxiating gases or materials.
   - Corrosive materials
   - Fire protection materials
   - Compressed air at or above 30 psig
   - Potable and nonpotable water
   - Materials at high pressures
   - Radioactive substances
   - Oxidizing materials
   - Materials at high and low temperatures (above 125° or below 32°F).
5. Titles shall be applied at frequent intervals sufficient to clearly identify piping contents.
6. Letters and numerals placed on piping shall be legible from the normal field of view, especially from operating positions.
   - Acceptable color codes are outlined in Appendix A Identification of Piping Systems.
   - Arrows are used to indicate the direction(s) of flow.

7. Piping systems less than three-fourth inch in diameter may be identified by securely attached nonferrous metal tags or pipe markers with piping system contents and direction of low clearly indicated.

Definitions

Piping Systems - Piping or tubing, including fittings, valves, coverings, and flexible hoses, used for conveying materials, i.e., gases, liquids, and solids. Air ducting at or below atmospheric pressure, buried piping, and motor vehicle components are excluded.

Reference

ANSI A13.1-1981, "Scheme for Identification of Piping Systems"

29 Code of Federal Regulations 1910.96, "Ionizing Radiation"

Appendix A - Identification of Piping Systems

IDENTIFICATION OF PIPING SYSTEMS

MATERIAL IN PIPE	LEGEND/ABBREVIATION**	BAND COLOR
Acetylene	ACETYLENE	Yellow
Air, compressed***		
30 PSIG or above	AIR	Gray
Ammonia Liquid	AMMONIA	Orange
Ammonia Vapor	AMMONIA	Blue
Argon	ARGON	Gray
Bromotrifluoromethane, fire	FREON 1301	Red
Carbon dioxide	CO_2	Gray
Carbon dioxide, fire	CO_2	Red
Carbon monoxide	CO	Brown
Chlorine	CHLORINE	Brown
Electricity*	ELECTRIC	Orange
Freon	FREON (11,12, or 22)	Gray
Fuel oil	FUEL OIL	Yellow
Gasoline	GAS	Yellow
Helium	HELIUM	Gray
Hydrogen	HYDROGEN	Yellow
Kerosene	KEROSENE	Yellow
Nitric acid	ACID, NITRIC	Blue
Nitrogen	GN2	Gray
Oxygen	GO2	Green
Oxygen, liquid	LO2	Green
Oil, hydraulic	HYD-OIL	Yellow
Oil, lubricating	LUB-OIL	Yellow
Petroleum gas	PROPANE, etc.	Yellow

Phosphoric acid	ACID, PHOSPHORIC	Blue
Radioactive materials	RADIOACTIVE	Yellow & Magenta
Steam***	STEAM	Gray
Sulfur dioxide	SO2	Brown
Sulfur hexafluoride	SF6	Gray
Sulfuric acid	ACID, SULFURIC	Blue
Water, fire	WATER, FIRE	Red
Water, above 75 psig	WATER	Gray
Water, potable***	WATER, POT	White
Water, raw***	WATER, RAW	Black

*Color coding NOT required, but IF used conforms to the above specifications.

**Pressure included if desired for functional purposes.

***Metal tags may be used on steam, air, and water lines.

Procedure 609 Lifting / Handling Materials

TVA Safety Manual

609 Lifting / Handling Materials

Procedure Number 609

TVA Safety Procedure

Lifting / Handling Materials

Revision 5

May 3, 2011

Purpose

The purpose of this procedure is to define requirements for safe lifting and handling materials.

Manual Lifting

1. Before gripping an object to make a lift, first consider the weight and dimensions involved.
2. The supervisor and employee performing a manual lift are responsible for determining if the employee is capable of lifting the object safely through analysis of the lifting task using the criteria in this paragraph for lifts less than and greater than 50 pounds. The existence of any of the following conditions either individually or collectively increases the risk of injury.
   - The horizontal distance from a point mid-point between the ankles to the mid-point between the hands on the load at the start of the lift is greater than 10 inches.
   - The load is being lifted from below the knees or above the shoulders.
   - Lifting the load more than 10 inches.
   - The body must be twisted in order to pick up the load.
   - Lifting continuously over a work shift rather than an occasional lift during a workshift.
   - Poor coupling between the hands and the object being lifted, i.e. the inability to obtain a good grip on the object.

   Jobs that require an employee to lift an object weighing 50 pounds or more must have a JSA. The JSA must address any of the above risk factors and identify safe work methods to mitigate the hazards. If the JSA determines one employee may be at risk of injury the employee shall not perform the lift, until assistance from one or more employees is obtained or mechanical assistance is made available.

   Lifts of objects weighing less than 50 pounds may also be hazardous to employees with the existence of one or more of the above listed risk factors or physical limitations of the employee. Employees are responsible to take the necessary action to ensure their safety when lifting items less than 50 pounds.

   Employees must notify their supervisors if they believe a lift is unsafe and the employee can not determine a way to make the lift safely.

   While not required supervisors and employees may utilize the NIOSH lifting formula at Appendix B to assist in evaluating the risks and developing the JSA. Use of NIOSH lifting formula is especially recommended for repetitive jobs.
3. Inspect material for slivers, jagged edges, burrs, and rough or slippery surfaces.
4. Get a firm grip on the object.
5. Keep fingers away from pinch points, especially when setting material down.

6. Keep hands free of oil and grease.
7. If employees are unable to see over or around the load they are handling, an observer shall be used to guide.
8. Nails or staples shall be removed from boxes, kegs, or crates before removal of material. When pulling is not practical, nails or staples shall be completely bent down.
9. Stacked material shall be arranged in a secure manner.
10. When two or more employees are lifting material, one person shall be designated to direct and coordinate the lift.
11. Approved personal protective equipment (PPE) shall be used when handling hazardous materials.
12. Gloves or other hand protection shall be worn when gripping loads with sharp edges or corners.
13. Wipe off greasy, wet, slippery, or dirty objects before you handle them.
14. When handling lumber, pipe or other long objects, keep the hands away from the ends of the object to prevent them from being pinched.
15. A wide range of hand or hand-operated tools, kits, and other devices can be used to handle materials. Each tool, jig, or other device should be kept in good repair and should be used only for the job for which it was designed.
16. Safe lifting techniques should be used for manual material handling. The following should be considered prior to lifting any load manually: size, weight, shape of load, feet, and body position. Lift with your legs, keep your back straight, ensure firm grip and footing, and maintain adequate control over and around load. Exertion should be performed while exhaling.
17. Avoid twisting the body when handling material.
18. Straighten your legs to lift the object and, at the same time, swing your back into a vertical position.
19. Appendix A, “Checklist - Safe Material Handling”, may be used to assess material handling safety.

Appendix A - Checklist - Safe Material Handling

	DIRECTIONS: Use boxes in the last column to document your evaluation. “No” responses may indicate potential problems that require further attention	**Yes/No**
1	**CAPABILITIES** Are workers knowledgeable of the proper material handling practices needed to perform this activity safely? Does the weight of the object to be lifted weigh 50 pounds or more? If so then a JSA is required in accordance with paragraph 2 of this procedure.	
2	**CONFIGURATION** Is the object stable? Is the weight evenly distributed? Is the object free from sharp edges and corners? Is the object easy to grasp and hold without slipping? [Handholds are helpful.]	
3	**ASSISTANCE** Can mechanical, wheeled, or motorized devices be used? [hoist, rigging, dolly, hand truck, cart, flatbed, trailer, conveyor, forklift, vehicle] Are others available to help handle heavy, awkward, or numerous objects?	
4	**PPE** **Personal Protective Equipment is available and worn to protect** *__Feet and Body:__ Proper footwear and appropriate clothing? *__Hands:__ Gloves fit properly and are made of the proper material?	
5	**INTERFERENCES** Is there enough “room” to maneuver and stay clear of traffic? Do workers have an unobstructed view of the material handling activity?	

6	**WALKING SURFACE** Are walking surfaces level, wide enough, clean, clear, and dry? Are floor openings protected or covered, loose grating secured, obstacles such as loose or granular material removed or area cleaned, slippery substances or oily residues removed or cleaned from the floor / walking surface? Is the load within safe limits for floor or trench grating?	
7	**PLACEMENT** Are materials being moved the least distance possible? Is the work surface adjustable for best handling height? Is the distance between the object and body minimized? Are pushing and pulling forces reduced or eliminated?	
8	**POSITIONING** Can the material handler avoid movement *above shoulder height? *extended reaching with the arms or raising the elbows? *static muscle loading? (i.e., prolonged grasping or holding tension) *sudden movements during handling? *twisting at the waist? *crouching? *finger pinching grip?	
9	**DURATION and REPETITION** Are high rates of repetition avoided by job rotation, self-pacing, or sufficient pauses?	
10	**REMINDER:** ***Bend the knees, not the back***, when lifting or moving an object.	
DO NOT HESITATE TO ASK FOR ASSISTANCE		

Note: Use of this checklist is optional.

Appendix B - NIOSH Lifting Formula

Procedure 610 Motor Vehicle Operations

TVA Safety Manual

610 Motor Vehicle Operations

Procedure Number 610

TVA Safety Procedure

Motor Vehicle Operations

Revision 7

May 4, 2011

Purpose

The purpose of this procedure is to ensure that the operation of TVA motor vehicles by TVA and authorized contractor employees is conducted to minimize accidents resulting in injuries, property damage, liability costs, and business interruptions, and to meet Department of Transportation (DOT) regulatory requirements.

Driver Qualifications for All TVA Employees

1. Major responsibilities/accountabilities for corporate organizations, line organizations, and all drivers can be found in Appendix A, “Accountability Matrix for all Drivers”. Organizations must communicate to employees and enforce the requirements of this procedure.
2. Drivers of TVA vehicles and rental vehicles other than a Commercial Motor Vehicle (CMV), will be (1) at least 18 years old, (2) possess a valid state driver's license from their state of domicile, (3) able to understand the English language sufficiently to properly recognize highway traffic signs and signals, and (4) authorized by his/her supervisor to operate the motor vehicle.
3. Employees will not drive on TVA business unless they have a current valid state driver's license in their possession.
4. Employees must immediately notify their supervisor if their state driver's license is suspended or revoked.
5. Employees are required to notify their supervisor of any physical or emotional condition that might adversely affect their ability to safely operate a vehicle.
6. Employees are required to notify their supervisor if under the influence of alcohol, or if taking prescription or non-prescription drugs that are known or have the capability to physically or mentally impair a person's ability to operate a vehicle safely.
7. Supervisors are required to request a medical or other clinical evaluation of any problem that may be related to a health condition.
8. Vehicle operators must follow TVA and organizational requirements, comply with all state motor vehicle safety laws and regulations, respond to any citations they receive for traffic violations, and be responsible for paying any fines levied on them for such traffic violations.

Driver Training

Organizations are encouraged to require all employees subject to drive on TVA business to take a defensive driving course, ATIS 00059113 or equivalent. Training is available online (CBT). Training is also available through TVA Police. Refresher training needs and frequency are determined by each organization.

General Motor Vehicle Safety

1. Obedience to laws will not be enough to prevent accidents. Alertness, common sense, and courtesy will improve your chances of avoiding accidents. Safety, in your work or when driving a vehicle, is a state of mind. To extend courtesy to all drivers and pedestrians is the best way to ensure your own safety. By your courteous attitude, you will properly represent TVA. Drive defensively.
2. Seat belts are required to be used in operator and passenger positions of sedans, truck cabs and the driver's seat in buses while traveling on TVA business. This applies to all TVA-owned, rented, and leased vehicles as well as personal vehicles. Drivers will ensure that all passengers' seat belts are operational and fastened prior to putting the vehicle in motion. Seat belts must be used in the operator position of equipment that is provided with rollover protection.
3. Employees must familiarize themselves with the location of critical vehicle controls such as the location of lights, windshield wipers, and turn signals and be sure they are working properly before driving a motor vehicle on TVA business. Any deficiencies noted that could affect the safe operation of the motor vehicle will be corrected before the motor vehicle is driven.
4. During operation the driver must be alert for equipment defects. If a defect causes any unsafe condition or impairs safe operation of the equipment, operation is suspended until the defect has been corrected. Any employee noting such defects must take appropriate action to secure replacement or repair according to applicable procedures.
5. Obey all speed limit and other regulatory signs. Give pedestrians the right of way.
6. Shut off the motor before refueling. Smoking, welding, open flames, or other sources of ignition are not permitted within 50 feet (15.2m) of any refueling activity.
7. Ensure the vehicle is parked clear of railroads, cranes, roadways or other traffic before refueling the vehicle.
8. Smoking is prohibited in TVA vehicles and when refueling TVA vehicles.
9. If it is possible for any part of a vehicle to contact energized equipment or conductors, the body of the vehicle is grounded. Be sure that radio and telephone antennas have sufficient clearance.
10. Vehicles stopped on roadways must be properly identified by approved markers and/or warning light.
11. Get on or off vehicles only after they have come to a complete stop.
12. When a vehicle is parked, the driver must set the brake or otherwise secure the vehicle from undesirable movement.
13. When a trailer is disconnected from a vehicle, it will be secured to prevent undesirable movement.
14. Headlights shall be used when fog is encountered or when driving in the rain. Use low beam headlights when driving in fog. (Parking lights are never to be used in lieu of headlights while the vehicle is moving.)
15. No vehicular equipment having an obstructed view to the rear may be operated on offhighway jobsites where any employee is exposed to the hazards created by the moving vehicle, unless:
    - The vehicle has a reverse signal alarm audible above the surrounding noise level,
    - The vehicle is backed up only when a designated employee signals that it is safe to do so.
    - Immediately, before backing a vehicle, the driver determines that the space is clear.
16. It is the driver's responsibility to back his or her vehicle safely.
17. When employees are being transported, the operator or driver will verify that the vehicle is not overcrowded, adequate seating is provided, and passengers remain seated within the confines of the vehicle while it is in motion.

18. Tools and other injury-producing objects carried inside vehicles are secured or a screen installed between the cargo and vehicle occupants. Fuel containers shall not be carried inside the passenger/driver compartment.
19. A-frames or collapsible booms mounted on trucks and tractors will be disassembled before being transported over public roads and highways. For off road movement it is permissible to transport the assembled A-frame if it is lowered to a safe position and the stiff leg secured. The path must be examined for safe clearance.
20. Check overhead clearance and use extreme caution when driving into or out of any building or area where visibility is limited.
21. Keep vehicle in gear when moving downgrade.
22. Drivers must not indicate (telegraph) the intentions of other drivers through the use of turn indicators or hand signals. Turn signals are to be used only to indicate the intended actions of the vehicle you are driving.
23. When filling portable metal gasoline cans, the container must be removed from the bed of the vehicle and placed on the ground. Keep the nozzle of the gas pump hose in contact with the gas container to reduce the chance of a spark or gap.
24. Operating vehicles near energized electrical lines or equipment shall be in accordance with TVA Safety Procedure 1018, “Vehicle Operations Near Energized Lines or Equipment”.

Loading Work Vehicles and Securing Cargo

1. Work vehicles include pick-up trucks (4- and 2-wheel drive), cargo work vans, station wagons, jeeps, trailers, trucks, truck tractors, semitrailers, full trailers, and pole trailers. Vehicle/manufacturers’ use a Gross Vehicle Weight Rating (GVWR) to rate vehicles. The GVWR is defined as the MAXIMUM WEIGHT for a single vehicle plus its load. The GVWR is determined by factors such as the power train, suspension, axles, brakes, and tires. Exceeding the GVWR is very dangerous and will affect the steering and braking of the vehicle. By knowing the weight of your vehicle and its GVWR, the safe loading capacity for the vehicle can be determined.
2. When loading a vehicle, the cargo must remain centered and as low as possible. Heavy loads carried on truck racks will raise the center of gravity of the vehicle and will cause the vehicle to become unstable in curves or when swerving to avoid a hazard.
3. Tires also have a load rating. The proper load-rated tires are installed on the vehicle to safely handle the loads being transported. Tires will be inflated in accordance with the manufacturer’s recommendations.
4. Vehicles will not be loaded past their GVWR.
5. Heavy cargo loads (such as steel poles) will not be hauled on truck racks. A heavy load is any load that exceeds the recommended load limit for a given truck rack.
6. Vehicles are not loaded past the axle weight rating or the tire load rating.
7. Cargo must be secured in accordance with the Federal Motor Carrier Safety Administration’s Cargo Securement Rules found at Appendix E for trucks, truck tractors, semitrailers, full trailers, and pole trailers. The rules at Appendix E must also be applied for cargo on other vehicles to the extent possible. Cargo must be secured in accordance with Appendix E for TVA vehicles regardless of the location they are being used.

Use of Cell Phones and Other Electronic Devices

1. The following requirements apply to the use of cell phone and other electronic devices, i.e. navigation devices, computers, etc. while driving a TVA owned vehicle, a rented vehicle on TVA business, or when driving a personal vehicle on TVA business.
    - Use of a cell phone in other than a hands free mode is prohibited. The only exceptions are (1) the use of a cell phone in an emergency and (2) use by TVA police and other emergency personnel.
    - “Texting” is prohibited. "Texting" or "Text Messaging" means reading from or entering data into any handheld or other electronic device, including for the purpose of SMS texting, e-mailing, instant messaging, obtaining navigational information, or engaging in any other form of electronic data retrieval or electronic data communication.

These requirements also apply to contractors while driving a TVA owned or rented vehicle. Contractors are encouraged to adopt and enforce the above policies for their employees while driving company-owned or -rented vehicles.

2. Employees are encouraged to not use a cell phone without a hands free microphone or to engage in "texting" while driving their personal vehicles off of the job.
3. The following are tips to assist in implementation of the requirements in paragraph 1 above.
   - If you must make or receive a call while traveling find a safe place to pull over to make or receive calls. Your voice mail will record the caller while you are locating a safe place to park and the call can then be returned safely.
   - If you have passengers, let one of them handle your calls while you are driving or let a passenger drive while you place and answer calls.
   - If you need to take a note pull off of the road at a safe location to record the information.

Driver Qualifications for Operating Commercial Motor Vehicles (CMV)

1. Major responsibilities/accountabilities for corporate organizations, line organizations, and all drivers can be found in Appendix B, "Accountability Matrix for (CMV) Drivers".
2. Before an employee is qualified to drive a CMV, organizations must ensure that the employee:
   - is at least 21 years old
   - possesses only one valid CDL covering the commercial motor vehicle group rating and endorsements for the vehicle the employee is subject to operate
   - understands the English language sufficiently to properly recognize highway traffic signs and signals
   - receives an initial TVA S5 medical approval with an accompanying Medical Examiner's Certificate. (Subsequent periodic medical evaluations, every two years, and accompanying Medical Examiner's Certificate, must be obtained from a TVA medical examiner.)
   - meets suitability screening requirements as outlined in 49 CFR 383, "Commercial Driver's License Standards; Requirements and Penalties." (involves contacts with previous employers and motor vehicle check to determine driving history)
   - is enrolled in TVA's DOT drug and alcohol testing program
   - is provided a copy of and signs a receipt for Appendix C, "TVA Commercial Motor Vehicle (CMV) Drivers Reporting Requirements and Disqualifications Penalties."
   - is authorized by his/her supervisor to operate the vehicle.
3. Organizations must periodically ensure that driver qualifications are current. It is recommended that this determination be made annually during an employee's performance evaluation.
4. Employees may have only one state driver's license. To drive a CMV, employees must have a Commercial Driver's License (CDL) issued by the state in which they are domiciled.
5. Employees are responsible for maintaining a current CDL. They must complete form TVA 13048, "Motor Vehicle Operator Certification" [1], annually. Employees will provide a photocopy of the CDL to their supervisor whenever the license is renewed.
6. Violations Employees shall notify their supervisor (in writing) of any moving violation within two (2) working days of the arrest or charge; notify (in writing) the state agency issuing their license of any moving violation committed in another state within 30 days of the arrest or charge, and notify their supervisor within one working day if their CDL has been suspended, revoked, or canceled; or if they are otherwise disqualified from operating these vehicles in any state. These notification requirements apply even when drivers commit a moving violation in other vehicles (including a privately-owned vehicle) not meeting the definition of CMVs. See Appendix B for a summary of CMV drivers reporting requirements and disqualification penalties. The Federal Motor Carrier Safety Administration website provides a complete list of disqualification penalties for specific offenses.
   Note: TVA Police may make periodic checks of the National Motor Vehicle Database to verify that a CDL has

not been suspended, revoked or received any moving violation.

7. The notification to the state agency and TVA must be made in writing and contain the following information.
   - Driver's full name
   - Driver's license number
   - Date of conviction
   - Nature of violation of a state or local law relating to motor vehicle traffic control (other than a parking violation)
   - Indicate whether the violation was in a CMV
   - Location of offense
   - Driver's signature
8. Effective April 16, 2004, an employee who is required to have a CDL as an essential function of their job and either cannot obtain or subsequently loses that license due to a medical condition or one of the disqualification penalties in Appendix C, "TVA Commercial Motor Vehicle (CMV) Drivers Reporting Requirements and Disqualifications Penalties." is not permitted to operate a CMV (also see section Training for Supervisors of CMV Operators of this procedure). The employee will have six months to obtain/re-obtain their CDL or pursue other employment alternatives. The six month period is not required to be given where federal disqualification penalties listed in Appendix C would prohibit an employee from re-obtaining their CDL. The organizational vice president, at his/her discretion, may approve an extension for an additional period of time, not to exceed a total of twelve months. After the allotted time, if the employee cannot obtain a CDL, and suitable work within TVA is not available, their employment may be terminated because the employee no longer meets the requirements of the position.
9. For those employees who have been unable to obtain or maintain a CDL due to a medical condition prior to April 16, 2004, the six month rule will not apply as long as the employee remains in the position that is his/her permanent position as of April 16, 2004. Management will continue to review them on a case by case basis and make adjustments as long as business needs can be met. However, those employees will not be allowed to perform DOT safety-sensitive work.
10. Employees must notify their supervisor of any medical condition, which could adversely affect their ability to safely operate a CMV. To confirm their approved medical status, employees will have their Medical Examiner's Certificate available at any time while at work.

Training for Supervisors of CMV Operators

1. Supervisors will receive two hours of training, "USDOT Supervisor Alcohol & Drug Testing", ATIS Number 00064870, to enable them to make a determination concerning the need for alcohol and/or controlled substances testing. Additional training will be required when DOT regulations change. Other responsibilities as specified in the policy can be found in TVA Employment Procedure 12,"TVA Department of Transportation (DOT) Alcohol and Drug (A&D) Testing Program"
2. Supervisors will be instructed not to allow employees to operate a CMV with a suspended, or revoked, or canceled Commercial Driver's License (CDL), or if the driver is subject to an out-of-service order. In addition, supervisors will be instructed not to allow employees to operate a CMV in violation of Federal, state, or local law pertaining to railroad highway grade crossings.
3. Supervisors will be instructed not to allow employees to operate a CMV with a medical condition that might affect their ability to safely operate the vehicle. Supervisors will request a medical or other clinical evaluation of any suspected health-related condition which they believe may affect the safe operation of a CMV.

Training for CMV Operators

1. Organizations will ensure that employees are briefed on their reporting responsibilities and penalties and organizational policies in this procedure as outlined in Appendix C, prior to being allowed to drive a CMV.
2. Employees shall be informed prior to organizations requesting TVA Police to make periodic checks of the National Motor Vehicle Data Base to verify that an employee's CDL has not been suspended or revoked. This is accomplished by obtaining the employees signature on form TVA 13048, “Motor Vehicle Operator Certification,” [1] which authorizes release of information to TVA in accordance with DOT Regulations 49 CFR 383.
3. Drivers of CMVs must receive additional training such as the National Safety Council's "Professional Truck Driver Course" or equivalent. (Heavy Equipment Department [HED] can provide this training as well as training to prepare employees to qualify for a CDL.)
4. CMV drivers subject to carrying hazardous materials in quantities that require placarding of the vehicle will receive the initial 56-hour Hazardous Materials (HAZMAT) training and 8-hour annual update training.
5. Drivers of CMVs must be trained on Cargo Securement Rules in Appendix E, Cargo Securement Rules. **NOTE: TVA Training & Development has been requested to develop a training course to assist in fulfilling this requirement. Full implementation of the cargo securement rules at Appendix E is not required until March, 2009, after completion of training is developed.**

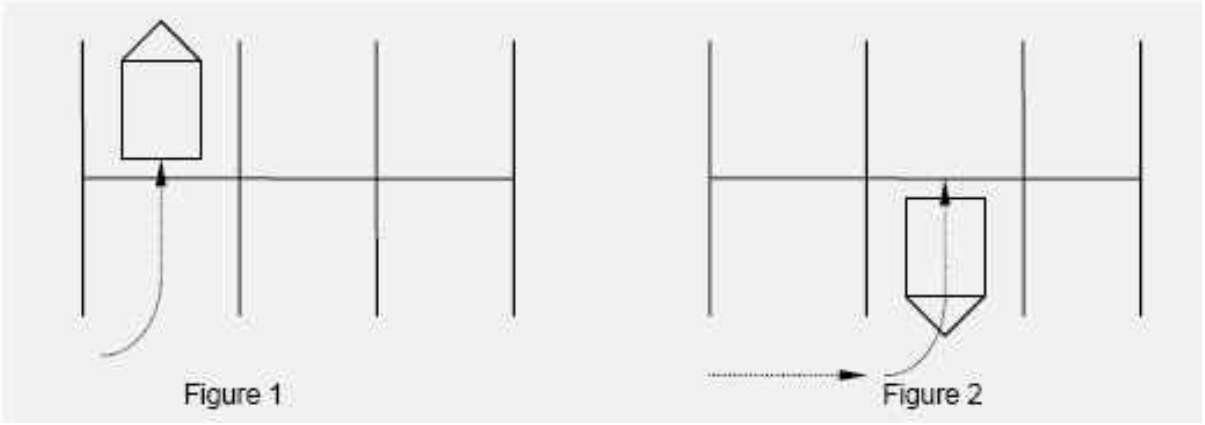
Vehicle Accidents

1. Vehicle operators must immediately report any vehicle accident, theft, or fire to their supervisor, TVA Police (1-800-824-3861), and local police. Injuries resulting from a vehicle accident must be reported in accordance with requirements in TVA Safety Procedure 13, "Report and Investigate Injuries and Illnesses".
2. Vehicle operators must carry a copy of TVA’s “Proof of Insurance” document when operating a TVA vehicle or a vehicle rented for official TVA business. A copy of the document can be found at http://insidenet.tva.gov/org/admin/ins_proof.htm.
3. If injuries are involved, obtain medical help for non-TVA as well as TVA employees, arrange for and authorize emergency treatment, including conveyance to a physician or hospital.
4. Preserve the accident scene; take names and addresses of any witnesses; do not admit fault. TVA Police investigates the vehicle accident by completing form TVA 11667, "Uniform Incident Report."
5. Injuries and motor vehicle accidents are not considered work-related if they occur during travel from the employee’s home to the employee’s current work station, even if travel involves a TVA motor vehicle assigned to the employee for mutual convenience to TVA and the employee. Such incidents are considered work-related if the employee is driving a TVA vehicle while in official work status or if TVA provides special transportation from and/or back to a designated reporting place. This does not include van pools.
6. PSO Vehicle Accident Reporting
    1. PSO drivers involved in vehicle accidents shall initiate form TVA 255, Report of Vehicle Accident [2], and forward to the immediate supervisor. The form is completed by the supervisor and forwarded TVA Safety-PSO.
    2. Upon notification of a vehicle accident, PSO Supervisors shall complete the Notice of Vehicular Accident (NOV), Appendix D. The NOV shall be distributed to line management through the Vice President level and to TVA Safety-PSO.
    3. TVA Safety determines if the accident was “driver controllable” or “non-driver controllable”.
    4. Alcohol and drug tests are administered following a vehicle accident in accordance with applicable TVA alcohol and drug testing procedures. Non-DOT tests are governed by Employment Procedure 11 [3]. DOT tests are governed by Employment Procedure 12 [4]. Supervisors should seek consultation, if time permits, with a Human Resources representative and TVA Fitness for Duty Staff before requesting alcohol and drug testing.

Parking

PSO and FM Parking Policy

1. When possible, vehicles are parked such that backing will not be required when the vehicle is moved.
2. Where possible, vehicles are driven through “straight” parking spaces (Figure 1) and parked to exit by driving forward. When a “drive-through” space is not available, the vehicle will be backed into the “straight” parking space (Figure 2).



Backing Policy

1. When backing a vehicle, the driver must determine that the vehicle can be backed safely.
2. When another employee is available, he or she will assist the driver to safely back the vehicle.

Driver Responsibilities

1. The vehicle driver is expected to follow the above policies when parking or backing.
2. The driver must conduct a “safety walk around” inspection of the vehicle and surrounding area prior to placing the vehicle in motion.

Manager/Supervisor Responsibilities

Managers and supervisors will communicate the above policies to employees who drive TVA-owned, leased, or rented vehicles and will enforce these policies in their work units. Back-up alarms are required on all PSO-assigned, TVA-owned work vehicles (pick-up trucks, 2- and 4-wheel drive vehicles; cargo and mini vans; station wagons; sport utility vehicles; and TVA-owned sedans) after March 19, 1999.

Maintenance of Over the Road Heavy Equipment

1. While TVA is not a DOT-regulated “motor carrier”, HED maintains over-the-road equipment in a manner consistent with the obligations placed on “motor carriers” under 49 CFR 96, "Inspection, Repair, and Maintenance," to ensure that vehicle parts and accessories are in safe and proper operating condition at all times. These include those specified in 49 CFR 393, "Parts and Accessories Necessary for Safe Operation," and any additional parts and accessories which may affect safety of operation.
2. HED conducts periodic inspections consistent with 49 CFR 396.17, and maintains appropriate records of inspections, repairs, and maintenance indicating their date and nature.
3. All inspections, maintenance, repair, or service to brakes are conducted by mechanics meeting qualification requirements of 49 CFR 396.25, "Qualifications of Brake Inspectors."
4. Modifications made to over-the-road equipment are designed in adherence to national consensus standards and the Society of Automotive Engineers standards. Modifications are not to be made except by HED (using DOT certified mechanics) to meet revised DOT requirements, or by the original equipment manufacturer (OEM).

5. HED provides organizations with state vehicle load width/size limitations and coordinates state permits, if required.
6. HED reviews 49 CFR 393 and 396 annually to ensure that over-the-road equipment is modified, inspected, and maintained consistent with current DOT requirements. Corporate Safety will be notified of any revisions that would require changes to this procedure.

Review of Applicable DOT Standards

The Office of the General Counsel (OGC) reviews the Federal Register for proposed changes to applicable DOT regulations, and inform/provide copies to responsible organizations for comment and/or implementation. OGC will notify Corporate Safety of any revisions that would require changes to this procedure.

Definitions

Commercial Driver's License (CDL) - A license issued by a state, in accordance with the standards contained in 49 CFR Part 383, to an individual which authorizes the individual to operate a class of commercial motor vehicle.

Commercial Motor Vehicle (CMV) (as defined by 49 CFR Part 383) - A motor vehicle or combination of motor vehicles used in commerce to transport passengers or property if the motor vehicle (a) has a gross combination weight rating of 26,001 or more pounds inclusive of a towed unit with a gross vehicle weight rating of more than 10,000 pounds; (b) has a gross vehicle weight rating of 26,001 or more pounds; (c) is designated to transport 16 or more passengers, including the driver; or (d) is of any size and is used in the transportation of materials found to be hazardous for the purposes of the Hazardous Materials Transportation Act and which require the motor vehicle to be placarded under the Hazardous Materials Regulations (49 CFR Part 172, subpart F).

Endorsement - An authorization to an individual's CDL required to permit the individual to operate certain types of commercial motor vehicles.

Gross Combination Weight Rating (GCWR) - Means the value specified by the manufacturer as the loaded weight of a combination (articulated) vehicle. In the absence of a value specified by the manufacturer, GCWR will be determined by adding the GVWR of the power unit and the total weight of the towed unit and any load thereon.

Gross Vehicle Weight Rating (GVWR) - Means the value specified by the manufacturer as the loaded weight of a single vehicle.

Physician Certification (medical examiners certificate) – Attestation of medical suitability consistent within accordance 49 CFR 391.11.

TVA Motor Vehicle - A vehicle, tractor, trailer, or semitrailer propelled or drawn by mechanical power, upon which or by which any person or property may be transported, on a public highway and/or public access road and which is owned, leased, rented, or controlled by TVA. This definition excludes motor vehicles not designed for use on public highways and/or public access roads such as road building machinery, crawler cranes, forklifts, three or four-wheel type scooters, and all terrain vehicles (ATVs).

Reference

49 CFR 382, "Controlled Substances and Alcohol Use and Testing."

49 CFR 383, "Commercial Driver's License Standards; Requirements and Penalties."

49 CFR 391.11, "Qualification of Drivers." (Requirement referenced in 49 CFR 383.71.) 15.4. 49 CFR Part 393, "Parts and Accessories Necessary for Safe Operation." 15.5. 49 CFR Part 396, "Inspection, Repair, and Maintenance."

49 CFR Part 397, "Transportation of Hazardous Materials; Driving and Parking Rules."

49 CFR Part 172, "Hazardous Materials Tables and Hazardous Materials Communications Requirements and Emergency Response Information Requirements."

TVA Safety Procedure 13, " Report and Investigate Injuries and Illnesses,"

TVA Employment Procedure 12, “TVA Department of Transportation (DOT) Alcohol and Drug (A&D) Testing Program

TVA Safety Procedure 1018, “Vehicle Operations Near Energized Lines or Equipment”

Appendices

Appendix A, Accountability Matrix for all Drivers

Accountability Matrix for all Drivers

Corporate Organizations	Line Organizations	Employees
*Update this criteria document as needed to ensure it remains current. *Establish TVA medical vendor contracts that provide for evaluation of any suspected health-related condition when referred by the line organization. *Perform periodic evaluations to assess how effectively this criteria document is being implemented by all responsible parties. **TVA Police** *Investigate motor vehicle accidents	*Ensure that employees meet the minimum requirements in this document for the vehicle under consideration prior to being authorized to drive that vehicle on TVA business. *Ensure that supervisors and employees obtain the required training as specified in this document. *Refer employees for medical or other clinical evaluations of any suspected health-related condition, which could affect the safe operation of a vehicle. *Establish and communicate specific additional motor vehicle policies based on an assessment of their accident experience, exposure, and mission requirements. *Communicate and enforce seat belt usage.	*Must be at least 18 years old. *Do not drive without a current valid state driver's license from your state of domicile in your possession. *Must understand the English language sufficiently to be able to properly recognize highway traffic signs and signals. *Be authorized by supervision to operate a specific motor vehicle. *Obey all motor vehicle laws and regulations including TVA's and your organization's requirements. *Respond to traffic violations and pay any fines assessed. *Notify supervision if their state driver's license is suspended or revoked. *Notify your supervisor of any medical, physical or emotional condition that might adversely affect your ability to safely operate a motor vehicle. *Familiarize yourself with critical vehicle controls. *Check vehicle condition and ensure the correction of safety deficiencies prior to vehicle operation. *Follow safe procedures for cell phone usage (Cell Phone Safety). *Report all motor vehicle accidents to supervision, TVA Police and local police.

		*In the event of an injury accident see to the medical needs of all involved. *If an accident occurs preserve the scene and do not admit fault. *Carry a copy of TVA's "Proof of Insurance" document when operating a TVA vehicle or a vehicle rented for official TVA business.

Appendix B, Accountability Matrix for CMV Drivers

Accountability Matrix CMV Drivers

Corporate Organizations	Line Organizations	Employees
*Update this criteria document as needed to ensure it remains current. *Establish TVA medical vendor contracts that provide for evaluation of any suspected health-related condition when referred by the line organization. *Perform periodic evaluations to assess how effectively this criteria document is being implemented by all responsible parties. **TVA Police** *Investigate motor vehicle accidents. *Perform periodic checks of the National Motor Vehicle Data Base to verify that an employee's CDL has not been suspended or revoked. **General Counsel** *Review the Federal Register for changes to DOT regulations, inform organizations of changes, and notify Corporate Safety of any revisions requiring a change in this document.	*Ensure that employees meet the driver qualifications as stated in this implementing criteria document prior to being authorized to drive that vehicle on TVA business. Ensure that these qualifications are maintained. *Do not allow employees to operate a CMV if their CDL is suspended, revoked, canceled, or subject to an out-of-service order. *Do not allow employees to operate a CMV if they are found in violation of a Federal, State, or local law or regulation pertaining to railroad-highway grade crossings. *Ensure employees obtain the required training as specified in this document including: -- National Safety Council's "Professional Truck Drivers Course" or equivalent. -- If hazardous materials are carried the initial 56-hour Hazardous Materials training and 8-hour annual update training. *Provide drivers a copy of Appendix C to this document and obtain a signed receipt. *Inform drivers of periodic TVA checks of driving records. *Ensure supervisors obtain the required training as specified in this document including 2 hours of training on determining the need for alcohol/drug testing.	*Must be at least 21 years old. *Possess only one valid CDL and do not drive without it in your possession. *Possess a current medical examination certification and do not drive without it in your possession. *Must understand the English language sufficiently to be able to properly recognize highway traffic signs and signals. *Be authorized by supervision to operate a specific motor vehicle. *Notify your supervisor in writing within 2 days of the arrest or charge of any moving violation and the state issuing your license within 30 days of any violation in another state. *Notify your supervisor within one working day if your CDL has been suspended, revoked, or canceled, or if otherwise disqualified from operating a CMV in any state. *Obey all motor vehicle laws and regulations including TVA's and your organization's requirements. *Respond to traffic violations and pay any fines assessed. *Notify your supervisor of any medical, physical or emotional condition that might adversely affect your ability to safely operate a motor vehicle.

	*Do not allow employees to operate a CMV if they have a condition that might adversely affect their ability to safely operate the vehicle. *Refer to H&S any suspected health-related condition, which could affect the safe operation of a vehicle. *Establish and communicate specific additional motor vehicle policies based on an assessment of your accident experience, exposure, and mission requirements. *Communicate and enforce seat belt usage. *Periodically ensure that driver's qualifications are current. **Heavy Equipment Department** *HED maintains and inspects over-the-road equipment. *HED makes modifications to over-the-road equipment. *HED provides organizations with state load width/size limitations and coordinates state permits, if required. *HED reviews 49 CFR 393 and 396 annually to ensure equipment is modified, inspected, and maintained consistent in accordance with current DOT requirements. Corporate Safety will be notified of any revision requiring a change in this document.	*Familiarize yourself with critical vehicle controls. *Check vehicle condition and ensure the correction of safety deficiencies prior to vehicle operation. *Follow safe procedures for cell phone usage (Cell Phone Safety). *Report all motor vehicle accidents to supervision, TVA Police and local police. *In the event of an injury accident see to the medical needs of all involved. *If an accident occurs preserve the scene and do not admit fault. *Carry a copy of TVA's "Proof of Insurance" document when operating a TVA vehicle or a vehicle rented for official TVA business

Appendix C, TVA Commercial Vehicle (CMV) Drivers Reporting Requirements and Disqualification Penalties

Department of Transportation (DOT) regulations require drivers of Commercial Motor Vehicles (CMV) as defined under 49 CFR Part 383 to follow requirements outlined in this information sheet. These regulations apply to you if you are subject to drive a single or combination of motor vehicles that (1) has a gross combined weight rating (GCWR) of 26001 or more pounds; (2) one designated to transport 16 or more passengers, including the driver; or (3) is of any size and is used in the transportation of hazardous materials which requires the motor vehicle to be placarded under the Hazardous Materials Regulations (49 CFR part 172, subpart P).

Driver's License Requirements

You may have only one state driver's license. To drive a CMV, you must have a Commercial Driver's License (CDL) issued by the state in which you are domiciled. Any person knowingly or willfully violating this requirement is subject to a fine not to exceed $5,000 or imprisonment for a term not to exceed 90 days, or both.

Notification Requirements

If you drive a CMV as defined above, you must (1) notify your supervisor (in writing) of any moving violation within 2 days of your arrest or charge; (2) within 30 days of your arrest or charge, notify the state agency issuing your license of any moving violation committed in another state; and (3) notify your supervisor within one working day if your driver's license is suspended, revoked, or canceled, or if you are otherwise disqualified from operating these vehicles in any state. These notification requirements apply even when drivers of above vehicular classifications commit moving violation in other vehicles (including a privately-owned vehicle) not meeting the definition of CMVs. Any person knowingly or willfully violating this requirement is subject to a fine not to exceed $5,000 or imprisonment for a term not to exceed 90 days, or both.

The notification to the state official and employer must be made in writing and contain the following information.

1. Driver's full name.
2. Driver's license number.
3. Date of conviction.
4. Nature of violation of a state or local law relating to motor vehicle traffic control (other than a parking violation).
5. Indicate whether the violation was in a CMV.
6. Location of offense.

7. Driver's signature.

A summary of federal disqualification penalties follows. The complete recitation (or list) test of the penalties can be found in 49 CFR Part 383.

Federal Disqualification Penalties

1. Under the DOT regulations, a CMV operator who is found to have committed a first violation of the following must be disqualified from driving a CMV for a year.
   - Driving a CMV under the influence of alcohol or a controlled substance. *
   - Leaving the scene of an accident involving a CMV.
   - Operating a CMV in the commission of a felony other than a felony described in item 4 below.
2. If the operator commits any of the above violations while carrying hazardous materials, the disqualification will be for three years.
3. Under the DOT regulations, a CMV operator who is found to have committed a second violation of any of the offenses described in 1. above must be disqualified for life from driving a CMV.
4. Using a CMV in the commission of a felony involving the manufacturing, distributing, or dispensing of a controlled substance or possession with intent to distribute will result in a disqualification from driving a CMV for life.
5. Under the DOT regulations, a driver is disqualified for a period of not less than 60 days if in a three-year period the driver has committed two serious traffic violations in a CMV and for not less than 120 days if the driver has committed three serious traffic violations in a three-year period.
   NOTE: Driving a CMV while under the influence of alcohol includes:
   - Driving a CMV while the person's alcohol concentration is 0.04 percent or more,
   - Driving under the influence of alcohol as prescribed by state law, or
   - Refusal to undergo such testing as is required by any state or jurisdiction in the enforcement of this requirement.

   "Serious traffic violation" means conviction, when operating a CMV, of:
   - Excessive speeding involving any single offense for any speed of 15 miles per hour or more above the posted speed limit.
   - Reckless driving, as defined by state or local law or regulation, including but not limited to offenses of driving a CMV in willful or wanton disregard for the safety of persons or property.
   - Improper or erratic traffic lane changes.
   - Following the vehicle ahead too closely.
   - A violation, arising in connection with a fatal accident, of state or local law relating to motor vehicle traffic control (other than a parking violation). (Serious traffic violations exclude vehicle weight and defect violations.)
6. Under DOT regulations, disqualification for violating out-of-service orders would mean disqualification of not less than 90 days nor more than 1 year for a first offense. For a second offense within 10 years, the disqualification would be not less than 1 nor more than 5 years. For a third offense in a 10-year period, the disqualification would not be less than 3 nor more than 5 years. The initial disqualification for drivers carrying hazardous materials or more than 15 passengers would be not less than 180 days nor more than 2 years for the first offense. In addition to disqualification, drivers would be subject to civil penalties of not less than $1,000 nor more than $2,500.

Appendix D, PSO Notice of Vehicular Accident

Name of TVA Driver
Employee ID
Job Classification
Date / Time of Accident
Date / Time Reported to Foremen or Supervisor
Date / Time Reported to Management
Accident Location
Local Police Called?
TVA Police Called?
TVA Vehicle Involved?
Damage to TVA Vehicle
Damage to Other Vehicle(s)
Foreman / Supervisor
Construction Foremen (ESP only)
Any Injuries?
Any Blood Exposure?
If yes to Blood Exposure, Whose Blood?
Name of Person(s) Who Contacted Blood?
Witnesses
Description of How Accident Occurred
Any Other Information
Name of Person Completing this Notice

Appendix E, Cargo Securement Rules

CARGO SECUREMENT RULES

1. Applicability of the Cargo Securement Rules
    1. This appendix provides cargo securement rules to comply with Federal Motor Carrier Safety Administration (FMCSA) requirements. Cargo must be secured in accordance with this appendix for TVA vehicles regardless of the location they are being used.
    2. The cargo securement rules in this appendix apply to trucks, truck tractors, semitrailers, full trailers, and pole trailers. The rules apply to all types of articles of cargo, except commodities in bulk that lack structure or fixed shape (e.g., liquids, gases, grain, liquid concrete, sand, gravel, aggregates) and are transported in a tank, hopper, box or similar device that forms part of the structure of a commercial motor vehicle.
    3. The FMCSA established performance standards concerning deceleration in the forward direction and acceleration in the rearward and lateral directions, that cargo securement systems must withstand. However, the new rules explicitly state that cargo immobilized or secured in accordance with the general securement rules, or the commodity-specific rules, are considered to meet the performance criteria.
2. Manufacturing Standards for Tiedown Assemblies
    1. Tiedown assemblies (including chains, wire rope, steel strapping, synthetic webbing and cordage) and other attachment or fastening devices used to secure articles of cargo to, or in, commercial motor vehicles must

conform to the applicable standards in Table 1 – Manufacturing Standards for Tiedown Assemblies on the next page.

3. Use of Tiedowns

1. Tiedowns and securing devices must not contain knots.
2. If a tiedown is repaired, it must be repaired in accordance with the applicable standards in paragraph (e) of this section, or the manufacturer's instructions.
3. Each tiedown must be attached and secured in a manner that prevents it from becoming loose, unfastening, opening or releasing while the vehicle is in transit.
4. All tiedowns and other components of a cargo securement system used to secure loads on a trailer equipped with rub rails, must be located inboard of the rub rails whenever practicable.
5. Approved edge protection must be used whenever a tiedown would be subject to abrasion or cutting at the point where it touches an article of cargo. The edge protection must resist abrasion, cutting and crushing.

Table 1 – Manufacturing Standards for Tiedown Assemblies

Table 1 – Manufacturing Standards for Tiedown Assemblies

An Assembly Component of	Must Conform to
(1) Steel strapping[1,2]	Standard Specification for Strapping, Flat Steel and Seals, American Society for Testing and Materials ASTM) $D_{3953-97}$, February 1998[4]
(2) Chain	National Association of Chain Manufacturers' Welded Steel Chain Specifications, November 15, 1999[4]
(3) Webbing	Web Sling and Tiedown Association's Recommended Standard Specification for Synthetic Web Tiedowns, WSTDA-T1, 1998[4]
(4) Wire rope[3]	Wire Rope Technical Board's Wire Rope Users Manual, 2nd Edition, November 1985[4]
(5) Cordage	Cordage Institute rope standard: (i) PETRS-2, Polyester Fiber Rope, 3-Strand and 9-Strand Constructions, January 1993;[4] (ii) PPRS-2, Polypropylene Fiber Rope, 3-Strand and 8-Strand Constructions, August 1992;[4] (iii) CRS-1, Polyester/Polypropylene Composite Rope Specifications, 3-Strand and 8-Strand Standard Construction, May 1979;[4] (iv) NRS-1, Nylon Rope Specifications, 3-Strand and 8-Strand Standard Construction, May 1979[4]; and (v) C-1, Double Braided Nylon Rope Specifications DBN, January 1984.[4]

1. Steel strapping not marked by the manufacturer with a working load limit will be considered tohave a working load limit equal to one-fourth of the breaking strength listed in ASTM $D_{3953-97}$.

2. Steel strapping 25-4 mm (1 inch) or wider must have at least two pairs of crimps in each seal and, when an end-over-end lap joint is formed, must be sealed with at least two seals.

3. Wire rope which is not marked by the manufacturer with a working load limit shall be consider to have a working load limit equal to one-fourth of the nominal strength listed in the manual.

4. See section 393.7 for information on the incorporation by reference and availability of this document.

- General Requirements for Securing Articles of Cargo

1. Cargo must be firmly immobilized or secured on or within a vehicle by structures of adequate strength, dunnage or dunnage bags, shoring bars, tiedowns or a combination of these.
2. Articles of cargo that are likely to roll must be restrained by chocks, wedges, a cradle or other equivalent means to prevent rolling. The means of preventing rolling must not be capable of becoming unintentionally unfastened or loose while the vehicle is in transit.
3. Articles or cargo placed beside each other and secured by transverse tiedowns must either:

- Be placed in direct contact with each other, or
- Be prevented from shifting towards each other while in transit.

4. Requirement for the Aggregate Working Load Limit. Minimum strength of cargo securement devices and systems. The aggregate working load limit of any securement system used to secure an article or group of articles against movement must be at least one-half times the weight of the article or group of articles. The aggregate working load limit is the sum of:
   - One-half the working load limit of each tiedown that goes from an anchor point on the vehicle to an attachment point on an article of cargo; and
   - The working load limit for each tiedown that goes from an anchor point on the vehicle, through, over or around the cargo and then attaches to another anchor point on the vehicle.
5. Determining the working load limit of a tiedown.
   - The working load limit (WLL) of a tiedown, associated connector or attachment mechanism is the lowest working load limit of any of its components (including tensioner), or the working load limit of the anchor points to which it is attached, whichever is less.
   - The working load limits of tiedowns may be determined by using either the tiedown manufacturer's markings or by using Table 2 – Values of Working Load Limits for Tiedowns. The working load limits listed in Table 2 – Values of Working Load Limits for Tiedowns are to be used when the tiedown material is not marked by the manufacturer with the working load limit. Tiedown materials which are marked by the manufacturer with working load limits that differ from Table 2 – Values of Working Load Limits for Tiedownsshall be considered to have a working load limit equal to the value for which they are marked.
   - Synthetic cordage (e.g., nylon, polypropylene, polyester) which is not marked or labeled to enable identification of its composition or working load limit shall be considered to have a working load limit equal to that for polypropylene fiber rope.
   - Welded steel chain, which is not marked or labeled to enable identification of its grade or working load limit, shall be considered to have a working load limit equal to that for grade 30 proof coil chain.
   - Wire Rope
     - Wire rope which is not marked by the manufacturer with a working load limit shall be considered to have a working load limit equal to one-fourth of the nominal strength listed in the Wire Rope Users Manual.
     - Wire which is not marked or labeled to enable identification of its construction type shall be considered to have a working load limit equal to that for 6 x 37, fiber core wire rope.
   - Manila rope which is not marked by the manufacturer with a working load limit shall be considered to have a working load limit based on its diameter as provided in the tables of working load limits.
   - Friction mats which are not marked or rated by the manufacturer shall be considered to provide resistance to horizontal movement equal to 50 percent of the weight placed on the mat.

Table 2 – Values of Working Load Limits for Tiedowns

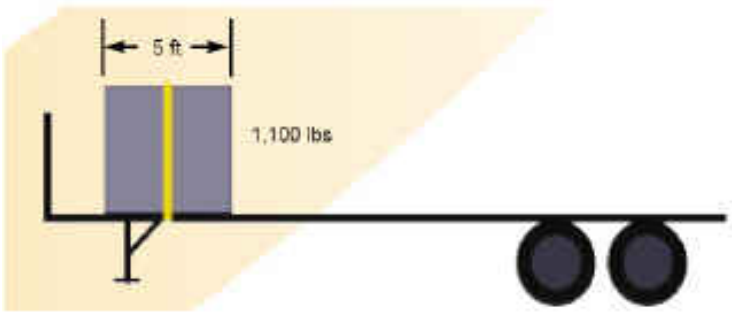
[Working Load Limits (WLL), Chain]

Size mm (inches)	WLL in kg (lbs) Grade 30 proof	Grade 43 high test	Grade 70 transport	Grade 80 alloy	Grade 100 alloy
1. 7 (1/4)	580 (1,300)	1,180 (2,600)	1,430 (3,150)	1,570 (3,500)	1,950 (4,300)
2. 8 (5/16)	860 (1,900)	1,770 (3,900)	2,130 (4,700)	2,000 (4,500)	2,600 (5,700)
3. 10 (3/8)	1,200 (2,650)	2,450 (5,400)	2,990 (6,600)	3,200 (7,100)	4,000 (8,800)
4. 11 (7/16)	1,680 (3,700)	3,270 (7,200)	3,970 (8,750)		
5. 13 (1/2)	2,030 (4,500)	4,170 (9,200)	5,130 (11,300)	5,400 (12,000)	6,800 (15,000)
6. 16 (5/8)	3,130 (6,900)	5,910 (13,000)	7,170 (15,800)	8,200 (18,100)	10,300 (22,600)
Chain Mark Examples:					
Example 1	3	4	7	8	10
Example 2	30	43	70	80	100
Example 3	300	430	700	800	1000

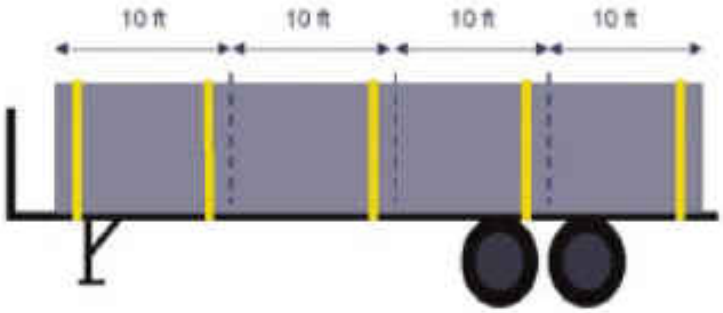
6. In addition to the requirements of 4.1 through 4.5 above, the minimum number of tiedowns required to secure an article or group of articles against movement depends on the length of the article(s) being secured, and the requirements listed below. See examples on the next page.
7. When an article is not blocked or positioned to prevent movement in the forward direction by a headerboard, bulkhead, other cargo that is positioned to prevent movement, or other appropriate blocking devices, it must be secured by at least:
   - One tiedown for articles 5 feet (1.52 meters) or less in length, and 1,100 lbs (500 kg) or less in weight;
   - Two tiedowns if the article is:
     - 5 feet (1.52 meters) or less in length and more than 1,100 lbs (500 kg) in weight; or
     - Longer than 5 feet (1.52 meters) but less than or equal to 10 feet (3.04 meters) in length, irrespective of the weight.
   - Two tiedowns if the article is longer than 10 feet (3.04 meters), and one additional tiedown for every 10 feet (3.04 meters) of article length, or fraction thereof, beyond the first 10 feet (3.04 meters) of length.
8. If an individual article is required to be blocked, braced or immobilized to prevent movement in the forward direction by a headerboard, bulkhead, other articles which are adequately secured or by an appropriate blocking or immobilization method, it must be secured by at least one tiedown for every 3.04 meters (10 feet) or article length, or fraction thereof.
9. The rules in 4.7 and 4.8 above do not apply to a vehicle transporting one or more articles of cargo such as, but not limited to, machinery or fabricated structural items (e.g., steel or concrete beams, crane booms, girders, and trusses, etc.) which, because of their design, size, shape, or weight, must be fastened by special methods. However, any article of cargo carried on that vehicle must be securely and adequately fastened to the vehicle.
10. Each tiedown, or its associated connectors, or its attachment mechanisms must be designed, constructed, and maintained so the driver of an in-transit commercial motor vehicle can tighten them. However, this requirement does not apply to the use of steel strapping.

Examples of Minimum Number of Tiedowns Based on Load Size

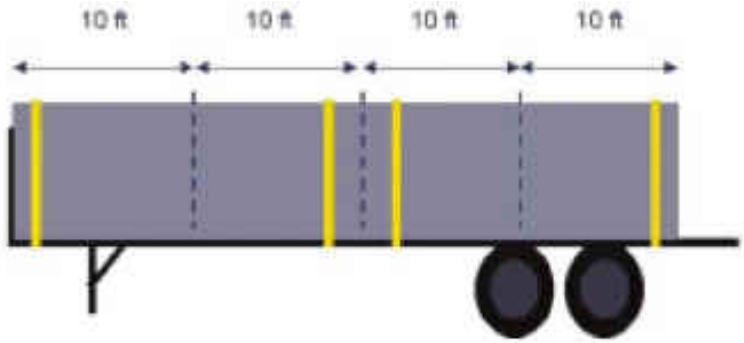
In the following example, one tiedown is required because the article of cargo is 5 ft in length and does not exceed 1,100 lbs. If the article of cargo were greater than 5 ft in length but less than 10 ft, two tiedowns would be needed regardless of the weight.



When an article of cargo is not blocked or positioned to prevent movement in the forward direction, and the item is longer than 10 ft in length, then it must be secured by two tiedowns for the first 10 ft of length, and one additional tiedown for every 10 ft of length, or fraction thereof, beyond the first 10 ft. An example of this is provided below.



If an article is blocked, braced or immobilized to prevent movement in the forward direction by a headerboard, bulkhead, other articles that are adequately secured, or other appropriate means, it must be secured by at least one tiedown for every 10 ft of article length, or fraction thereof.



- The rules for front end structures used as part of a cargo securement system are applicable to commercial motor vehicles transporting articles of cargo that are in contact with the front end structure of the vehicle. The front end structure on these cargocarrying vehicles must meet the performance requirements of 4.11 listed below.
  Front End Structure Height and Width.
  - The front end structure must extend either to a height of 4 feet above the floor of the vehicle or to a height at which it blocks forward movement of any item of article of cargo being carried on the vehicle, whichever is lower.
  - The front end structure must have a width which is at least equal to the width of the vehicle or which blocks forward movement of any article of cargo being transported on the vehicle, whichever is narrower.

  Strength. The front end structure must be capable of withstanding the following horizontal forward static load:

- For a front end structure less than 6 feet in height, a horizontal forward static load equal to one-half (0.5) of the weight of the articles of cargo being transported on the vehicle uniformly distributed over the entire portion of the front end structure that is within 4 feet above the vehicle's floor or that is at or below a height above the vehicle's floor at which it blocks forward movement of any article of the vehicle's cargo, whichever is less; or
- For a front end structure 6 feet in height or higher, a horizontal forward static load equal to four-tenths (0.4) of the weight of the articles of cargo being transported on the vehicle uniformly distributed over the entire front end structure.

Penetration resistance. The front end structure must be designed, constructed, and maintained so that it is capable of resisting penetration by any article of cargo that contacts it when the vehicle decelerates at a rate of 20 feet per second, per second. The front end structure must have no aperture large enough to permit any article of cargo in contact with the structure to pass through it.

Substitute devices. The requirements of this section may be met by the use of devices performing the same functions as a front end structure, if the devices are at least as strong as, and provide protection against shifting articles of cargo at least equal to, a front end structure which conforms to those requirements.

- Specific Securement Requirements by Commodity Type

1. The FMCSA has adopted detailed requirements for the securement of the following commodities: logs; dressed lumber; metal coils; paper rolls; concrete pipe; intermodal containers; automobiles, light trucks and vans; heavy vehicles, equipment and machinery; flattened or crushed vehicles; roll-on/roll-off containers; and large boulders. The following paragraphs cover the FMCSA requirements for intermodal containers and heavy vehicles, equipment and machinery which TVA frequently uses. If securement requirements are needed for any of the remaining commodity types the requirements can be found by going to the following link: http://www.fmcsa.dot.gov/documents/cargo/cspolicy.pdf.
2. Rules for Securing Intermodal Containers

Applicability. The rules in this section apply to the transportation of intermodal containers. Cargo contained within an intermodal container must be secured in accordance with paragraph 4 or, if applicable, the commodity specific rules of this paragraph.

Securement of Intermodal Containers Transported on Container Chassis Vehicles

- Each intermodal container must be secured to the container chassis with securement devices or integral locking devices that cannot unintentionally become unfastened while the vehicle is in transit.
- The securement devices must restrain the container from moving more than 1.27 cm (1/2 in) forward, more than 1.27 cm (1/2 in) aft, more than 1.27 cm (1/2 in) to the right, more than 1.27 cm (1/2 in) to the left, or more than 2.54 cm (1 in) vertically.
- The front and rear of the container must be secured independently.

Securement of Loaded Intermodal Containers Transported on Vehicles other than Container Chassis Vehicles

- All lower corners of the intermodal container must rest upon the vehicle, or the corners must be supported by a structure capable of bearing the weight of the container and that support structure must be independently secured to the motor vehicle.
- Each container must be secured to the vehicle by:
  - Chains, wire ropes or integral devices which are fixed to all lower corners; or
  - Crossed chains which are fixed to all upper corners; and,
- The front and rear of the container must be secured independently. Each chain, wire rope, or integral locking device must be attached to the container in a manner that prevents it from being unintentionally unfastened while the vehicle is in transit.

Securement of Empty Intermodal Containers Transported on Vehicles Other than Container Chassis Vehicles. Empty intermodal containers transported on vehicles other than container chassis vehicles do not

have to have all lower corners of the intermodal container resting upon the vehicle, or have all lower corners supported by a structure capable of bearing the weight of the empty container, provided:

- The empty intermodal container is balanced and positioned on the vehicle in a manner such that the container is stable before the addition of tiedowns or other securement equipment;
- The amount of overhang for the empty container on the trailer does not exceed 5 feet on either the front or rear of the trailer;
- The empty intermodal container must not interfere with the vehicle's maneuverability;
- The empty intermodal container is secured to prevent lateral, longitudinal, or vertical shifting.

3. **Rules for Securing Heavy Vehicles, Equipment, and Machinery**

- *Applicability.* The rules in this section apply to the transportation of heavy vehicles, equipment and machinery which operate on wheels or tracks, such as front end loaders, bulldozers, tractors, and power shovels and which individually weigh 4,536 kg (10,000 lbs) or more. Vehicles, equipment and machinery which is lighter than 4,536 kg (10,000 lbs) may also be secured in accordance with the provisions of this section; with provisions for automobiles, light trucks or vans at the link given in section **Specific Securement Requirements by Commodity Type**; or in accordance with the provisions of Paragraph 4.

- *Preparation of equipment being transported.*
- Accessory equipment, such as hydraulic shovels, must be completely lowered and secured to the vehicle.
- Articulated vehicles shall be restrained in a manner that prevents articulation while in transit.

Securement of Heavy Vehicles, Equipment or Machinery with Crawler Tracks or Wheels.

- In addition to the requirements of Paragraph 5.3.2, heavy equipment or machinery with crawler tracks or wheels must be restrained against movement in the lateral, forward, rearward, and vertical direction using a minimum of four tiedowns.
- Each of the tiedowns must be affixed as close as practicable to the front and rear of the vehicle, or mounting points on the vehicle that have been specifically designed for that purpose.

Appendix F, Requirements of Objects Extending from Rear of Vehicles

All vehicles and trailers with poles, materials, posts, or any other objects extending past 4 feet from the rear of the body or bed of vehicles will be required to have securely affixed as close to the end of any projecting load either:

1. One amber strobe-type lamp, complying with SAE J595, equipped with a multi-directional type lens so mounted as to be visible from the rear and both sides of the projecting load, multiple amber strobe lights, complying with SAE J595, shall be utilized so as to meet the visibility requirements of this subdivision. The amber strobe lamp shall flash at a rate of at least five hundred feet (500') to the rear and sides at a radius of one hundred eighty degrees of the projecting load.
2. One amber light-emitting diode (LED) light, complying with SAE J595, equipped with a multi-directional type lens, mounted so as to be visible from the rear and both sides of the projecting load. If the mounting of one amber LED cannot be accomplished so that it is visible from both sides of the projecting load, multiple amber LED lights, complying with SAE J595, shall be utilized to comply with the requirements of this procedure. The amber LED light shall flash at a rate of at least sixty (60) flashes per minute and shall be plainly visible from a distance of at least five hundred feet (500') from the rear and sides at a radius of one hundred eighty degrees of the projecting load. Any LED shall be constructed of durable, weather resistant material and may be powered by the vehicle's electrical system or by an independent battery system, or both. If the LED light is powered by an independent battery system, the driver shall have in his or her immediate possession charged, spare batteries for use in case of battery failure. Any solid state LED lighting that consists of multiple LED lights shall have eight-five (85) percent of the LED lights in operable condition.

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072560186
[2] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072561699
[3] http://chapedmw2.cha.tva.gov/dms/pc/getdocument.asp?library=chaedmp%5echachaedmp1&idmId=103160513
[4] http://chapedmw2.cha.tva.gov/dms/pc/getdocument.asp?library=chaedmp%5echachaedmp1&idmId=103160515

Procedure 611 Office Safety

TVA Safety Manual

611 Office Safety

Procedure Number 611

TVA Safety Procedure

Office Safety

Revision 2

November 01, 2005

Purpose

The purpose of this procedure is to establish requirements for safety in office areas.

Office Furniture

1. Heavy equipment and files shall be placed on structures that can support the intended load.
2. Office furniture such as tall narrow bookcases and file cabinets that may tip over shall be adequately secured.
3. The following requirements must be met to ensure that file cabinets are stable to prevent tipping when opening drawers:
   - Cabinets must be equipped with an interlock that prevents more than one drawer being opened at one time.
   - Cabinets must be secured to prevent tipping by either, (1) ganged with adjacent file cabinets and secured together; (2) equipped with an optional counterweight package; or (3) bolted to the floor or wall.
   - Cabinets must be loaded from the bottom drawer up. The heaviest contents must be loaded in the bottom drawers.
   - Only one file drawer in any file cabinet shall be opened at a time, and the drawers shall be kept closed when not in use.
4. Office furniture shall not be used as a substitute for ladders, or step stools.
5. Office furniture shall not have any rough edges, burrs, sharp corners, etc.

Office Facilities

1. Floor finishes shall be selected for anti-slip qualities. The wax used on floors should also be selected based on its anti-slip qualities.
2. Use only approved (rubber-backed or other non-slip backing) throw rugs.
3. Interior aisles shall have a minimum width of 36 inches and remain unobstructed throughout the work area.
4. Main corridors shall comply with the applicable requirements of National Fire Protection Association, Standard 101, Life Safety Code.
5. Report loose tiles, broken steps or railings immediately to the responsible facilities organization.
6. Use only step stools or ladders for climbing.

Electrical Equipment and Office Machines

1. All office machines shall be Underwriter Laboratories listed and be provided with a grounded service cord or double insulated.
2. Do not connect multiple outlet extension cords into other multiple outlet extension cords.
3. Immediately unplug any electrical device that smokes, sparks or delivers an electrical shock and report to the responsible repair personnel.
4. Avoid running electrical cables and cords in way that may create a tripping hazard or may be damaged by traffic.
5. Coffee making appliance shall be grounded, UL listed and placed on a noncombustible surface that is at least 3 feet from unprotected combustible material.
6. Portable electrical heaters shall not be placed near flammable or combustible material.
7. Portable electrical heaters shall be provided with an automatic power cutoff switch that will activate when the heater is tipped over.
8. Portable fans shall not be plugged into electrical receptacles while making adjustments or moving the fan to other locations. Portable fans shall be guarded with no opening in the guard greater than ½ inch.
9. Defective electrical cords or defective electrical equipment shall not be used.

Office Tools

1. Sharp edges on tools such as exacto knives shall be guarded.
2. When using exacto knives, the cutting action should be away from the body.
3. Waste receptacles appropriate for the work environment shall be provided.
4. The blades of hand-operated paper cutters shall be kept in the down position and locked when not in use. Guards for paper cutters shall be kept in place at all times.

Office Housekeeping

1. Objects on the floor and spilled liquids shall be cleaned up immediately.
2. Materials stored in offices shall be kept in a manner that does not create a hazard.

Procedure 612 Warning Signs

Procedure 613 Clearance Procedure to Safely Control Hazardous Energy Using Group Tagout

TVA Safety Manual

613 Clearance Procedure to Safely Control Hazardous Energy Using Group Tagout

Procedure Number 613

TVA Safety Procedure

Clearance Procedure to Safely Control Hazardous Energy Using Group Tagout

Revision 6

November 3, 2010

Purpose

This procedure establishes standardized requirements for group tagout (hereafter referred to as clearance) to safely control hazardous energy. Implementing the requirements of this procedure demonstrates a level of safety equivalent to that obtained by the use of a lockout program. This procedure is used to ensure that before performing work on machines or equipment where the unexpected energizing, start up, or release of stored energy could occur and cause injury or property damage, the machine or equipment is isolated from its energy source and rendered non-operative.

For any task where hazardous energy can not be safely controlled by implementing the requirements of this procedure, the work is considered “working on energized equipment” and must be approved by the Management Official-In-Charge (MOIC) (refer to TSP 1021 Working On / Or Near Energized Electrical Equipment).

Scope

1. This procedure applies to work on machines and equipment under plant control where unexpected energizing, start up, or release of stored energy could occur and cause injury during servicing, maintenance, or modification activities.
2. When plant status is other than “operating” or “recovery”, e.g., deferred, cancelled, or decommissioned, TSP 613 will apply unless the MOIC approves the use a different TVA approved lockout/tagout procedure.
3. Servicing and/or maintenance that takes place during normal production operations is covered by this procedure if:
    1. An employee is required to remove or bypass a guard or other safety device; or
    2. An employee is required to place any part of his or her body into an area on a piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during a machine operating cycle.

    Note: Exception to this paragraph: Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, are not covered by this procedure if they are routine, repetitive, and integral to the use of the equipment for production, provided that the work is performed using alternative measures which provide effective protection to the employee. Minor servicing includes connecting maintenance and test equipment, pump and piping venting, cap and flange removal, instrumentation calibration, and connection of test instruments to circuits.

4. TSP 613 applies to contractor owned and operated equipment/facilities or equipment/facilities under contractor construction and installation only where such equipment/facilities are physically connected at an energy connection point to TVA operated equipment/facilities. When a contractor has contractually agreed to the use TSP 613, it applies to all the contractor owned and operated equipment/facilities or those under construction.
5. When a contractor's clearance procedure is in use at a contractor construction site or operating facility on TVA property, TVA employees who are physically on the construction site or in the facility must receive the appropriate level of training, e.g., affected or authorized employee, on the contractor procedure. When TVA employees are on the site or in the facility, they must comply with the contractor procedure restrictions and prohibitions, e.g. danger tags and/or locks.
6. This procedure applies to personnel who work on generating plant machines and equipment including TVA, contractor, and staff augmented employees. When outside service personnel perform activities on equipment, this procedure is used to establish the necessary clearance.
   Note: Members of the public who may be on TVA property for non-TVA business reasons, such as fishermen are not within the scope of this procedure. See Note to paragraph 5.3.6.1 for requirements on securing energy isolation devices in public access areas.
7. This procedure establishes the minimum requirements for group lockout/tagout clearances. Organizations may publish a separate clearance procedure. The content of the organizational procedure must comply with TSP 613. The organization may impose additional requirements and add clarifying details, but cannot conflict in any way with TSP 613, which is the higher tier document. The organizational procedure must be submitted to Corporate Safety in accordance with TSP 201, Safety Manual and TVA SPP-18.001, "Develop Safety Program Documentation for review by the Clearance Advisory Team (CAT) and approval by Corporate Safety prior to initial issue and before each revision.
   Note: In NPG, TSP 613 / SPP 10.2 does not apply to machines and equipment that are not an integral part of the power generation processes or equipment. Clearance requirements for these machines and equipment are in TSP 615, Hazardous Energy Control - Lockout/Tagout (LOTO).
8. Clearances for work on or near Power System Operation (PSO) controlled equipment are obtained from the transmission operator in accordance with the current PSO Operating Letter on clearances.
9. The requirements of this procedure to control hazardous energy are satisfied in the following situations:
   1. Work on cord and plug connected electric equipment for which exposure to the hazards of unexpected energization or start up of the equipment is controlled by the unplugging of the equipment from the energy source and by the plug being under the exclusive control of the employee performing the servicing or maintenance.
   2. Work on motor vehicles where turning the engine off and removing the ignition key would de-energize and isolate the power source and the key is retained by the employee performing the servicing or maintenance.
10. Whenever replacement or major repair, renovation, or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machines or equipment must be designed to accept a lockout device as defined in theDefinitions section item Lockout Device.

Roles and Responsibilities

1. There are five primary clearance functions/activities assigned to employees. These functions/activities are only assigned to employees who have been trained within their area of responsibility to qualify them to perform their assigned clearance functions/activities described in this procedure. The five functions/activities are the following:
   1. **Responsible Employee (RE):** Writes, prepares, and issues clearances in accordance with this procedure. A person trained as a RE may also perform the role of a QE, PAE, or Authorized Employee as described in this procedure.
   2. **Qualified Employee (QE):** Implements the clearance by operating energy-isolating devices in accordance with the clearance instructions to de-energize equipment and installing clearance tags at each isolation point. A

QE may draft clearances for RE preparation and issue. A QE may also perform the role of a PAE or Authorized Employee as described in this procedure.

3. **Primary Authorized Employee (PAE):** Holds a clearance by name on the equipment that servicing, maintenance, and/or modification will be performed and holds the clearance for the Authorized Employee(s) who performs the servicing, maintenance, and/or modification. A person trained as a PAE may also perform the role of an Authorized Employee as described in this procedure.
4. **Authorized Employee:** Performs servicing, maintenance, and/or modification on equipment that is under a clearance.
5. **Affected Employee:** Anyone in the area of components under a clearance, but not involved in the work activities covered by a clearance.

2. The MOIC designates a person(s) responsible for informing plant employees of their individual responsibilities specified in this procedure. This person(s) is responsible for issuing and maintaining current the Official Plant Clearance List approved by the MOIC that identifies by name and title each person who is authorized to be issued a clearance. Electrical representative PAEs who are authorized to receive and return ground discs will be indicated on this list.
3. The MOIC is responsible for implementing the requirements of this procedure. The MOIC may elect to designate in writing a manager(s) to perform the function of the “MOIC designee” listed in this procedure.
4. The MOIC is responsible for implementing the audit requirements of this procedure in accordance with section Conduct Clearance Process Audit.
5. A TVA level policy and oversight team, the Clearance Advisory Team, is established to serve as an advisory group to review TVA's clearance procedures periodically, provide interpretations, and recommend revisions to the procedures. This team is represented by all organizations utilizing clearance procedures and is composed of persons with extensive experience in the clearance process. The Clearance Advisory Team is responsible for recommending changes to the TVA clearance processes/procedures. Team members participate, as appropriate, with TVA Safety in annual evaluations of the clearance procedures.
6. The Designated Agency Safety and Health Official receives proposed improvements to safety documentation, obtains and resolves comments on draft procedures; refers significant unresolved issues to the Executive Committee for disposition; and approves and issues new or revised procedures.

Train Personnel

1. Employees and/or contractors are trained and examined annually relative to their responsibilities contained in this procedure. Annual refresher training will expire at the end of the quarter in which it comes due. The initial and re-training courses for each of the courses listed below are the same course. The training course is specific to the individual’s responsibilities to carryout the clearance functions assigned to their level of authorization in the organization in which they work. TVA Safety Procedure 459, “Clearance Procedure Course Standard” establishes requirements for clearance training. The training courses are as follows:

1.	Clearance Procedure (Responsible/Qualified Employee	ATIS 00059194
2.	Clearance Procedure (Primary Authorized Employee)	ATIS 00059195
3.	Clearance Procedure (Authorized Employee)	ATIS 00059196
4.	Clearance Procedure (Affected Employee)	ATIS 00059199

Note: Clearance Procedure (Affected Employee) training is not required for visitors who are escorted at all times when they are in areas where clearances may be established.

2. Additional training for employees with clearance responsibilities will be conducted as follows:
    1. When revisions are made to this procedure that change the performance of assigned roles and responsibilities. Minor changes e.g., editorial and correction of typographical errors, do not require training on the change to the procedure.
    2. When changes are made in job assignments, machines, equipment, or processes that present a new hazard.
    3. When a clearance audit reveals deviations from this procedure or inadequacies in an employee's knowledge or use of this clearance procedure.
    4. When the MOIC determines that there are deviations from or inadequacies in an employee's knowledge or use of this procedure.
3. Clearance procedure training for employees, contractors, and others must be maintained in an approved system. TVA annual and staff augmented employees training records will be maintained in HRIS-ATIS. The process for maintaining records for managed task employees, vendors, etc. is as follows:

    Note: In NPG, this process for managed task employees does not apply. Training for NPG employees, NPG contractor employees, vendors, etc. is tracked using the Human Resources Information System-Automated Training Information System (HRIS-ATIS).

    1. The individual is trained on TSP 613 as required.
    2. The individual successfully passes the associated test on his or her training.
    3. The instructor has the individual complete a TVA training roster.
    4. The instructor presents the individual with a card (form TVA 20095) that includes the person's full name (printed); one box is checked for the course completed (Affected Employee, Authorized Employee or Primary Authorized Employee (PAE)). The instructor signs and dates the card. If more than one box is checked on the card, the certification card is invalid.

        Note: The card (form TVA 20095) must be ordered from TVA Printing Services. To place a printing order, complete a Request for Copy Services form (TVA Form 51C) [1]and email it to Printing Services (pubchat2@tva.gov).
    5. The instructor maintains the original training roster for site use to validate managed task employee completion of training. The instructor mails a copy of the training roster to Training and Development, LP-5B-C, for filing. If the person trained is a managed task employee and the employer is currently using the Marsh database to track managed task employee training, a record of completion of TSP 613 training should be entered into the Marsh database.
    6. If a TSP 613 training certification card has more than one box checked or if it is not possible to determine by looking at the card what level of training the employee has received, the site training records must be reviewed for level of training completed or the employee must be retrained.

Establish a Clearance

Request Clearance

1. Before anyone performs servicing, maintenance, or modifications on a machine or equipment where unexpected energizing, start up, or release of stored energy could occur and cause injury, the hazardous energy must be safely controlled in accordance with this procedure.
2. For equipment under the control of the plant, a person that identifies the need for a clearance on equipment to perform maintenance, servicing, and/or modification work must submit TVA Form 17987, “Request for Clearance,” [2] to the RE to identify the component(s) and scope of work. This documentation is submitted as required by the organization’s work management process.
3. Each person with a different scope of work, requests a clearance in accordance with section "Request Clearance" even though a clearance may have been issued for other work activities on the same equipment. This separate clearance request is necessary because equipment is cleared for specific work and cannot be considered safe for any work except that for which it is cleared. If the scope of work changes after a clearance has been requested, an additional clearance request must be submitted.
4. For equipment under the control of the transmission operator, a plant employee needing a clearance on equipment to perform maintenance, servicing, and/or modification work submits form TVA Form 6615, Request for Clearance System Operations and Load Dispatching [3], to the plant representative, who interfaces with the transmission operator. The request identifies the component(s) to be cleared and scope of work. A 7-day advance notice of the need for a transmission system clearance and a 3-day advance notice for all other clearances is required to avoid a delay in getting equipment removed from service. Plant representative submits TVA Form 6615 [3] in accordance with the current “Process for Obtaining an Outage of Transmission Facilities” to the PSO Transmission Maintenance Manager (TMM). The request must have the following information:
    - The equipment or lines to be cleared,
    - The work order number,
    - The nature of the work to be performed, and
    - The estimated time required to perform the work.
5. Clearances on TVA switchyard equipment/lines and the equipment/lines of other utilities and municipalities with a dispatching organization must be obtained from the TVA transmission operator except in cases where an emergency exists and communication with the transmission operator is impossible. In an emergency, follow the requirements of Section Prepare Clearance, paragraph 14.
6. Where there is no disconnect switch between the generator and the main transformer bank, the following will apply:
    1. The transmission operator will obtain a plant clearance on hazardous energy sources for work in the switchyard from the plant RE. When it is necessary to issue a clearance to the transmission operator for this purpose, then the clearance is issued to the transmission operator by title and no walk down by the transmission operator of the clearance boundaries is required.
    2. The plant RE will obtain a system separation clearance from the transmission operator before placing a plant clearance on generator, transformer or associated equipment. The plant clearance shall include the system separation boundary points.
    Note: In RO, the RE will request the Transmission Operator to determine if a system separation clearance is necessary.
    3. The RE will hold the PSO system separation Hold Order by title and record in the remarks section of the plant TVA Form 17982, Clearance Coversheet [4] the system separation Hold Order number being held for that plant clearance. The PSO system separation clearance shall stay in effect until the related plant clearance(s) is closed.

Prepare Clearance

1. The RE prepares a clearance in accordance with Appendix B - "Instructions for Completing Clearance Sheets." This documentation includes the positioning of energy-isolating devices and the appropriate means to control residual and/or stored energy for the application of clearance tags. The source of an active clearance can come from an automated system that contains approved standard energy isolation clearance templates or archived clearances, or a hand written clearance. No matter what the source is for writing the clearance, all active clearances have to be verified correct in accordance with this procedure including those that are developed from a standard clearance, archived clearance or a hand written clearance.
   Note: In NPG and FPG except for CT, the clearance must be reviewed and verified by a second RE. Clearances that have Caution Order tags only do not require review and verification by a second RE.
   Note: In FPG, the clearance must list all work order numbers in the eSOMS Work Order/CPAL section.
2. For equipment under the plant's control, the RE reviews the clearance request and the necessary information such as drawings and other documents to identify the energy-isolating control devices necessary to safely clear the equipment. If a clearance temporary lift has been requested, the RE notes this request in the "Remarks Section" of the clearance.
   Note: In NPG, the RE shall use controlled drawings or other controlled documents as references when preparing clearances. Recommended isolation points listed on the clearance request shall be verified using controlled drawings.
   Note: In FPG, prior to the clearance being written, a RE will review the Request for Clearance with the requestor using Section 1 of the Clearance RE/PAE Discussion Checklist (Appendix L) as a guide to discuss the work to be performed under the clearance. The Discussion Checklist with Section1 completed is attached to the Request for Clearance.
3. The RE will determine for a given clearance request, if more than one clearance must be held to safely perform the stated work. If more than one clearance must be held, the RE will list the required clearances in the "Other clearances required to be held for this work" section of the Request for Clearance AND in the remarks section of the clearance. The RE will communicate to each PAE who signs-on the clearance, all clearances that must be held to safely perform the scope of work.
4. Work must not be performed on an energy isolating device used to establish a clearance that makes the device unable to function as an energy isolating device for that clearance.
5. If up-to-date documents are not available, the RE is responsible for a walk down being performed on the equipment to determine the necessary energy isolation control points. The RE may request assistance from the MOIC or the MOIC designee when up-to-date prints are not available in the control room.
6. A non-energy-isolating device, i.e. local control push buttons, hand-switches, and computer software switches (soft tags), cannot be used as an energy-isolating device for a clearance; however, they may be tagged as necessary for information purposes.
7. The RE determines the appropriate means to control any potentially hazardous residual or stored energy in the equipment. The energy will be appropriately removed, relieved, discharged, restrained, or otherwise rendered safe. An adequate number of devices, i.e., vents, drains, and dump valves, used to depressurize or drain components are identified to be tagged in the open position or the appropriate controls in accordance with Appendix E, "Special Requirements for Mechanical Equipment Clearances," are established by the clearance.
8. The RE develops the clearance to configure energy-isolating devices in such a manner that energy cannot be applied to the isolating device that causes it to operate or to fail as an isolating device.
9. Tags-plus establishes another step in addition to hanging a danger tag that prevents inadvertent re energization resulting from a single human error or mistake at an energy isolation device. "A single error or mistake" means operation of one tagged energy isolation device. Examples of tags-plus are shown in Appendix C - "Increasing Single Point Isolation Safety (Tags-Plus)." The RE fulfills the tags-plus requirement by either (1) writing a clearance such that the configuration of isolating devices, e.g., double-valving or racking a breaker, satisfies the

tags-plus criteria or (2) identifying in the “Clearance Tag List and Operational Steps” the need for a tags-plus device on particular energy isolating component(s). When the RE is uncertain about meeting tags plus (configuration of energy isolating devices or the use of a tags-plus device), the RE will consult with the MOIC or the MOIC designee.

10. The RE uses the special requirements for clearances on plant equipment listed in Appendix D - “Special Requirements for Plant Electrical Equipment Clearances,” and Appendix E, “Special Requirements for Mechanical Equipment Clearances,” in writing clearance instructions.
11. The RE determines which type of tag is necessary to place on each device used to establish the clearance in accordance with the following:
    1. The RE prepares danger tags specific to the clearance using the tag specified in Appendix F, “Danger Tag.”
    2. The RE prepares caution tags using the tag and procedure specified in Appendix G, “Caution Tag.”
    3. The RE prepares Operating Permit tags using the tag and procedure specified in Appendix H, “Operating Permit.”

       Note: In NPG, the RE indicates the sequence for hanging and removal of clearance tags on the clearance sheet. Components with the same sequence number may be manipulated in any order within their sequence.

       Note: In NPG, at a RCS/Moderator temperature of less than or equal to 200°F, tags placed inside containment may be composed of standard tag material and attached to devices with a standard red cable tie. With a RCS/Moderator temperature in excess of 200°F, only tags and their associated attachment device which are approved for use inside containment will be used. Before exceeding a RCS/Moderator temperature of 200°F, an audit of all clearances in effect will be conducted for the purpose of identifying all tags in containment. Those tags and their attachment devices shall be visually inspected and verified to be made of materials approved for use inside containment.
    4. A clearance may list devices and steps as required to support placing or removing the clearance without requiring placement of an actual clearance tag, i.e., drain valve opened but not tagged. When listed in this manner, configuration of such devices is not controlled by the clearance.
12. Permits required to implement a clearance (e.g., breaches for containment, fire protection impairments and associated compensatory measures, etc.) must be in established in accordance with the applicable permit procedure.
13. The employee who performs the switching will retain locally either (1) a copy of the transmission operator switching order or (2) a completed clearance for each transmission operator clearance issued at the plant. Only the date, transmission operator’s clearance number, apparatus held, and a list of all energy-isolating devices tagged need to be filled out on the clearance instruction.
14. When grounds are placed in conjunction with the transmission operator’s clearance, the TVA Form 7295 [5] is attached to the clearance instruction.
15. In the event communication with the transmission operator is impossible and an emergency clearance is required, the necessary switching operations, including placing the clearance tags and issuing the clearance, will be performed by the available qualified personnel, i.e. RE, QE, or PAE. The qualified person directing the work of restoring service or removing a hazard is responsible for issuing such clearances, as are necessary. In cases where the emergency procedure is used, a complete record of the operation and the work performed must be reported to the transmission operator in control of the equipment/lines involved as soon as possible.

De-energize and Tag Equipment

1. Employees whose jobs require them to operate equipment on which a clearance will be issued for servicing, maintenance, or modification are notified that tagout devices will be applied by the implementation of Sections Prepare Clearance and De-energize and Tag Equipment.
2. The RE evaluates clearances that affect systems common to other units to ensure that conditions in all units allow the equipment/system to be removed from service. If the RE has questions or concerns about clearances that share common systems or impact other units, the RE will discuss the steps necessary to accomplish the requested clearance with the MOIC or the MOIC designee.
3. The RE is responsible for ensuring that the equipment to be cleared is properly removed from service (shutdown) and made available for clearance.
   In NPG, the RE, with a Senior Operator License, must approve the clearance for placement and determines if Technical Specification (TS), Fire Protection, Off-site Dose Calculation Manual (ODCM), Technical Requirements Manual (TRM), Independent Spent Fuel Storage Installation (ISFSI) or other plant requirements can be met and ensures appropriate tracking documents (e.g., Limiting Condition for Operation (LCO) Log, etc.) are initiated as required.
4. The RE reviews the clearance instruction with the QE and answers any questions.
5. The RE provides the clearance instruction and tags to the QE.
6. The QE performs and documents the following steps in accordance with the clearance instruction.
   1. The QE places all energy-isolating devices in the “safe” or “non-operating” position, installs appropriate tags-plus devices on components as required by the “Clearance Tag List and Operational Steps”, and controls residual/stored energy in the required sequence on the clearance instruction.
      Note: Energy Isolating devices located in areas where members of the public may be on TVA property (uncontrolled access) for non-TVA business reasons, such as fishermen, shall be made in-operative, e.g. remove a valve handle or chain and lock the valve to prevent operation.
   2. The QE removes, relieves, discharges, restrains, or otherwise renders safe equipment with residual or stored energy in accordance with the clearance instruction.
   3. The QE reports any discrepancies in implementing the clearance instruction to the RE for resolution. When a QE has a question about correctly identifying an energy isolating device listed in the Clearance Tagging List and Operational Steps, the QE will request assistance from a RE, or the MOIC or the MOIC designee. The QE will report the absence of a unique identification (UNID) label for an energy isolating device in accordance with their organization's equipment configuration control procedure.
   4. The QE attaches clearance tags to energy-isolating devices in accordance with appendices F, G, and H.
      Note: In NPG, once the clearance is authorized, the equipment may be tagged. Verification requirements for clearances shall be in accordance with NPG SPP 10.3.
      Note: In FPG, except for CT, second party (QE or PAE) verification of clearance danger and operating permit tags hung on energy isolating devices is required for all clearance initial placement, clearance revision placement, or clearance re-establishment after a Clearance Temporary Lift.
   5. Clearance tags shall not be altered or removed until the clearance is closed in accordance with section Close Clearance or a clearance temporary lift is established in accordance with section Apply Normal Energy Source for Test, Alignment, Etc. No one may operate a device tagged with a danger tag.
   6. The QE returns the completed clearance to the RE, documenting that all isolating devices were positioned and tags attached in accordance with the clearance instruction. When the form can not be returned due to operational restrictions, such as radiological, the QE will document in a separate report that tagging was completed in accordance with the clearance “Clearance Tagging List and Operational Steps.”

Place Clearance in Issued Status

1. The RE places the clearance in issued status after receiving the completed "Clearance Tag List and Operational Steps." The RE may impose restrictions on an issued clearance to ensure a face-to-face discussion takes place with a PAE(s) prior to issuing the PAE(s) the clearance.
   Note: In FPG and NPG, the clearance is not placed in issued status until second party verification of clearance tags hung has been completed.
   Note: In FPG, prior to placing a PAE on the Clearance Holders List, the RE and PAE will review the clearance instruction and work scope using the (Clearance RE/PAE Discussion Checklist as a guide for the required pre-job brief. This discussion will include any hazards associated with the work to be performed under the clearance. Sections 2 and 3 of the checklist are completed and the checklist attached to the Request for Clearance Form.
2. For equipment under the transmission operator's control, the transmission operator issues the clearance.

Verify Equipment Isolated and Tagged

1. Regardless of the presence of a danger tag, all equipment is considered energized unless the equipment is known to be within the boundary of a clearance that is in issued status and the equipment is grounded (if required).
2. Each PAE who holds a clearance physically walks down the clearance before work starts on the cleared equipment using the tagging list to determine if energy isolating-devices are controlled to prevent introduction of hazardous energy to the machine or equipment on which the PAE will perform or holds the clearance for AEs to perform servicing, maintenance, or modification. The PAE may request the assistance of a RE/QE on the walk down to verify that energy isolating devices are properly positioned and tags are attached in accordance with the clearance tagging list. The walk down must be completed and the clearance held before the PAE or any Authorized Employee starts to work on the equipment under the clearance.
3. The PAE reports to the RE or documents through an automated system that the walk down is complete and the work can be safely performed under the clearance. When the same person performs the function of the RE and PAE, this requirement is satisfied.
   Note: In CT and RO, when the same person is the QE and the PAE, the requirement of this paragraph is satisfied without a second walk down of the clearance boundaries.
   Note: Note: In FPG, after the clearance walk down is completed, the PAE will verify that the work order is correct for the work to be done by "first verifying" on the electronic work order / CPAL section sheet of the clearance in the automated system.
4. If a PAE releases a clearance and the clearance remains in issued status without modification, that PAE may be issued that same clearance without another walk down of the clearance boundaries.

Hold Clearance by PAE(s)

1. Only persons whose names are on the Official Plant Clearance List and designated to hold clearances are authorized to hold a clearance. The clearance is held by name only, not by title, for work performed on equipment under the clearance. When it is necessary to issue a clearance for administrative purposes only, then the clearance is issued by title and no walk down of the clearance boundaries is required.
2. To be issued a clearance, a person on the Official Plant Clearance List must either manually or electronically "sign-on" the "Clearance Holders List."
3. When it is known that equipment will be out of service for stated periods of time and will not be needed, the PAE obtaining and holding the clearance may keep it until his/her work is completed. Should it not be possible for the PAE holding the clearance to be present when the equipment is ready to be restored to system alignment, that PAE shall ensure adequate controls are in place to prevent removal of the clearance from issued status, e.g., a knowledgeable person administratively holds the clearance by title. Then the PAE can release the clearance. The clearance shall be subsequently held by a PAE in charge of, or doing the work, prior to resuming work on the

equipment under the clearance.

4. If a RE holds a clearance for any Authorized Employee such as during a callout, then the RE must perform all the functions of a PAE that are required in this procedure.

Perform Work on Equipment Under Clearance

Perform Pre-Job Activities

1. The PAE maintains TVA Form 17989, Clearance Personal Accountability Log (CPAL), [6] as shown in Appendix I, Clearance Personal Accountability Log (CPAL), for each clearance to indicate the authorized employees who are working on the cleared equipment. This log may be maintained either manually or in an automated system.
   Note: In FPG, the PAE signs on as a CPAL holder in the automated system for each clearance.
2. A single CPAL may not be associated with more than one clearance, i.e., a single CPAL must not list multiple clearances.
3. Each Authorized Employee who will work on equipment under a clearance will take a personal action to place their name on the CPAL for that clearance prior to starting work on the cleared equipment. This action may be accomplished by the Authorized Employee “signing-on” the CPAL either manually or using their unique identification in an automated system.
   Note: In NPG, the Authorized Employee(s) must "sign-on" the CPAL for each clearance they are working under and for each work order they are performing work on.
4. An Authorized Employee after “signing-on” the CPAL and before starting to work may request to walk down the applicable portion of the boundaries of the clearance using the tagging list to determine if energy-isolating-devices are controlled to prevent introduction of hazardous energy inside the clearance boundary.
5. The PAE maintains the CPAL by having each Authorized Employee “sign-off” the CPAL upon completion of their work under the clearance or whenever the Authorized Employee does not plan to perform any additional work under the clearance. When the equipment under clearance may need to be placed into operational status after the Authorized Employee(s) who have “signed-on” the CPAL for that clearance leave the plant, the Authorized Employee(s) may be required to “sign-off” the CPAL before leaving the plant.
6. Prior to any Authorized Employee starting to work on cleared equipment, the PAE is responsible for ensuring that the Authorized Employee(s) who is protected by a clearance is knowledgeable of the applicable portions of the clearance boundaries and of the type and magnitude of the hazardous energy being controlled for his or her protection.
7. The PAE evaluates the need for temporary additional services within the clearance boundary for example, lighting, sump pump, and compressed air.
8. A PAE may transfer an active CPAL with Authorized Employees signed-on to another PAE who is holding the same clearance for which the CPAL was created, as long as the scope of work for the clearance associated with the CPAL has not changed. All Authorized Employees on the transferred CPAL must be briefed by the new PAE responsible for their CPAL. The date and time of this briefing will be recorded in the comments section of the CPAL. As a minimum, the briefing must include a notice of the transfer of responsibility for the CPAL and contact information for the new PAE. At all times during the transfer, there must be a PAE holding the clearance who is responsible for the Authorized Employees who are signed-on the CPAL being transferred.

Prevent Re-Accumulation of Energy

1. The PAE complies with the clearance instruction for preventing the cleared equipment from re-accumulating energy to a hazardous level in any form: electrical, mechanical, hydraulic, pneumatic, chemical, thermal, motion, or gravity.
2. Where re-accumulation of energy cannot be completely prevented, the RE, the PAE, and responsible manager(s) will determine the actions necessary to protect employees from slowly accumulating energy. These actions must be approved by the MOIC prior to starting to work. A means of monitoring the hazard and communicating danger to the Authorized Employees will be established. The means of monitoring and communicating will be documented in the remarks section of the clearance.
3. If temporary protective grounds are required, an electrical representative PAE authorized to receive grounds discs will hold the clearance in accordance with Appendix J - Temporary Protective Ground Disc Procedure while grounds are installed. The grounds will be controlled with ground record discs in accordance with Appendix J - Temporary Protective Ground Disc Procedure.
4. For equipment under plant control, the electrical representative PAE is personally responsible to install or be present and observe the installation of temporary protective grounds (if required) in accordance with TVA SP 1008, “Temporary Protective Grounding for Generating Stations and Other Non-Transmission Facilities.”

Test for Absence of Energy

1. The PAE is responsible for ensuring the verification of the absence of hazardous energy, including energy in the form of electrical (50 volts or greater, nominal), mechanical, hydraulic, pneumatic, chemical, thermal, motion, or gravity. Verification is accomplished by the appropriate method, e.g., testing circuitry, visually inspecting position, monitoring movement or discharge; observing bleeds, gauges, indicators, etc; or other available means. If the PAE is not sure of how to verify the absence of energy, the PAE will consult with the RE.
2. If hazardous energy is detected on the equipment that is under clearance, stop work and immediately report the presence of the hazardous energy to the RE.
3. Live-Dead-Live checks are required on cleared electrical equipment before performing either mechanical or electrical work on the equipment in accordance Appendix D, “Special Requirements for Plant Electrical Equipment Clearance,” paragraph 19, Live-Dead-Live (LDL) tests.
4. Any time all work is suspended on cleared equipment, prior to resuming work the normally energized parts are again tested for the absence of hazardous energy in accordance with Section Test for Absence of Energy, item 1 above. Work is “suspended” when all work activities have stopped on the cleared equipment. This period of time may allow re-accumulation of hazardous energy or result in an Authorized Employee(s) starting to work on the wrong exposed electrical parts that are normally energized. Before work activities are resumed at a later time, such as later in the shift, the next shift, or some other time in the future; a test will be performed for the absence of energy on normally energized parts.
5. If cleared equipment is located remote from its isolation device, the cleared equipment is tested for the absence of energy at the location the work will be performed before beginning work.
6. If the PAE or Authorized Employee is qualified to perform electrical tests, he/she conducts the tests using an electrical test instrument. If not qualified, the PAE requests a qualified employee to perform the tests and observes the tests being performed. Test the electrical test instrument on a known energized source to check proper operation before and after testing the electrical equipment (Live-Dead-Live). Electrical test instrumentation shall be approved devices.

   Note: Electrical test instrument means either a voltmeter or voltage detector. A voltmeter is used to measure phase-to-phase or phase-to-ground voltages with a claimed degree of accuracy. Voltage detectors are used to determine the electrical status of circuits or equipment, generally to confirm the conductor/part is de-energized.

Install Safety Barricades and Barriers

1. For equipment under the plants control, the PAE installs or directs the installation and removal of safety temporary barricades and barriers, in accordance with TSP 602, “Barricades and Barriers (Temporary)".
2. For equipment under the transmission operator’s control, the electrical representative PAE installs or directs the installation and removal of orange barrier tape in accordance with TSP 1107, “Identifying Electrical Hazards".
3. If there are any normally exposed energized parts that may be inadvertently contacted, the PAE/Authorized Employee will take steps to control the hazardous energy. For example, normally exposed electrical parts that remain energized and subject to inadvertent contact must have an insulating barrier installed or some other method used to isolate the employees from the hazardous electrical exposure.

Apply External Energy Source for Test, Alignment, Positioning, Etc.

1. The PAE informs the RE of a need to apply external energy source for test, alignment, positioning, etc. of cleared equipment. An external energy source is not a part of the normal design of the operating system. Since applying external energy does not involve re-energizing the equipment with its normal energy source(s), it does not require a temporary clearance lift. External energy may be in the form of electrical (50 volts or greater, nominal), mechanical (e.g., using a come-along to rotate a shaft), pneumatic, hydrostatic test, local leak rate test, MEGGER® test, “manual” motion of a shaft, etc.
   Note: In NPG, clearances established to allow the application of external energy into a cleared boundary shall be prepared as directed by an approved, written procedure that specifically addresses the conduct of activity.
2. The RE identifies all PAEs on the clearance who would be affected by the application of the external energy to the equipment under the clearance. This includes the identification of PAEs on other clearances that are affected by the application of this external energy.
3. The PAE responsible for applying the external energy is responsible for notifying all PAEs holding the affected clearance(s) that they must “sign-off” the clearance. The PAEs holding the affected clearances must release their hold on these clearances in accordance with section "Release by PAE Holding the Clearance".
4. The PAE responsible for applying the external energy must be the only PAE allowed to hold the clearance while applying external energy.
5. The RE will not issue the affected clearance(s) to additional PAEs until the external energy application is completed. In the case of a clearance that is maintained in an automated system, the RE will impose restrictions on the clearance to prevent additional PAEs from ”signing-on” the clearance. For paper clearances, the RE imposes restrictions to prevent additional PAEs from ‘signing-on” the clearance by completing the “Clearance is Locked” section on the TVA Form 17982, Clearance Coversheet [7].
6. The PAE in charge of applying the external energy is responsible for the following:
   1. Having each of his or her Authorized Employees **who are not assisting** in the application of an external source of energy to sign-off the CPAL associated with the clearance before external energy is applied. Authorized Employees who are assisting in applying energy remain on the CPAL.
   2. Evaluating the application of external energy for any hazards and taking action to protect Authorized Employees, other personnel, and equipment while the external energy is being applied to the cleared equipment. It is the direct responsibility of the PAE in charge to see that no hazardous voltage or voltage that will be transformed to a hazardous magnitude is applied to any equipment unless all personnel are in the clear and informed of activity in progress.
   3. Installing appropriate safety temporary barricades and barriers in accordance with TSP 602, Barricades and Barriers (Temporary) or TSP 1107, Identifying Electrical Hazards, that may be necessary as a result of external energy application.
   4. Verifying that the worksite/equipment is ready for application of external energy by removing tools, instruments, special equipment, etc., from danger areas and installing necessary items for the application of an

external energy source.

5. Verifying that Authorized Employee(s) assisting with the work activity are in the clear or safely positioned before energy is applied.
6. Applying the energy when the equipment is ready and personnel are safely positioned.
7. Notifying the RE that the application of energy is complete and no additional external energy will be applied.
8. Having Authorized Employees who signed off the CPAL sign onto the CPAL before they start to work on cleared equipment.
9. Testing for the absence of stored / residual hazardous energy after the application of external energy is complete before anyone starts to work on the cleared equipment.

7. After the RE has been notified that the application of external energy is complete, the RE records “unlock” date & time on either the paper clearance or in the automated system, and issues the clearance in accordance with Paragraph 6, Hold Clearance by PAE(s), as needed.
8. The PAE responsible for applying external energy informs PAEs who were previous clearance holders that the application of external energy is complete and they may “sign-on” the clearance, if necessary, to perform approved work.

Apply Normal Energy Source for Test, Alignment, Etc.

1. The PAE who needs the normal energy source to be applied submits a TVA Form 17987, Request for Clearance [2], to the RE describing the need to apply the designed normal energy source for test, alignment, positioning, etc., on cleared equipment. If the initial request for clearance specified the need for the application of the normal energy source, a second request is not required. The RE will determine whether to close the clearance in accordance with paragraph 7 or to use a clearance temporary lift in accordance with this section.
2. If the clearance is not closed in accordance with paragraph 7, the RE develops the clearance temporary lift to support the application of the normal energy source and prepares the clearance temporary lift sheet. The RE identifies all clearances affected by the application of the normal energy source.
   Note: NPG and FPG, except for CT, require a second RE to verify the Clearance Temporary Lift Sheet.
3. The RE protects equipment subject to the temporary lift from damage by complying with applicable operating procedures. This includes removal of temporary protective grounds by the electrical representative PAE and placing equipment protective devices (breakers, relays, etc.) in service, as necessary.
4. The RE identifies all PAEs on clearance(s) affected by the application of the normal energy source to the equipment under the clearance and provides the requesting PAE a list of the affected PAEs. This list includes PAEs on other clearances that are affected by the application of the normal energy source.
5. The PAE who requested the application of normal energy is responsible for coordinating with the affected PAEs and requesting that they release their clearance hold(s). Only the PAE who requested the clearance temporary lift continues to hold the affected clearance.
6. After the identified PAE(s) have released the clearance(s), the RE prevents additional PAEs from holding the affected clearance(s) while the temporary clearance lift is in progress. In the case of a clearance that is maintained in an automated system, the RE imposes restrictions on the clearance to prevent additional PAEs from “signing on” the clearance. For a paper clearance, the RE enters imposes restrictions to prevent additional PAEs from ‘signing-on” the clearance by completing the “Clearance is Locked” section on TVA Form 17982, Clearance Coversheet [7].
7. The PAE who requested the clearance temporary lift is responsible for the following:
   1. Verifying the worksite/equipment is ready for the application of normal source energy by removing tools, instruments, special equipment, etc., from danger areas and installing necessary items for the work activity.
   2. Notifying the Authorized Employee(s) who are assisting in the test that a clearance temporary lift will be used for the application of the normal energy source.

3. Closing the CPAL associated with the clearance before the temporary lift is implemented. By signing-off the CPAL, Authorized Employees are releasing their hold on the clearance and acknowledging the equipment is not protected from being energized.
4. Informing assisting employee(s) of all hazardous conditions that are created during the application of the normal energy source and the methods to use to protect themselves from these hazards. The PAE will verify that employees assisting in the work activates will be safe while the normal energy is applied.
5. Informing the RE that personnel and equipment are ready to proceed with normal energy application through implementation of the clearance temporary lift.
6. Signing-on (holding) the clearance temporary lift and performing work activities to completion while normal energy is applied.

8. When the requesting PAE authorizes the RE to proceed with energy application, the RE verifies with the PAE that personnel and equipment are ready and provides the Clearance Temporary Lift Sheet to a QE to implement the clearance temporary lift.
9. The QE removes danger tags and manipulates the energy isolation devices in accordance with the temporary lift sheet. The lifting of danger tags is limited to the energy-isolating devices necessary to apply normal energy to the equipment.
10. After the work activity is completed, the PAE who requested the clearance temporary lift notifies the RE that the activity is complete and releases the clearance temporary lift. The RE may re-establish the clearance, as needed.
11. The PAE who requested the clearance temporary lift is responsible for notifying the affected PAEs who previously held the clearance(s) that the clearance temporary lift work activity is complete and that they may request the clearance be re-established.
12. If the RE does not re-establish the clearance, the clearance is closed in accordance Close Clearance section of this procedure.
13. If the RE re establishes the clearance, the clearance is re-established in accordance with the Clearance Temporary Lift Instructions and the following paragraphs:
    - De-energize and Tag Equipment
    - Unlock the clearance and place in Issued Status
14. Before resuming work on cleared equipment, the PAE(s) must complete the activities listed in the following :
    - Verify equipment is isolated and tagged
    - Hold the clearance
    - Perform pre-job activities
    - Prevent re-accumulation of energy, as needed
    - Test for the absence of energy
    - Install safety barricades and barriers, as needed
15. When under ground piping of mechanical or “slip-joint” design (e.g., a water main or fire protection system) is being excavated, write the clearance to isolate at the second valve back from the work location to prevent release of energy at the first valve. The first valve back from the work location is tagged in the opened position to relieve pressure.

Revise Clearance Boundary

1. When the need for a clearance boundary modification is identified, the RE performs an assessment to determine if the clearance boundary can be revised.
2. A clearance boundary revision is a two step process completed by first issuing a new clearance (clearance revision) and then closing the original clearance.
3. All affected PAEs on the clearance to be revised must be notified to obtain their concurrence of the clearance boundary revision. The PAEs who are holding the clearance to be revised will review the change and agree that work can be performed safely after the clearance boundary is revised. The RE will note the reason for revising the boundary in the remarks section of the original clearance.
4. If the clearance boundary can be revised while maintaining continuous employee protection under the original clearance that the PAEs are continuing to hold, then work may continue. Otherwise, all PAEs must stop work, have each Authorize Employee sign-off the CPAL, and release their hold on the original clearance.
5. The RE revising a clearance boundary will issue the new clearance (clearance revision) using the same process, (listed below), required to establish an initial clearance:
    1. Prepare clearance.
    2. De-Energize and Tag Equipment.
    3. Place Clearance in Issued Status.
6. The PAE who remained on the old clearance while the new clearance (clearance revision) was established will perform the activities listed below for work under the new clearance (clearance revision) before Authorized Employees start to work within the new clearance boundary.
    1. Verify equipment is isolated and tagged.
    2. Sign-on the new clearance (revised clearance) (see section Hold Clearance by PAE(s)).
    3. Perform pre-job activities. These activities include creating a new CPAL and informing the Authorized Employees of the new clearance (clearance revision) and its boundaries.
    4. Prevent re-accumulation of energy, as needed.
    5. Test for the absence of energy.
    6. Install safety barricades and barriers, as needed.
7. After signing-on the new clearance (clearance revision), the PAE(s) releases and the RE closes the original clearance in accordance with section Close Clearance. This includes the PAE(s) closing the CPAL(s) for the original clearance.

Close Clearance

Release by PAE Holding the Clearance

1. The Authorized Employee(s) informs the PAE that work is complete. All Authorized Employees sign-off the CPAL. The PAE releases the clearance after all Authorized Employee(s) under his or her jurisdiction have signed-off the CPAL indicating that they will no longer work on the equipment covered by the clearance.
2. The PAE is responsible for verifying that equipment is ready to return to operational status. This includes removing tools, instruments, special equipment, and cleanup jobsite.
3. The PAE is responsible for ensuring the removal of installed safety temporary barricades and barriers used during the work.
4. To ensure that no other PAEs are holding the clearance, the electrical representative PAE requests permission from the RE to remove temporary protective grounds. The electrical representative PAE is personally responsible to remove or be present and observe the removal of temporary protective grounds in accordance with Appendix J - “Temporary Protective Ground Disc Record Procedure,” and TVA TSP 1008, “Temporary Protective Grounding for Generating Stations and Other Non-Transmission Facilities.”

5. The PAE notifies the RE that the approved work activities have been completed and the equipment is ready for system alignment and all Authorized Employee(s) are in the clear. The PAE releases his or her hold on the clearance (signs-off the clearance). With identification that is acceptable to the RE, the RE may accept a PAE sign-off when the PAE is remotely located from the plant.
   Note: In FPG, the RE and PAE uses the Clearance RE/PAE Discussion Checklist (Appendix L) as a guide to complete the post-job brief prior to releasing the clearance. Section 4 of the checklist is completed and the checklist attached to the Request for Clearance. The PAE signs off of the CPAL in the automated system..
6. For equipment under the transmission operator's control, the PAE notifies the transmission operator that the approved work activities have been completed, all grounds have been removed in accordance with the ground discs record procedure, and the equipment is ready to return to operational status. The PAE releases the clearance to the transmission operator.

Release of Clearance in the Absence of an Authorized Employee(s)

1. When a clearance needs to be released in the absence of an Authorized Employee(s) who is signed-on to a specific CPAL the PAE makes an effort to contact the Authorized Employee(s) who is **not** at the plant.
2. The PAE obtains the approval of the MOIC or the MOIC designee for release of the clearance in the absence of an Authorized Employee(s) that is signed-on to the CPAL.
   Note: In FPG, the MOIC designeee must authorize the PAE to sign the Autorized Employee(s) off of the especified clearance electronic CPAL(s).
3. The PAE is responsible for a documented review of the associated work documents to determine status of the work on the cleared equipment and that the Authorized Employee(s) is not at the plant. This documentation is attached to the CPAL.
   Note: In FPG, this review shall be documented in the work order/CPAL eSOMS tab section of the clearnce by the PAE.
4. The PAE shall notify the RE to annotate the restoration instructions section on the clearance that the "Procedure for release in the absence of an Authorized Employee was used to release this clearance," date and time.
5. The PAE responsible for the absence Authorized Employee(s) on the CPAL shall notify the Authorized Employee(s) **as soon as the Authorized Employee(s) returns to work and before he or she starts to work** that the CPAL he or she was working under has been released and the associated clearance is no longer in being held by the PAE.

Release of Clearance in the Absence of a PAE(s)

1. 7.3.1 When a clearance needs to be released in the absence of a PAE(s) who is holding the clearance, the RE makes an effort to contact the PAE(s) who is **not** at the plant. If the RE is not able to contact the PAE, then the RE requests the PAE's manager to either (1) locate the PAE's CPAL for the clearance to be released or (2) use such information as work documents, attendance records, etc. to re-construct the CPAL with the names of all Authorized Employees in the work group who were working under the clearance. In either case, the PAE's manger will ensure that all Authorized Employee(s) have signed-off the CPAL. If the PAE's manager is unable locate the CPAL or re-construct the CPAL, then the manager must make an effort to notify all Authorized Employees in the work group who may have been performing work under the PAE's CPAL that the clearance is going to be released.
   Note: In FPG, if the RE is able to communicate with the PAE(s) not at the plant, the RE must review the electronic CPAL(s) held by the PAE for that clearance and verify the electronic CPAL(s) has been cleared. If this has not been done, the PAE's manager must make an effort contact the Authorized Employee(s) listed on the CPAL before they can be removed from the clearance. Upon verification from the PAE's manager that the electronic CPAL(s) for the clearance has been cleared, the RE may remove the PAE from

the clearance. The RE will document this in the restoration instructions and the Work Order/CPAL tab sections in eSOMS.

2. The operations and maintenance managers and the manager(s) of the absent PAE(s) who could not be contacted are responsible for a documented review of the associated work documents and a walk down of the equipment to determine status of the work on the equipment under the clearance and that all PAEs and Authorized Employees are in the clear. This review must be performed by a person(s) with an appropriate level of expertise and approved by the manager responsible for the work that was being performed on the equipment. This status of the work and PAE/Authorized Employees being in the clear is documented in the restoration instructions section of the clearance.
3. The RE obtains the approval of the MOIC or the MOIC designee for the release of the clearance in the absence of a PAE that is holding the clearance. The RE documents this approval in the restoration instructions section of the clearance.

   Note: In FPG, the RE documents this approval in the restoration instructions section of the clearance and the Work Order/CPAL tab section in eSOMS.
4. The RE is responsible for having temporary protective grounds (if any) removed by an electrical representative PAE.
5. The RE shall note in the restoration instructions section on the clearance that the "procedure for release in the absence of a PAE(s) was used to release this clearance," date and time.
6. The manager(s) of the PAE(s) who was holding the clearance shall notify the PAE(s) and the Authorized Employee(s) who were working under that clearance that the clearance has been released. This notification shall be **as soon as the PAE(s) and/or Authorized Employee(s) returns to work and before they start to work** that the clearance they were either holding (PAE) or working under (Authorized Employee) has been released and the equipment is no longer under a clearance.

Implement Restoration Instructions

1. The RE prepares the necessary instructions, verifies all PAEs have released their holds on the clearance, removes the clearance from issued status, and approves the clearance for restoration to the needed system alignment.
2. If the clearance involves a circuit with relays or solenoids that are normally energized, the RE evaluates the impact of a return to power to these components, e.g. review of applicable logic or control diagrams.
3. The RE provides written instructions to the QE.
4. The QE performs and documents the removal of clearance tags and the necessary system alignment to configure the equipment in accordance with the clearance restoration instruction.
5. The QE reports any discrepancies in implementing the clearance restoration instruction to the RE for resolution.
6. For equipment under the transmission operator's control, the transmission operator authorizes a person listed on the transmission operator's Switching Directory to implement the switching instructions and return the equipment to operational status and record the time for each operation, including the time that the clearance tags were removed.
7. By implementing the steps in section Close Clearance, notification is given to the RE, QE, PAE, Authorized and Affected Employees that the clearance has been closed and the equipment has been configured as necessary.

Document Clearance

1. The RE will retain the clearance documentation for a minimum of one year.
2. The PAE will retain the CPAL for a minimum of one year. The MOIC may designate the process for maintaining the CPAL record for at least one year.
3. The MOIC will retain audits for a minimum of one year.

Note: In NPG, clearance documentation is processed as a QA Record in accordance with the Document Control and Management Program. These records must be maintained for six years. The forms listed below may be generated via software and may not exactly mimic the forms, provided the information on the documents is equivalent to that specified on the forms.

QA Records

- Clearance Coversheet, TVA Form 17982 [7]
- Clearance Tag List and Operational Steps, TVA Form 17984 [8]
- Clearance Holders List, TVA Form 17983 [9]
- Ground Disc Holders List, TVA Form 17986 [10]
- Clearance Temporary Lift Sheet, TVA Form 17985 [11]

Non-QA Records

- Request for Clearance, TVA Form 17987 [2]
- Clearance Personal Accountability Log (CPAL); TVA Form 17989 [12]
- Clearance Audit, TVA Form 17988 [13]

Review Clearance Process

Conduct Clearance Process Evaluation

1. TVA Safety conducts periodic clearance process evaluations in accordance with TVA Safety Procedure 14, “Conduct Safety Program Assessments.” The TVA Clearance Advisory Team members participate, as appropriate, to assess the adequacy of the clearance process and recommend changes.

Conduct Clearance Process Audit

1. The plant MOIC designates a person, who is a RE or who has completed the required training to be a RE, to perform as a minimum an annual audit of a representative sampling of active clearances at the plant. The sampling will consist of at least 10 per cent of the active clearances at the time of the audit and will include clearances issued by different REs.
2. The audit is conducted to ensure that employees are knowledgeable of the clearance process and utilize the required clearance when performing servicing, maintenance, or modification on equipment. The auditor must not audit a clearance that he or she wrote or issued.
3. The audit includes the following:
    1. An interview between the auditor and the RE, QE, PAE(s) and Authorized Employee(s) of their responsibilities under the specific clearance being audited to ensure they understand the limitations of a tagout system and their responsibilities established in this procedure.
    2. An interview with affected employees whose work activities are or may be in the areas of the equipment under the specific clearance being audited to make certain that they are aware of and understand the purpose of the clearance procedure and its tagout system.
    3. A review of training records for the assigned positions, RE, QE, PAE, and Authorized Employee in accordance with ATIS.
    4. A determination that the Official Plant Clearance List is current.
    5. A determination that paper or automated clearance sheets are being maintained in accordance with this procedure.

6. A walk down inspection to verify the following:
   - Clearance boundaries are adequate to perform the specified scope of work/task(s).
   - All information on each clearance tag is legible, accurate and complete.
   - Each clearance tag is on the proper component and in good condition.
   - The component, on which there is a clearance tag, is in the required position.
   - The clearance tag is readily visible.
   - Nomenclature on the clearance tag adequately describes the device held.

   Note: In NPG, initiate a PER in accordance with SPP-3.2, "Corrective Action" for any deficiency identified by the clearance audit.

4. The clearance audit form (TVA Form 17988 - Appendix K, "Clearance Audit") [13] identifies the equipment on which the clearance is used, the date of the audit, the employees interviewed during the audit, any problems/resolutions, and the person performing the audit. The auditor forwards the clearance audit form to the MOIC for corrective action. Any discrepancies identified during the audit are corrected and the resolution noted on the clearance audit form. The completed audit form is retained for at least one year.

Definitions

Affected Employee - Employees, contractors, and others who are required to operate or use equipment identified for servicing, maintenance, or modification under a clearance or works in an area where such servicing, maintenance, or modification is being performed. Affected employees include the general population who works in an area where equipment is under clearance or may observe clearance tags on such equipment. An affected employee becomes an authorized employee when that person performs servicing, maintenance, or modification on equipment under clearance. An affected employee becomes an authorized employee, a primary authorized employee, or a responsible employee based on the level of training received and work functions assigned.

Authorized Employees – Employees, contractors, and others who perform servicing, maintenance, or modification on machines or equipment under a clearance and have successfully completed the appropriate level of training required by this procedure. These employees work on equipment under a clearance that has been issued in accordance with this procedure. An authorized employee becomes a primary authorized employee or a responsible employee based on the level of training received and work functions assigned.

Capable Of Being Locked Out - An energy-isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy-isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy-isolating device or permanently alter its energy control capability.

Caution Order Tag – A Caution Order is a yellow tag that is attached to plant equipment, switches, or controls where a hazardous or abnormal condition(s) exists. The Caution Order Tag has its own set of instructions for the condition under caution. See Appendix G - Caution Tag.

Clearance – A condition established by an "issued clearance" meaning that all energy sources of feed and feedback, such as electrical, mechanical and/or hydraulic, have been isolated and tagged. A clearance is established when it is placed in issued status by the Responsible Employee in accordance with this procedure.

Clearance Boundary – Points at energy-isolating devices established in accordance with this procedure that allows authorized employees to safely work on equipment under a clearance.

Clearance Personal Accountability Log (CPAL) - A log that identifies all authorized employees who are working on equipment under a specific clearance.

Closed Clearance – The clearance is closed when the restoration order prepared by the RE has been implemented in accordance with this procedure.

Danger Tag – A red tag used to identify energy-isolating devices for a clearance. See Appendix F - "Danger Tag."

Electrical Representative PAE – A PAE that, as a minimum: (1) has completed training on TSP 613, (2) been designated by MOIC or the MOIC designee as a qualified electrical representative PAE, and (3) is knowledgeable of

the requirements in TSP 1008, "Temporary Protective Grounding for Generating Stations and Other Non-Transmission Facilities."

Electrically De-energized - Free from any electrical connection to a source of potential difference and from electric charge; not having a potential different from that of the earth. Note: The term is used only with reference to current-carrying parts, which are sometimes electrically energized (live).

Electrically Energized (live) - Electrically connected to a source of potential difference, or electrically charged so as to have a potential significantly different from that of earth in the vicinity.

Emergency – Conditions that threaten the life of an employee or member of the public, or the plant operability.

Energy Isolating Device – A device that physically prevents the transmission or release of energy including, but not limited to, the following: An electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated independently; a line valve; a block; and any similar device with a visible indication of the position of the device used to block or isolate energy. Push buttons, selector switches and other control-circuit type devices are not energy-isolating devices.

Energy Source - Any electrical, mechanical, hydraulic, pneumatic, chemical, nuclear, thermal, or other energy source that could cause injury to personnel.

eSOMS® - Enterprise Shift Operations Management System (eSOMS®) is a modular software application suite that is designed to automate and integrate the major processes involved in plant operations management, e.g. clearances.

eSOMS® Standard Clearance - A clearance template located in an eSOMS® database that can be used as a starting point for writing an active clearance. No matter what the source is for writing a clearance, all active clearances have to be verified correct in accordance with this procedure including those that are developed from a standard clearance.

External Energy Source - Any electrical, mechanical (e.g., rotation of a shaft with a come-a-long), hydraulic, pneumatic, chemical, nuclear, thermal, or other energy source that is not provided by the equipment's normal designed energy source(s).

Group Tagout – The process by which a PAE holds a clearance for two or more Authorized Employees who will work on the equipment under a specific clearance. The Authorized Employees indicate that they are working under the clearance through the "Clearance Personal Accountability Log (CPAL)."

Issued Clearance– A clearance is issued when all actions required to establish a clearance in accordance with this procedure are completed and the responsible employee places the clearance in issued status. Regardless of the presence of a danger tag, all equipment is considered energized unless it is known to be controlled by a clearance in issued status.

Lines – Refers to transmission system conductors that are installed to distribute electrical power in the power transmission system.

Lockout - The placement of a lockout device on an energy-isolating device, in accordance with an established procedure, ensures that the energy-isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout device - A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy-isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

Normal Energy Source – This is the energy normally available to the machine or equipment for its proper operation. There can be more than one type of normal energy source supplied such as electric, mechanical, hydraulic, pneumatic, etc.

Management Official-In-Charge (MOIC) – This means the plant, facility, production, or site manager. The MOIC may elect to designate in writing a manager(s) to perform the function of the "MOIC designee" listed in this procedure.

Operating Permit Tag - An Operating Permit is a blue tag shown in Figure H-1 that is attached to equipment or

controls when the equipment is to be operated by any person other than its operator. The equipment operator is not authorized to operate the equipment except by instruction of the person holding the Operating Permit. The Operating Permit does not authorize persons other than the operator to operate the equipment from a switchboard. It does authorize the operator to operate equipment from a switchboard only under direction of the person holding the Operating Permit. The Operating Permit does not signify that the equipment tagged is de-energized. Where it is necessary for the equipment to be deenergized for work on the equipment, a danger tag clearance must be issued.

Official Plant Clearance List – A list of names approved by the MOIC of the plant. The personnel are approved to perform the specific authorized functions designated on the list in accordance with this procedure. A RE, QE, or PAE on this list may be issued clearances.

Primary Authorized Employees - Employees, contractors, and others who request/identify the work to be performed under a clearance, walk down the boundaries of a clearance to determine if energy-isolating devices are set in proper position and tagged in accordance with the applicable clearance instruction; and have successfully completed the appropriate level of training and the associated qualifying examination(s) required by this procedure. The primary Authorized Employee is responsible for administering the CPAL for group tagout.

Qualified Employees - Employees, contractors, and others who prepare equipment for servicing, maintenance, and modification and return equipment to operational status and have successfully completed the training and the associated qualifying examination(s) required by this procedure. They have completed appropriate training for the area of the plant for which they have clearance responsibilities.

Released Clearance– A clearance is released when all actions required to release a clearance in accordance with this procedure are completed and the RE removes the clearance from issued status.

Responsible Employees - Employees, contractors, and others who write and issue clearances in accordance with this procedure and have successfully completed the appropriate level of training and the associated qualifying examination(s) required by this procedure. They have completed systems and electrical training and the qualifying examinations for the area of the plant for which they have clearance responsibilities.

Servicing, Maintenance, and Modification - Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or un-jamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energizing or startup of the equipment or release of hazardous energy.

Sign-on/Sign-off – A personal act an employee, contractor, or other person takes to acknowledge his or her responsibilities for their name being on a log, list, or other documentation associated with a clearance.

Tagout - The placement of a tagout device on an energy-isolating device, in accordance with a clearance instruction, to indicate that the energy-isolating device and the equipment being controlled must not be operated until the tagout device is removed.

Tagout device - A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy-isolating device in accordance with a clearance instruction, to indicate that the energy-isolating device and the equipment being controlled must not be operated until the tagout device is removed.

Transmission Operator (Dispatcher) – refers to the TVA power system transmission operator who controls the transmission system lines and equipment.

References

- Title 29 CFR Part 1910.269, Electric Power Generation, Transmission, and Distribution.
- American National Standard, ANSI/ASSE Z244.1-2003, "Control of Hazardous Energy Lockout/Tagout and Alternate Methods."

Appendix A - Instructions for Completing Request for Clearance

Appendix A

Instructions for Completing Request for Clearance

Form TVA 17987, "Request for Clearance" REQUIRED FIELDS to be completed by the person requesting the clearance:

Date of Request: Enter request initiation date.

Requester's name and phone number: Enter the name and phone number of the individual completing the form.

Work Order No.: Enter the Work Document Number that requires a clearance.

Equipment/System to be cleared: Enter the Unique Identifier (UNID) and noun description of the component to be tagged out. For example, if a clearance is required to prevent automatic cycling of a compressor due to calibration of a pressure switch; list the compressor as "Equipment to be cleared", not the pressure switch.

NOTE: In NPG, if devices being tagged do not have UNIDs assigned; the requestor must obtain the new UNIDs before submitting the clearance request.

Detailed description/scope of work to be performed:

- Enter a clear description of the scope of work to be performed; "see work order" is an unsatisfactory description. State clearly why the clearance is needed.
- State if the requested clearance is part of a contingency plan that may be required as the result of trouble shooting.
- Describe the recommended boundary in general terms; e.g., "tag pump breaker, suction valve and discharge valve." Consider information such as the following:
  - This is an opportunity for the requester to "disclose what he/she knows". If obscure components need to be tagged, provide this information.
  - Indicate when both control and main power must be tagged out.
  - When appropriate, provide the following:
    - Marked up Design Change Authorizations (DCAs) for design changes that result in rename (UNID change) or removal of devices that could be tagged.
    - Marked up drawings for Temporary Alteration Change Forms (TACFs).
    - Marked up drawings to identify location and unique identification of obscure components not listed on drawings.
- Identify any Clearance Temporary Lifts required.

Potential adverse affects / Other systems affected / Reference drawings: "Disclose what you know".

Operations / management completes the form starting with "Operations Review."

Other clearances required to be held for this work: (List all clearances that must be held to safely perform the described scope of work in this clearance request.)

Link to the TVA Form: TVA 17987 [2]

Appendix B - Instructions for Completing Clearance Sheets

Appendix B

Instructions for Completing Clearance Sheets

Use the following as a guideline for completing the minimum information on clearance sheets.

(1) Clearance Number	Number assigned to the clearance. This is the consecutive number assigned including the current year. Caution Order or Operating Permit may be indicated with a "CO" or "OP," respectively.
(2) Page ___ of ___	Enter clearance sheet page number and total number of pages. Sheet with information on two sides is two pages.
(3) Component to be Worked	Unique Identifier (UNID) for component to be tagged. If a UNID is not available, describe component(s) to be worked in the "Remarks" field.
(4) Site/Plant/Facility	Name of plant, facility or site.
(5) Requested by	Name of person requesting clearance, organization, and phone/pager numbers.
(6) Ground Discs Issued?	Mark "YES", if "Ground Disc(s)" is issued.
(7) Remarks	Brief description of work to be done and/or other information. Work document number may be listed and may be used in lieu of description. Information regarding this clearance that the requester or holder must be made aware, examples are: 1) double isolation not available for high temperature/high pressure systems, 2) utilized the alternate method for clearance release (Absence of PAE), 3) system not drained or vented, 4) problems due to proximity to sensitive equipment, 5) freeze plug installed, (6) list any additional clearances required to be held to safely perform the scope of work, etc.
(8) Placement Instructions	Special guidance pertaining to the placement of the clearance, e.g., identification of interfacing documents needed for placement, positioning of vents, drains, or switching to alternate feeds. Information entered will not supersede, conflict with, or replace any formal plant instruction or procedure.
(9) Caution Order Information	Enter information to be placed on the Caution Order tag placed in conjunction with this clearance.
(10) Restoration Instructions	Special guidance pertaining to the release of the clearance, e.g., identification of interfacing documents needed for release or means for configuration control upon returning system to service, positioning of vents, drains, or switching to alternate feeds. Information entered will not supersede, conflict with, or replace any formal plant instruction or procedure.
(11) Operating Permit No./Issue Date/Release Date	Enter information for Operating Permit issued in conjunction with the clearance. This block is not in eSOMS; a stand alone Operating Permit is noted in the "Remarks Section."
(12) Clearance-Locked/Unlocked	For paper clearances, enter date and time clearance is locked to prevent PAEs from signing-on the clearance when a clearance temporary lift will be implemented. Enter date and time clearance is unlocked to allow PAEs to sign-on the clearance after the temporary lift is released.
(13) Prepared by	The RE who prepared the clearance (both placement and release portions). This includes ensuring that configuration control is maintained upon clearance release.
(14) Placement Review	**Note: In NPG and FPG, except CT, the name of second party RE responsible for review of placement portion of clearance to ensure adequacy for listed work activities. .**
(15) Placement Approved	The RE who authorizes the clearance to be placed on the affected unit/system/equipment. **Note: In NPG, review for applicable Technical Specification, Fire Protection, Off-Site Dose Calculation Manual, Technical Requirements, etc.** **Note: In NPG, signature indicates accuracy of containment penetration breach determination.**
(16) Date and Time Clearance Issued	Signature with date/time of RE who issued the clearance (places clearance in "issued status"). This signature certifies that all tags have been verified in accordance with the clearance and that the clearance is complete, in place and ready to accept clearance holders.
(17) Restoration Modified	If the closure portion (restoration configuration) of the clearance must be modified, the RE of the revised closure portion signs here, if release portion is unchanged from the original no signature is required.

(18) Restoration Reviewed & Approved	Independent review by a RE to ensure that the clearance closure information is correct. This includes a review for the proper sequencing and configuration of components. **Note: Not required for RO and CT.**
(19) Clearance Closed by	RE verifies documentation that all tags are removed and closes the clearance. This signature also ensures that all preceding documentation is accurately and completely filled out. Configuration control is now being maintained in accordance with site procedures, another clearance, or other approved means. **Note: In NPG, control is in accordance with SPP-10.1, "System Status Control."**
(20) Equipment Identification Equipment Description Equipment Location	All components tagged or manipulated, as a part of the clearance shall be listed under this column. The component should be identified by acceptable equipment nomenclature (description) and by unique identification number of device.
(21) Tag Serial Number	Sequential tag serial number (eSOMS® only).
(22) Tag Type	Type of tag to be placed on the device is listed. Multiple tag types (Danger, Caution) may be listed.
(23) Placement Sequence	Specify sequence of tagging, isolating, or repositioning.
(24) Placement Configuration	Enter position/condition that component is to be tagged.
(25) Placement Verifier #1	The QE who placed the tags configured the device as required by the clearance instruction.
(26) Placement Verifier #2	**Note: In NPG and FPG, except CT, the second party person who verified that the components are configured properly and the tags are in place.**
(27) Restoration Sequence	Specify sequence of restoration of equipment.
(28) Restoration Configuration	Enter normal required position/condition from system checklist, plant procedure or other document utilized to control the configuration of the component.
(29) As Left Configuration	Position in which component was left when the tags were removed.
(30) Restoration Verifier #1	The QE who removed the tags and placed the devices in the "as left" configuration. The QE who removes the last Danger Tag will remove the tags-plus device.
(31) Restoration Verifier #2	**Note: In NPG only, the QE who verified tag removal and component positioned as required by the clearance instruction.**
(32) Tag Notes	Enter instructions as needed to support tag placement or removal, e.g., the need for tags-plus devices. If the component by the nature of its configuration is already complying with tags-plus, e.g., a racked out 4160 volt breaker, there will be no comment in block 30. When a tags-plus device must be used on a tagged component, words similar to "tags-plus device required" will be placed in block 30. No comment is necessary to delineating which tags-plus device to use. The QE determines the tags-plus device to use.
(33) Clearance Holder(s)	Name of PAE holding the clearance. If a RE is holding the clearance as a PAE for contractors, vendors, power service shops, etc., the clearance must be issued to the RE by name and the RE must fulfill all the duties of a PAE, e.g., maintaining a CPAL, etc.
(34) Work Document Number	DCN number, WO number, etc. (if available). **Note: In NPG, the clearance holders list is used by both the PAE and Authorized Employee. When used by the PAE, the work document number is not required. When used by the Authorized Employee, the clearance holder list is used in lieu of the CPAL and the work document number is required.**
(35) Work description	Brief description of work to be done by clearance holder. **Note: In NPG, the clearance holders list is used by both the PAE and Authorized Employee. When used by the PAE, the work description is not required. When used by the Authorized Employee, the clearance holders list is used in lieu of the CPAL and the work description is required.**
(36) Sign-on Date	Date and time clearance holder signed-on the clearance.
(37) Signed-on by	Name of individual who signed-on the clearance.
(38) Sign-off Date	Date and time clearance holder signed-off the clearance.
(39) Signed-off by	Name of individual who signed-off the clearance.
(40) Holder	Name of electrical representative PAE authorized to receive ground discs.
(41) Number	Unique number of ground disc issued. Enter one ground disc number per line.

(42) Location	Location where ground disc is to be placed.
(43) Issued Time/Date	Time and date of issuing the ground disc.
(44) Issued By	Name of RE who issued the ground disc to the electrical representative PAE.
(45) Returned Time/Date	Time and date of release of control of the ground disc to the RE.
(46) Received By	The name of the RE who released the ground disc holder of responsibility for the ground disc.
(47) Clearance Temporary Lift No.	Unique number assigned to a Clearance Temporary Lift.
(48) Name of requesting PAE and reason for the temporary lift	Briefly explain the reason for the temporary lift. Include the work-controlling document, if applicable, and the name of the PAE requesting the temporary lift.
(49) Temporary Lift Written By	Name of RE responsible for writing the temporary lift.
(50) Temporary lift reviewed by	*Note: In NPG and FPG, except CT, the name of second party RE responsible for reviewing the temporary lift.*'
(51) Tag removal approved by	Name of RE approving/authorizing the temporary lift/tag removal.
(52) Temporary lift issued by	Name of the RE issuing the temporary lift.
(53) Tag re-hang approved by:	Name of RE notified by the requesting PAE that his/her hold on the Temporary Lift is released and that the clearance may either be re-established or closed.
(54) Temporary lift released by	Name of RE who closed-out the temporary lift by either re-establishing or releasing the affected clearance(s).
(55) Requesting PAE notified of temporary lift close-out.	Name of RE who notified the temporary lift requesting PAE that the temporary lift is closed-out and the clearance is re-established. The temporary lift requester PAE is responsible for notifying the affected PAEs that the clearance is re-established.
(56) Equipment Identification	All components tagged or manipulated, as a part of the clearance temporary lift shall be listed in this column. The component must be identified by acceptable equipment nomenclature (description) and/or by the unique identification number.
(57) Temporary Lift Position	Position/condition that component is to be placed after removing tag.
(58) Tagout Number	The eSOMS® "Tagout number" or the clearance number.
(59) Tag Type	Type of tag (Danger or Caution) on the listed component.
(60) Tag Serial Number	Sequential tag serial number (only for tags created by eSOMS®).
(61) Removal Sequence	Specify sequence of tag removal and component positioning.
(62) Removal Verifier #1	The QE who removed tags and configured the component as required by the temporary lift sheet.
(63) Removal Verifier #2	**Note: This applies to NPG only, the QE who verified tags removed and component configured as required by the temporary lift sheet.**
(64) Tagged Configuration	The position/condition the component is placed before re-hanging the tag.
(65) Re-hang Sequence	Specify sequence of tag re-hang, isolating or repositioning.
(66) Re-hang Verifier #1	The QE who re-hung tags and configured the component in tagged configuration as required by the temporary lift sheet.
(67) Re-hang Verifier #2	**Note: In NPG and FPG, except CT, the person who verified tags re-hung and component in tagged configuration as required by the temporary lift sheet.**
(68) Affected Work Order Holder PAE	All PAEs except the requestor (PAE) of the Clearance Temporary Lift must release their hold(s) on all affected clearances. Only the requesting PAE will be listed.

Link to the TVA Form: TVA 17982, Clearance Coversheet [7]

Appendix C - Increasing Single Point Isolation Safety (Tage-Plus)

Appendix C

Increasing Single Point Isolation Safety (Tags-Plus)

As required by section Prepare Clearance, item 8 of this procedure, additional measures are used to protect employees performing work on cleared equipment from inadvertent re-energization resulting from a single human error or mistake at a tagged energy-isolating device. Tags-plus is the use of a device or component configuration to prevent the inadvertent energization of a machine or equipment under clearance by a single human mistake. When a tags-plus device, such as a nylon tie-wrap, is used to achieve tags-plus, the device must be capable of preventing a person from inadvertently energizing the isolating device. Examples of tags-plus include, but are not limited to, the following:

1. "Checking it open/Making it non-operative, e.g., Motor Operated Disconnects and Motor Operated Valves.
2. Fuse removed and blocking device installed.
3. Secure placement of a barrier or blocking device adequate to physically prevent a tagged isolating device from being inadvertently operated, e.g., "clam" shell cover over a valve handle and a closed switchgear compartment door.
4. Two valves tagged closed in series (Figure C-2).

Figure C-2

5. An air-wrench operated valve is inherently Tag-Plus by design (Figure C-3). It requires a hose, socket, and air motor to operate the valve.

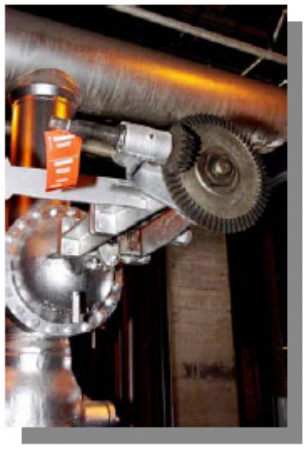


Figure C-3

6. One valve blocked and tagged in required position. Figure C-4 shows a blocking device (Master Lock Company) with an arm to secure a quarter-turn ball valve.

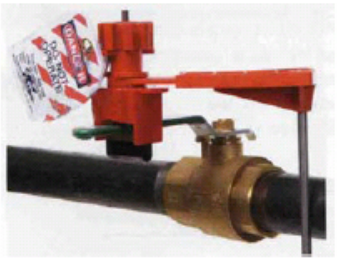


Figure C-4

7. One tagged valve with a nylon tie-wrap or cable device (Master Lock Company) connecting the valve handle to the pipe, valve yoke, or other fixed location (Figure C-5), thus preventing the valve from being operated. A retractable cable device (Brady Company) used to prevent the value handle (Figure C-6) from being operated. Nylon tie-wraps/cable-ties having the following TVA CAT ID numbers are available: 21-inch cable-tie (**CLQ079C**), 28-inch cable-tie (**CLL878B**), and 40-inch cable-tie (CLQ067K).

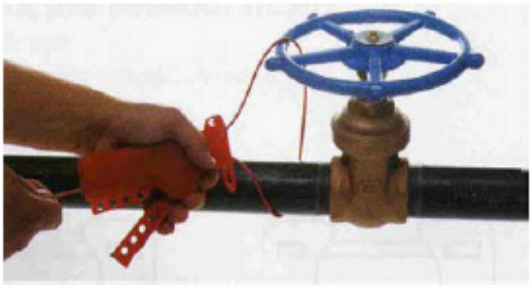


Figure C-5

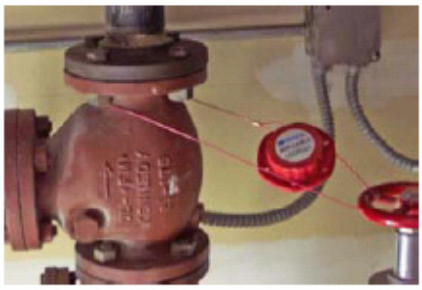


Figure C-6

8. An example of tags-plus devices from the Brady Company is shown on low voltage circuit breakers in Figure C-7.

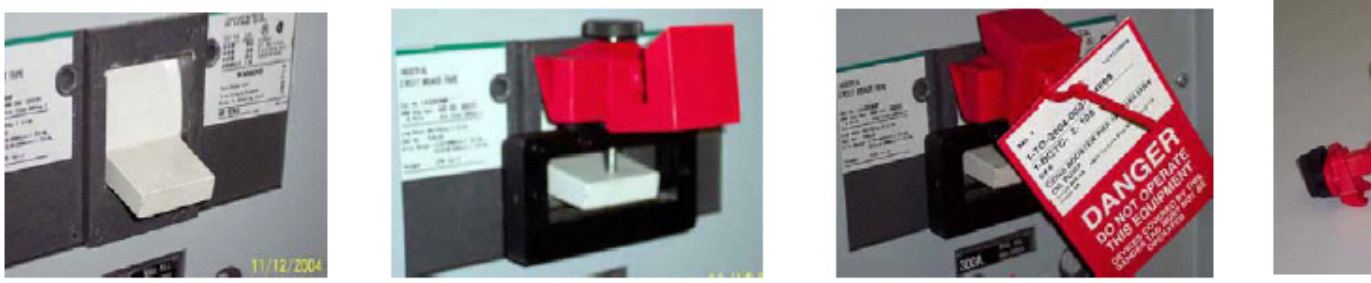


Figure C-7

9. Molded case circuit breakers in a panel (Figure C-8) are shown blocked by a device called Power/Boc™ by Safety Design, Inc.

Figure C-8

10. A tags-plus device is available from Power/BOC™ by Safety Design, Inc. that can be used on the rotary switch operated molded case circuit breakers shown in Figure C-9. This device achieves tagplus while allowing the compartment door to be opened.

Figure C-9

11. Examples of tags-plus devices on a knife blade electrical switch are shown in Figure C-10.

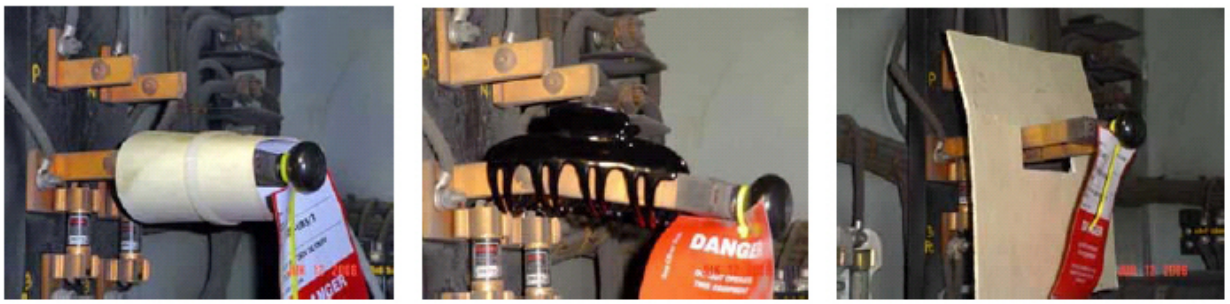


Figure C-10

12. Some attachment devices are available from Porter Walker, LLC, in Columbia, TN. Their BPO number is 3628 and their phone number is 1-800-737-1631. The devices shown in Table C-1 are available from Porter Walker, LLC.

Table C-1 Examples of Tags-Plus Attachment Devices

	TVA CAT ID	DESCRIPTION	MFR	PN
	CGT862L	LOCKOUT, ELECTRICAL, QA 0, CIRCUIT BREAKER, SINGLE POLE	MASTER LOCK	492
	CJQ398H	LOCKOUT, ELECTRICAL, QA 0, CIRCUIT BREAKER, MULTI-POLE, UNIVERSAL	MASTER LOCK	495
	CKA130A	LOCKOUT, ELECTRICAL, QA 0, OVERSIZED, 480/600 VOLT BREAKER	MASTER LOCK	491
	CKA133Q	LOCKOUT, ELECTRICAL, QA 0, CIRCUIT BREAKER, 277 VOLT, SINGLE POLE, NO HOLE	MASTER LOCK	493
	CKA132T	LOCKOUT, ELECTRICAL, QA 0, CIRCUIT BREAKER, 480/600 VOLT, NO HOLE	MASTER LOCK	494

Appendix D - Special Requirements for Plant Electrical Equipment Clearances

Appendix D

Special Requirements for Plant Electrical Equipment Clearances

1. Only component hand-switches that meet the definition of an energy isolating device are to be used as a clearance energy isolation point.
2. Component hand-switches not meeting the definition of a clearance isolating device may be tagged as indication/information that associated equipment is under a clearance.
3. 3. If potential or station service transformers are outside of the clearance zone, they may be cleared from the primary side. If they are inside the clearance zone, they must be cleared from the secondary side. This requirement applies to “potential transformers” designed for monitoring single-phase and three phase line voltage in power metering applications, such as plant generator and transmission system substation bus metering, relaying, and synchronization on the TVA power system.
4. Coupling capacitors within a clearance zone must have their secondary circuits shorted if work is to be performed on or within the minimum approach distance to them.
5. Static capacitors within a clearance zone must be grounded. The PAE holding the clearance is responsible for discharging and grounding the static capacitors.
6. The RE who is responsible for maintaining protection to equipment must approve any changes in current transformer secondary circuits that are in service.
7. Blocks shall be removed in current transformer secondaries when connected in parallel with current transformers that are energized, before work is performed on them. If blocks are not available, it will be necessary to short circuit the current transformer, ground, and open the secondary circuits.
8. When two or more transformers are connected to ground through a common reactor, the transformer’s neutral ground switch for the transformer to be cleared shall be opened and tagged with a danger tag.
9. All disconnecting devices or breakers that establish a clearance boundary must be opened made inoperable, when possible, and tagged to ensure that they will not be closed.
10. Gang or motor-operated disconnects/air-break switches must be mechanically locked in the open position and visually checked to verify that all blades are open.
11. Prior to allowing any PAE to hold a clearance for work other than electrical on an electrostatic precipitator, hopper, or connection duct; temporary protective grounds shall be installed by an electrical representative PAE in accordance with Appendix J.

12. The QE should verify the absence of energy on circuits involving molded case circuit breakers whenever a secondary method of verification is available.
13. The procedure for clearing a 161 kV or 500 kV air blast power circuit breaker requires the breaker and its disconnects to be “opened” and then the breaker cycled at the direction of the transmission operator to discharge any capacitors that may be in parallel with the contacts of the breaker.
14. When placing or removing clearances inside electrical boards, the QE will ensure that no loose materials remain in the breaker compartment.
15. Control power circuits must be tagged if (1) the work is on the control circuit, (2) the proximity of the work is near the energized control circuit, or (3) there exists a possibility of grounding the control circuit (e.g., start an Emergency Diesel Generator (EDG), actuate Engineered Safeguard Function (ESF), electrocute worker, etc.).
16. When tagging draw-out type fuses, the danger tag must be attached to the fuse compartment door after the fuses have been removed from the circuit. The fuses may be tagged for informational purposes
    Note: For NPG: Clearances involving control fuses located on multi-fused terminal boards required to be tagged must have the control fuses removed, a danger tag attached to non-conducting fuse blanks, and the blanks inserted into the fuse clips. Clearances on fused control circuits (1) on boards with molded case breakers or (2) for which fuse blanks are not provided, do not require tagging and installation of fuse blanks. Fuses removed should be placed in a secure, easily identifiable location where adverse plant conditions would not occur if they became dislodged from that location. Fuse storage may be in a fuse storage cabinet or in an appropriate bag attached to the compartment from which the fuses were removed (e.g., door handle, lugs attached to the relay covers, etc.). Fuses stored in a fuse storage cabinet should be clearly annotated on the clearance sheet. The following applies for placement of clearances on low voltage circuits (250V or less): When available, appropriate electrical prints for load lists and electrical circuit prints must be utilized. If plant conditions preclude tagging of main breaker to multiple components in a circuit, fuses shall be removed and tagged where available to isolate only those components affected by the work. If the circuit involves relays or solenoids that are normally energized, the impact of a loss of power as well as a return to power to these components shall be evaluated, e.g. review of applicable logic or control diagrams. Circuits that supply power to a board or panel often "daisy-chain" and supply additional panels and components. A detailed search of wiring connection prints is recommended to determine all the components affected. When low-voltage circuits are de-energized, alarms and responses must be evaluated to ensure expected results are obtained. The main control room shall be contacted immediately prior to opening the circuit. When the affected unit is at power, the main control room shall be contacted after the circuit is opened to verify expected results.
17. When fuses are removed in a 3-plase circuit, tags-plus devices, e.g., a blocking device, are installed on each phase, if possible.
18. Live-Dead-Live (LDL) Tests
    1. Breakers may be tagged under clearance as an isolating device for performing either mechanical or electrical work on equipment. Electrical work involves work on electrical components and/or bare electrical parts and conductors.
    2. When a draw-out type breaker is tagged as a clearance boundary for performing mechanical work, verify that the breaker is physically disconnected from the electrical bus via inspection at the breaker compartment and observe at the equipment location that deenergizing has been accomplished.
    3. When a draw-out type breaker is tagged as a clearance boundary for performing electrical work, verify the breaker is physically disconnected from the electrical bus via inspection at the breaker compartment and perform a LDL test at the location of the work activity.
    4. When a molded case type breaker is tagged as a clearance boundary for performing mechanical work, perform a LDL test on the load side of the breaker and observe at the equipment location that deenergizing has been accomplished.

5. When a molded case type breaker that has a motor contactor between the breaker and the load is tagged as a clearance boundary for performing electrical work, perform a LDL test on BOTH the load side of the breaker AND at the location of the work activity.
6. Regardless of the breaker type (molded case or draw-out), LDL tests are required at the location of the work activity when tagged as an electrical boundary to allow personnel to perform electrical work on circuits.
7. In all cases, the PAE holding the clearance is responsible for ensuring that LDL tests are performed by an employee qualified to perform tests for the absence of electrical energy.

Appendix E - Special Requirements for Mechanical Equipment Clearances

Appendix E

Special Requirements for Mechanical Equipment Clearances

1. An air-operated valve that fails open on a loss of air is not be considered closed for blocking purposes unless it is held closed with an installed jacking device or device used to secure the valve in the required position. A clearance tag will be issued and attached to the jacking or other device.
2. An air-operated valve that fails closed must have its air supply electrically or mechanically isolated, depressurized, and the valve visually checked-to-be-closed by local or remote indication. The air supply energy-isolating devices must be tagged.
3. An air-operated valve that fails “as is” shall be closed and mechanically restrained. Its air supply should be electrically or mechanically isolated, depressurized, and the valve visually checked to be closed by local or remote indication. The air supply energy-isolating devices and mechanical restraint must be tagged.
4. In cases where it is not possible to physically secure an air operated valve that fails “as- is” in the closed position, such as a valve closed by applying closing air to the valve diaphragm by the use of a solenoid valve air override, equipment can not be cleared under the provisions of this procedure. Such equipment must be “worked energized” and must be approved by the MOIC.
5. Pressure controlled valves, relief valves, and check valves will not be used as isolation boundary valves under normal conditions. Where such a valve does not have an external means of physical restraint, the work is considered “working on energized equipment” and must be approved by the MOIC.
6. Prior to an Authorized Employee entering a boiler or furnace, proper clearance must be obtained to ensure a safe working environment for the nature of the work to be performed. The PAE foreman or supervisor for those Authorized Employee(s) entering the boiler will hold the clearance(s). In the absence of the PAE foreman or supervisor, the RE will hold the clearance(s) for the Authorized Employee(s) who cannot hold a clearance.
7. Before boiler clearance holds are released to the RE, the PAE foreman or supervisor must be certain that all Authorized Employee(s), tools, and equipment are out of the boiler and work for which the clearance was obtained has been completed.
8. After boiler clearances are released, no employee shall enter the boiler without obtaining another clearance from the RE.
9. The following instructions govern the use of freeze plugs
    1. The clearance should be in place, but not issued, before establishing the freeze plug.
    2. The need for the freeze plug should be identified on the Remarks Section of the clearance sheet. The freeze plug should not be listed as a device held on the clearance sheet. The establishment and maintenance of the freeze plug shall be in accordance with approved procedures or work documents.
    3. The freeze plug must be attended by a person who is qualified to ensure that it is maintained intact until all work is complete and the proper Post Maintenance Tests (PMTs) are performed.
    4. If the RE closes out a clearance to allow performance of a PMT, the equipment must be placed under a new clearance before allowing the freeze plug to thaw. This will prevent migration of a portion of the plug.

5. All PAEs must release the clearance and the clearance removed from issued status before allowing the freeze plug to thaw. All vents and drains must be verified CLOSED before allowing the freeze plug to thaw. However, to prevent migration of the freeze plug, tags on boundary valves shall not be removed until the freeze plug has completely thawed.

10. If suitable means are not available to depressurize or control hazardous energy, the PAE, RE and responsible manager(s) will determine actions necessary to protect employees. These actions must be approved by the MOIC. An inability to depressurize a component or system must be clearly documented in the remarks section of the clearance and communicated to proposed clearance holder(s). In cases where a component or system design does not include a vent or drain path within the clearance boundary, the clearance must be "locked" to prevent a clearance holder sign-on and initiation of work prior to direct communication with the RE.
11. When performing Temporary Lifts that could result in fluid flow (e.g., Motor Operated Valve Actuator Test (MOVAT) testing, valve stroke, etc.) the PAE responsible for the activity must ensure that a flow blocking clearance is in place to maintain safe isolation and adequate flow blocking.
12. Clearances for work on high energy systems (operating with temperature greater than 200 F or pressure greater that 500 psig), lethal chemical systems, or systems connected to high energy systems shall when possible isolate the work area by two closed valves in series. If equipped, a tell-tale vent or drain between the isolation valves should be opened. Lack of two valve isolation shall be clearly documented and communicated to the proposed clearance holder before issue.
13. 13. When under ground piping of mechanical or “slip-joint” design (e.g., a water main or fire protection system) is being excavated, write the clearance to isolate at the second valve back from the work location to prevent release of energy at the first valve. The first valve back from the work location is tagged in the opened position to relieve pressure.
    Caution:
    a. If the location of the second valve back is such that the valve may be disturbed by the excavation, or is in close proximity where work on the system can affect it, then a valve further back must be closed and tagged to provide a safe clearance.
    b. Piping systems that are depressurized but not drained may have enough weighted force (head pressure) to cause piping joints to separate when excavated and/or when restricting devices (e.g., thrust blocks, friction clamps with nuts and rods, retaining bolts) are removed. Long runs of piping that are excavated must be depressurized (including head pressure).
14. Clearances for entry into permit required confined spaces with piping, lines, or ducts (steam, water, inert gases, chemicals, etc.) must be completely protected against the release of energy and material into the space by such means as blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; or a double block and bleed system, such as two closed valves in series with an open vent between the valves. Entry into confined spaces must comply with TSP 801, Confined Space Entry.

Appendix F - Danger Tag

1. **Danger Tag**
    1. The clearance tagout device, Danger Tag Form, TVA Form 17681 (10-2002), shown in Figure F-1, is used in accordance with this procedure for creating a clearance and will not be used for any other purpose. The tag is installed on all energy-isolating devices, including drains and vents, used to isolate equipment from all sources of energy and to permit work to be safely performed on the equipment. The danger tag(s) identifies the boundaries of a clearance. A danger tag may be attached, as necessary, to non-energy-isolating devices such as local push buttons, control switches, etc. of cleared equipment to indicate that the associated equipment is under a clearance.
    2. A danger tag must never be placed upon any equipment that is energized or in service. Equipment must never be energized until after the clearance(s) has been released or a clearance temporary lift has been established

and the danger tag is approved to be removed from the energy isolation device in accordance with the Temporary Lift instruction.

3. The danger tag, including its means of attachment, must be substantial enough to prevent inadvertent or accidental removal and be capable of withstanding the environment to which it is exposed for the maximum period of time that exposure is expected. The danger tag is constructed and printed so that exposure to corrosive environments, weather conditions, or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.
4. The print and format on the tag is standardized. As a minimum, the danger tag bears the clearance tag number, the energy isolation device identifier, and the legend, "DANGER-DO NOT OPERATE THIS EQUIPMENT." The tags are designed to allow a user to cut them in half to prevent covering controls on boards. The TVA Catalog Identification (ID) for the danger tag (Form TVA 17681 (10-2002)) is CGF913N. The TVA Catalog ID for the clearance tag printer ribbon is CFF581V.

   Note: In NPG, when placing Danger tags inside containment, they must be composed of materials that are approved for use inside containment.

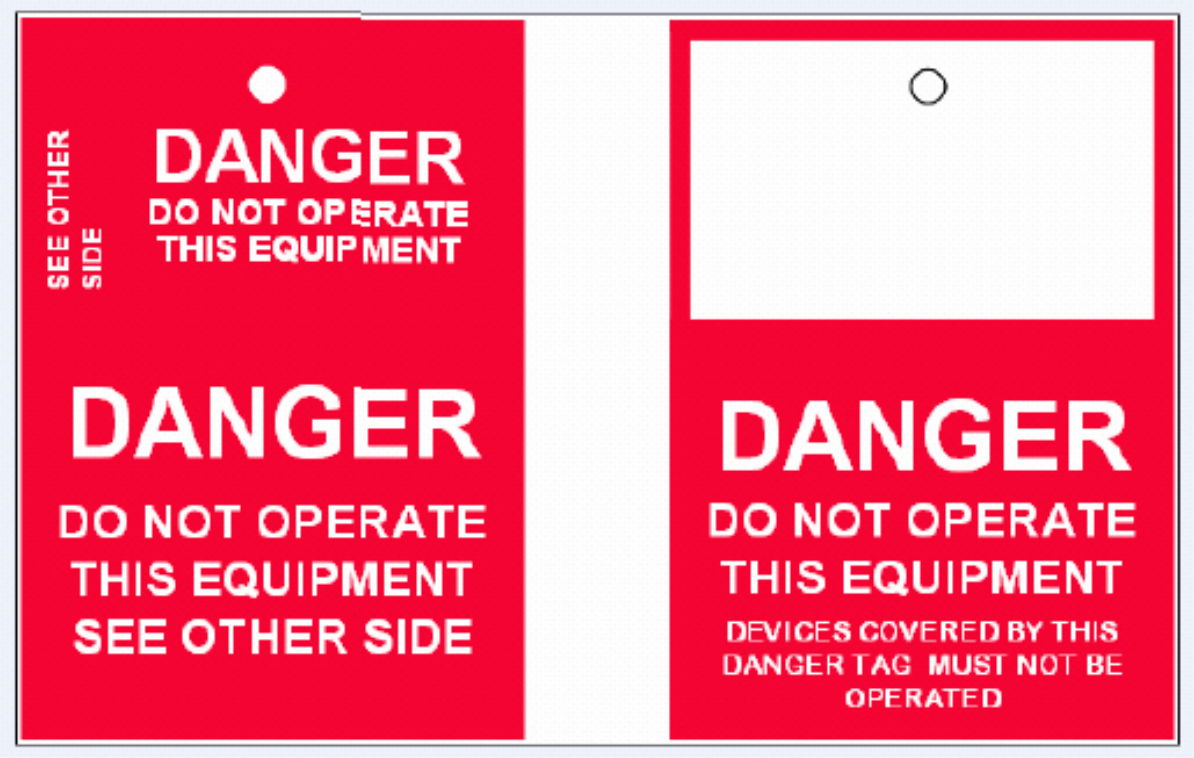


Figure F-1 Danger Tag Form TVA 17681 (10-2002)

2. **Tagout Device Attachment**
   1. The danger tag attachment means must have the following characteristics:
      1. Non-reusable,
      2. Attachable by hand,
      3. Self-locking, and
      4. Non-releasable with a minimum unlocking strength of no less than 50 pounds.
   2. The tags are attached in a manner that the tags are visible and at the same location that a lockout device would have been attached, if the isolating device has an attachment point for a lock. If the isolating device has no attachment point for a lock, the tag is affixed to the device so as to be obvious to anyone not to operate the isolating device. Where the tag cannot be affixed to the isolating device, the tag is located as close as safely possible to the device so as to be obvious to anyone not to operate the isolating device. If the isolating device attachment point for a lock is not visible to anyone who would attempt operate the device, an additional tag(s)

is placed so as to be obvious to anyone not to operate the equipment.

Note: Whenever replacement or major repair, renovation, or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machines or equipment must be designed to accept a lockout device as defined in the Definitions section (see Lockout Device).

3. The tag attachment means must have the general design and basic characteristics of being at least equivalent to a one-piece, all environment-tolerant nylon cable tie. In normal situations, the only acceptable means of attachment of tags is a one-piece, all environment-tolerant nylon cable tie. Tags may be attached to non-isolating devices by any suitable means.
4. Where a cable tie cannot be used directly on the isolating device, an adapter such as that shown in Figure F-2 is used to enable the attachment of the cable tie.

Note: NPG uses a red nylon cable tie for attaching tags to devices outside of containment. The TVA Catalog ID for the red cable tie is CHY043M. When a danger tag is placed inside containment, only attachment devices that are approved for use inside containment shall be used. The TVA Catalog ID for the stainless steel cable tie used in containment modes 1 - 4 is CKN033M.

Figure F-2

3. **Transmission System Clearance Tags**
   1. Transmission system clearance hold order tag, TVA Form 6270 [14](1-1999), Figure F-3, and Hold Notice Tag, TVA Form 6269 [15] (PO-12-72), Figure F-4, are used on transmission operator issued clearances and have the same purpose as the danger tag. The Transmission Power Supply Operating Letter on clearances establishes the criteria for the use of transmission system clearance tags. “Double” tagging is permitted, therefore, if necessary, a danger tag may be placed in conjunction with a transmission system clearance tag.

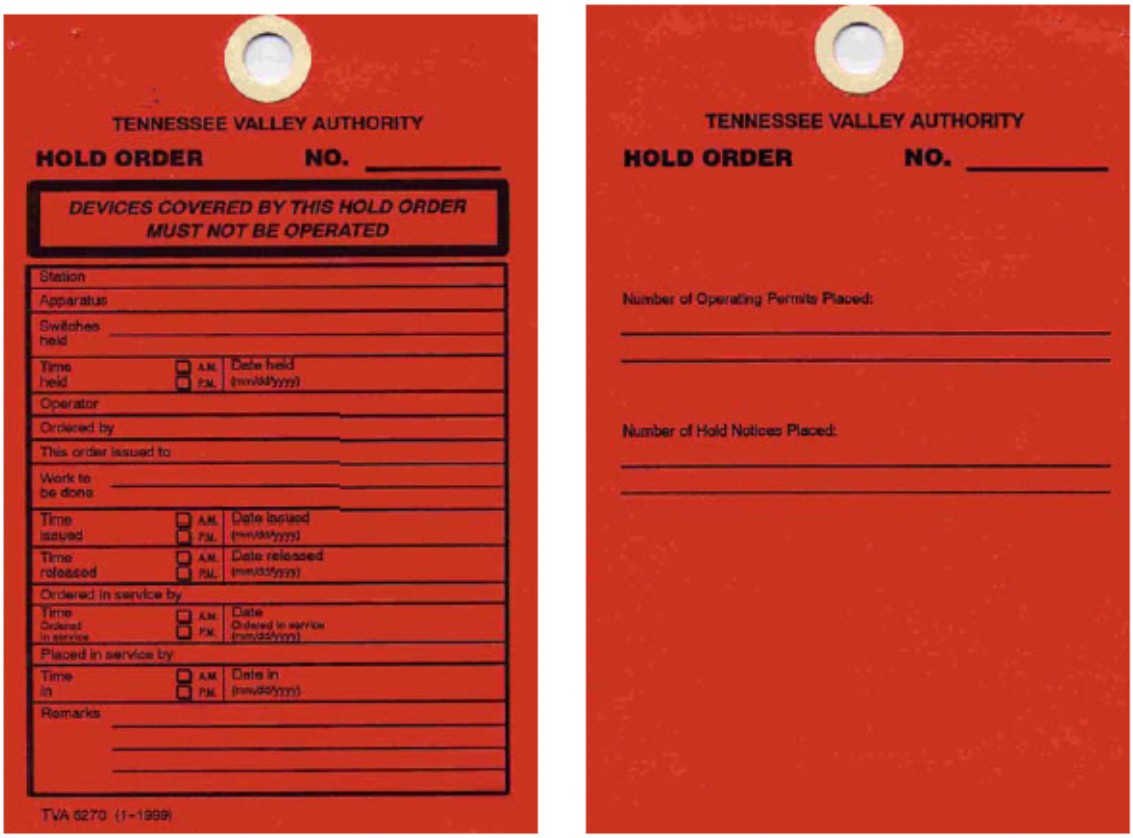


Figure F-3
Transmission System Hold Order Tag From TVA 6270 (1-1999)

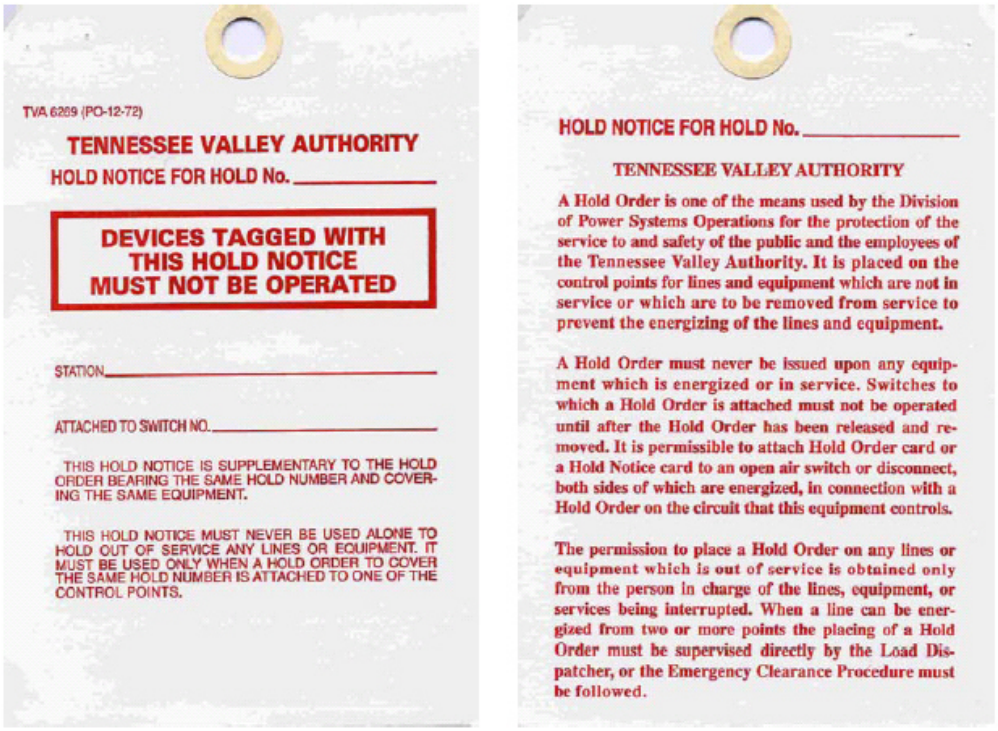


Figure F-4
Transmission System Hold Notice Tag, form TVA 6269 (PO-12-72)

Appendix G - Caution Order

1. A Caution Order is a tag, TVA Form 19629 [16] (9-2004), Figure G-1, or Caution Order Tag, TVA Form 6273 [17], that is attached to plant equipment, switches, or controls where a hazardous or abnormal condition(s) exist. The Caution Order provides direction concerning the circumstances of the hazardous/abnormal condition. A Caution Order does not establish control of energy isolating devices for the purpose of implementing a danger tag clearance.
2. A component with a Caution Order tag can not have an Operating Permit tag at the same time.
3. The RE issues the Caution Order tag, TVA Form 19629 [16] (9-2004) (Figure G-1). The RE completes a Clearance Sheet for each Caution Order issued.
4. The QE's signature for tag placement documents placement of the caution tag only. The tags are designed to allow a user to cut them in half to prevent covering controls on boards.
5. The construction and attachment requirements are the same as a danger tag. The TVA Catalog ID for the caution tag (TVA Form 19629 [16]) is CKE-897C.
6. The minimum required information on a caution tag is the following:
   - Tag number.
   - Device identity.
   - Description of the hazardous or abnormal condition(s).

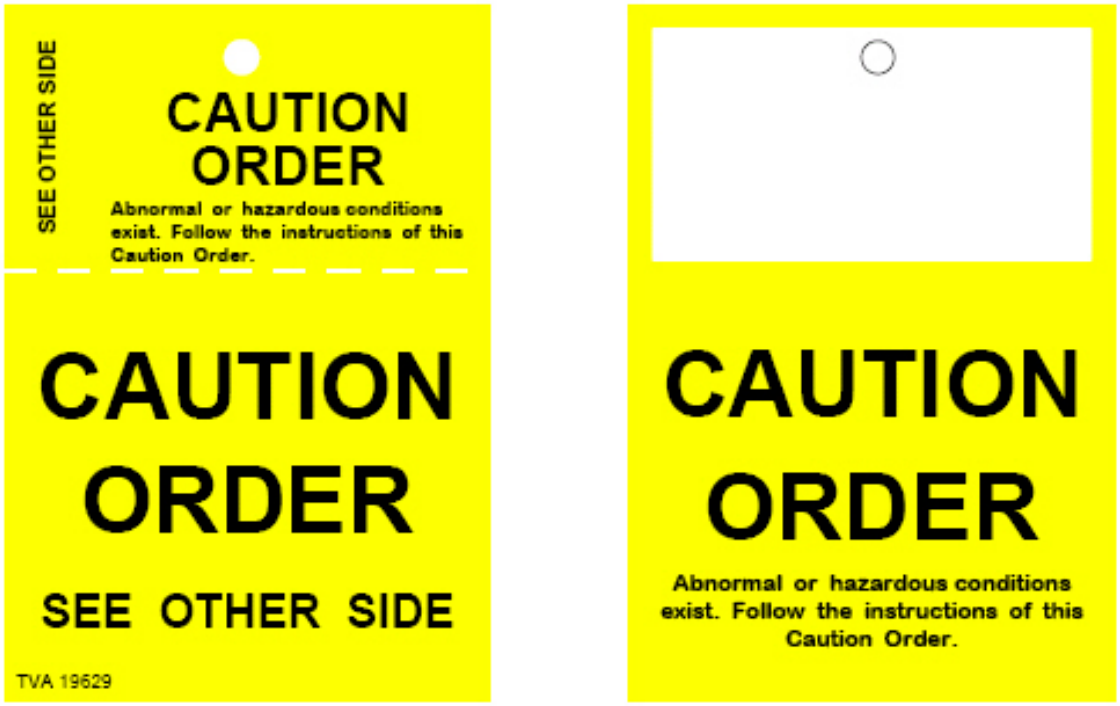


Figure G-1
Form TVA 19629 Caution Order Tag

7. For transmission system equipment, the Caution Order tag, TVA Form 6273 [17] (1-2000), Figure G-2, is used.

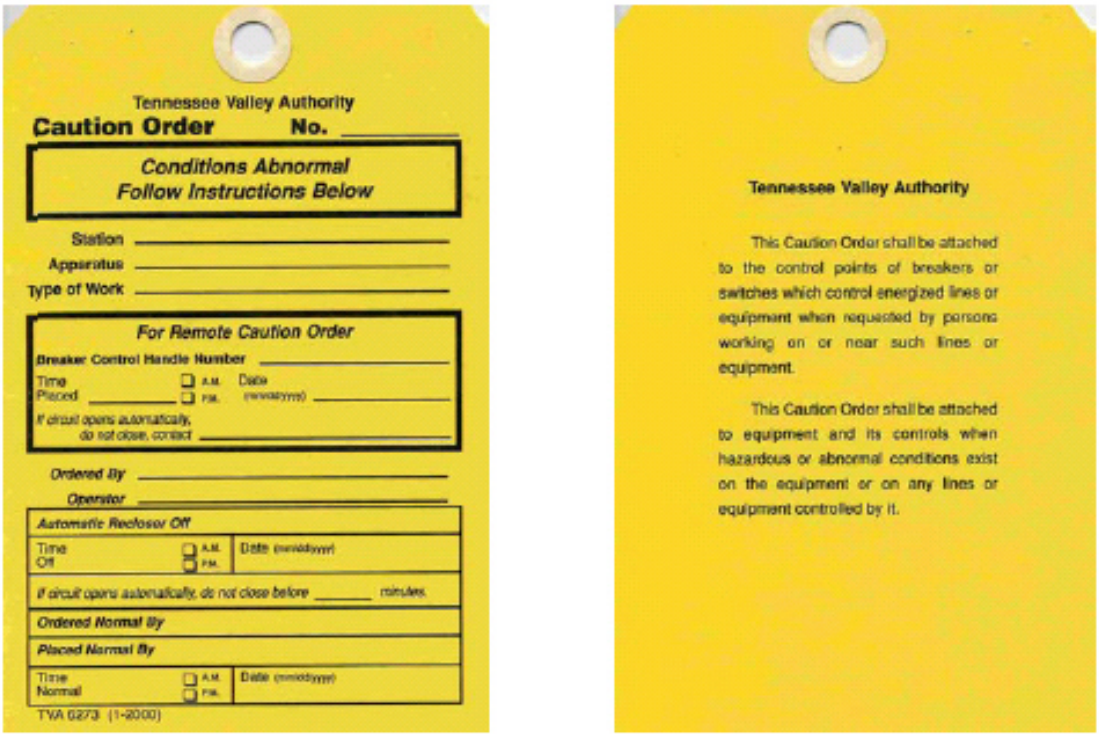


Figure G-2 Caution Order Tag form TVA 6273 (1-2000)

Appendix H - Operating Permit

Appendix H

Operating Permit

1. The Operating Permit is a blue tag, TVA Form 19632 [18] (9-2004), Figure H-1, that is attached to equipment or controls when the equipment is to be operated by any person other than its operator. The equipment operator shall not operate equipment except by instruction of the person holding the Operating Permit. Operating Permit requirements include the following:
    1. Equipment must not have more than one Operating Permit at a time.
    2. A device tagged with an Operating Permit tag shall not be tagged with a danger tag at the same time.
    3. An Operating Permit is issued by name (not be issued by title) to only one person at a time.
    4. The person holding the Operating Permit shall be the only person to authorize the operation of the device covered by the Operating Permit.
    5. A device covered by an Operating Permit shall not be operated for any reason other than that for which the Operating Permit was originally issued. The holder of an Operating Permit shall not grant permission to operate a device for any reason other than that for which the Operating Permit was originally issued.
    6. Operating Permit tags shall not be placed on devices that are required to be in service by Operations.
    7. The affected RE shall be contacted by the Operating Permit holder immediately prior to initiation of any sequence of operation of a device held by an Operating Permit.
    8. An Operating Permit shall be held by name, it will not be held by “title.”
    9. A “position held” is not specified for Operating Permit tags listed on a clearance.
    10. The tag shall have a tag identification number and device identifier.
    11. The PAE does not maintain a CPAL for an Operating Permit.

Figure H-1 Operating Permit, form TVA 19632 (9-2004)

2. The RE issues the Operating Permit tag, TVA Form 19632 [18] (9-2004) (Figure H-1). The RE completes a Clearance Sheet for each Operating Permit issued.
3. The construction and attachment requirements are the same as a danger tag. The TVA Catalog ID for the Operating Permit tag (TVA Form 19632 [18]) is CKE898A.
4. The Operating Permit does not authorize anyone to operate equipment from a control board or switch panel except its normal operator and the normal operator will operate equipment covered by the Operating Permit only under instruction from the person holding the Operating Permit.
5. When an Operating Permit is used in conjunction with a danger tag clearance, only the PAE who is holding the Operating Permit is allowed to hold the danger tag clearance on that equipment. If the application of any auxiliary motive power within a clearance boundary is required to be performed by someone other than the normal operator, then an Operating Permit must be issued. The same PAE must hold both the danger tag clearance and the Operating Permit. No other PAE will be issued either the clearance or the Operating Permit while they are used in conjunction with each other.
6. The PAE who is holding an Operating Permit issued in conjunction with a danger tag clearance has direct responsibility for ensuring that permitted operations are conducted such that employees and others are protected from any hazardous conditions. Before operating a device tagged with an Operating Permit, the Operating Permit holder or his/her authorized designee shall ensure that all persons and equipment are protected from any hazards created by operating the device.
7. A danger tag clearance that has an Operating Permit issued in conjunction with it requires special procedures and precautions. Examples are pulverizer air-drive inching motors and airdrive motors used with Lungstrom regenerative-type air heaters. Turning of these pieces of equipment by air motor/oil pressure or other motive power is occasionally required to perform maintenance while the main electric drive source remains under clearance and fully de-energized.

   Note: In NPG, paragraph 7 above does not apply.
8. A danger tag clearance that has an Operating Permit issued in conjunction with it requires compliance with tags-plus requirements.

Appendix I - Clearance Personal Accountability Log (CPAL)

Link to TVA Clearance Personal Accountability Log Form: TVA 17989 [12]

Appendix J - Temporary Protective Ground Disc Procedure

Purpose

This procedure is for recording the placement and removal of temporary protective grounds. The procedure increases the awareness of the importance of removing grounds before returning the equipment to operational status, and reduces the risk of erroneously leaving grounds installed. The process of temporary protective ground identification disc issue, removal, and return is performed in accordance with this appendix.

Ground Identification Discs

1. Ground identification discs are made of circular brass or LAMICOID tag material with a diameter of approximately two (2) inches. The discs are attached to the ground by a suitable device such as a metal snap-type clip or nylon cable tie.
2. The numbered identification discs are in locked cabinets in strategic locations at the plant. Each numbered disc has a designated space in the cabinet bearing the same number as the disc. All ground identification discs at a given plant must bear different numbers regardless of the cabinet in which they are located.
3. Figure H-1 shows a general description of the ground identification disc and cabinet used at plants.

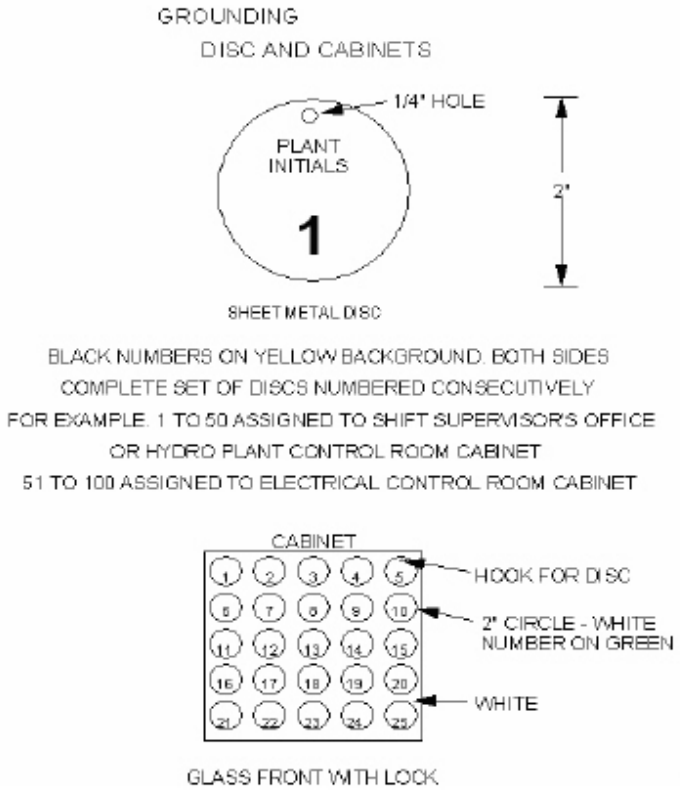


Figure A-1

Ground Identification Disc and Cabinet

Issuing Ground Identification Discs

1. When temporary protective grounds are installed, they will be accounted for on TVA Form 17986, Ground Disc Holders List [19].
2. The PAE informs the RE of the total number of grounds that will be installed.
3. The RE issues the clearance to the electrical representative PAE who has responsibility for placing grounds and ensures that this PAE is the only holder of the clearance.
   Note: If a need for temporary protective grounding is identified after a clearance is held by one or more PAEs, the RE will determine, after conferring with all PAEs holding the clearance, whether the protective grounds can be installed without creating a hazard to the PAEs or Authorized Employees who are performing work that does not require protective grounds. Upon approval by the RE, the PAEs who are holding the clearance for work that does not require protective grounds may continue to hold the clearance while grounds are installed. PAEs and/or Authorized Employees who will be performing work that requires protective grounding will not start that work until after the protective grounds are installed.
4. The RE imposes restrictions (in an automated system, lock the clearance) to prevent additional PAEs from "signing-on" the clearance while grounds are being placed.
5. The RE then issues a disc for each individual ground that will be placed and records on the clearance coversheet that grounds have been issued in conjunction with the clearance. The RE records on the Ground Disc Holders List the name of the electrical representative PAE holding the clearance and being issued the discs, the identifying number of each disc, the issued time/date, the name of RE issuing the discs, and the location of ground placement. Three-phase grounds require a disc for each phase except where a single device provides a three-phase ground.
   NOTE: In NPG, the ground discs shall only be issued to personnel that have successfully completed an initial ground holder qualification course.
6. The RE records on the clearance coversheet that grounds have been issued in conjunction with the clearance.

Installing Ground Identification Discs

1. The electrical representative PAE who holds the clearance is personally responsible to install or be present and observe the installation and removal of any ground identification disc(s).
2. The electrical representative PAE placing the grounds attaches a numbered disc to the "ground side" clamp of each ground before the ground is installed. For breaker grounding devices, such as a "grounding buggy," the disc is placed in a visible location on the front of the installed device.
3. The person placing grounds must be fully cognizant of clearance boundaries and where the grounds will be placed inside the clearance boundaries.

Transfer of Ground Identification Discs

1. Ground discs may be transferred to another electrical representative PAE only under the direction of an RE.
2. The new electrical representative PAE signs-on the clearance.
3. The new electrical representative PAE walks down the clearance to verify the location of installed grounds in accordance with the "Ground Disc Holders List."
4. The RE transfers responsibility for the ground discs to the new PAE on TVA Form 17986, Ground Disc Holders List [19].
5. After responsibility for the ground discs has been transferred, the relinquishing PAE may sign-off the clearance.
6. When the electrical representative PAE who is holding a clearance for temporary protective grounds that are installed is absent from the plant and the responsibility for the grounds needs to be transferred to another electrical representative PAE, the MOIC may authorize the RE to transfer the ground discs to another electrical representative PAE in accordance with paragraphs 1 through 5, above. The RE will notify the absent employee's supervisor that the responsibility for the grounds has been transferred. The supervisor is responsible for informing the employee upon the employee's return and before starting to work that responsibility for the grounds has been

transferred to another electrical representative PAE.

Removing Ground Identification Discs

1. After all work is complete, all PAEs will release their hold on the clearance except for the electrical representative PAE temporary protective ground holder.
2. The electrical representative PAE reports to the RE that all work is complete and grounds may be removed.
3. The RE shall verify that all PAEs except the electrical representative PAE responsible for the ground discs have released the clearance.
4. The RE shall impose restrictions (in an automated system, lock the clearance) to prevent other PAEs from signing on the clearance while the grounds are being removed.
5. The electrical representative PAE returns all ground identification discs removed grounds to the RE.
6. For each ground identification disc returned, the RE records on the Ground Disc Holders List the returned time/date, the name of the RE receiving the discs.
7. The electrical representative PAE responsible for the ground discs may not sign-off the clearance until all grounds are removed and all identification discs issued in conjunction with the clearance are returned to the RE. After the grounds are removed and ground discs returned, the electrical representative PAE ground holder may release their hold on the clearance.

Closing the Clearance

1. The electrical representative PAE holding the clearance is responsible for removing all installed grounds and returning all ground identification discs to the RE.. The RE verifies all temporary protective grounds are recorded as removed on the Ground Disc Holders List.
2. The transfer of temporary protective grounds and their ground identification discs from one clearance to another clearance is **prohibited**.
3. When grounds are placed in conjunction with the clearance, the RE will not authorize any switching to align equipment to needed system configuration until all grounds are reported removed and all identification discs issued in conjunction with that particular clearance have been returned and properly recorded.
4. After all grounds are removed and all identification discs that were issued in conjunction with the clearance are returned to the RE, the RE may implement the restoration instructions for the clearance.

Lost Ground Disc

1. If a ground disc that has been issued to an electrical representative PAE is lost, the RE will instruct the PAE to verify by inspection that all temporary protective grounds issued in conjunction with the clearance are removed from the equipment. The RE will record the number of the disc that is lost in the remarks section of the clearance.
2. Prior to releasing the clearance, an electrical test will be performed to determine that the equipment is not grounded. The results of this test will be recorded in the remarks section of the clearance.
3. The number of a lost ground disc will not be assigned to a replacement disc. If a replacement disc is created, the replacement disc number shall be the number of the lost disc plus an alpha character such as 20-A. The new disc with the numeric-alpha number based on the number of the lost disc can replace the lost disc.

Appendix K - Clearance Audit Form

Link to TVA Clearance Audit Form: TVA Form 17988 [13]

Appendix L - Clearance RE/PAE Discussion Checklist

Link to Clearance RE/PAE Discussion Checklist

TVA Operating Letter No. 15

Link to TVA Operating Letter No. 15

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072561963
[2] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=063380016
[3] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072562133
[4] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=72561424
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[6] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=070310031:4
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[15] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=080440487
[16] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=80420424
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Procedure 614 Fabrication or Modification of Tools

TVA Safety Manual

614 Fabrication or Modification of Tools

Procedure Number 614

TVA Safety Procedure

Fabrication or Modification of Tools

Revision 1

July 15, 2006

Purpose

This procedure establishes requirements for fabrication and modification of tools (i.e. tools not commercially available) required for work by TVA. These requirements are to ensure that the tool will function safely for the work being performed.

This procedure does not apply to tools / equipment that are formally controlled by other TVA procedures (e.g., rigging, cranes, scaffold, etc). This procedure also does not apply to tools that are supplied by vendors and meet other recognized federal or industry safety standards (e.g., Underwriters Laboratories) as long as the tools are not modified.

Roles and Responsibilities

1. All managers, supervisors and foremen are responsible for providing needed tools that meet the requirements of this procedure.
2. The engineering organization for the user organization shall ensure that the abricated or modified tool is capable of safely performing the function it is intended to be used for.
3. The craftsmen using fabricated or modified tools shall ensure that the tool is in proper condition with no obvious damage and that the tool has been evaluated and approved for the designed purpose as listed on form TVA 20051, “Tool Fabrication or Modification Approval”. Do not use a tool that has not been evaluated and approved.
   Note: Paragraph 3.2 allows 36 months (until February 27, 2009) to complete evaluations of existing tools. When a tool is identified that has not been evaluated form TVA 20051, “Tool Fabrication or Modification Approval,” will be initiated to allow evaluation of the tool to be scheduled. During this time period existing tools may be used with supervisor concurrence. Use of special tools must be discussed during pre-job briefings.
4. The supporting safety consultant will review the fabricated / modified tool design for compliance with TVA and regulatory safety requirements.

General Requirements

1. All tools fabricated or modified by TVA for performing work shall be approved and controlled in accordance with this procedure.
2. Existing tools fabricated or modified by TVA shall be authorized by the organizations work control process.
   NOTE: The backlog of authorizing tools must be completed within 36 months.
3. New tools fabricated or modified by TVA shall be approved by the organizations engineering group.
4. Tools are evaluated and approved for specific uses and are not to be used except for the evaluated purpose as listed on the approval form.

Review and Approval

1. When the need is identified that requires a fabricated or modified tool, the responsible engineering organization shall be contacted to provide detailed instructions, (i.e. material type, size, weld size, filler material. procedure, etc.) on TVA Form 20051, “Fabrication or Modification of Tools Approval”. Specifications will be based on regulatory standards, national consensus standards, and TVA engineering practice.
2. The responsible engineering and / or safety organization will identify inspections and tests required, if applicable, including identification of those responsible for performance of the inspections and tests. Provide signoffs for documenting completion. Identification of inspections and tests will include any inspections and tests required on a periodic basis for the fabricated or modified tool. Preventive Maintenance (PM) will be established for all periodic inspections or tests required.
3. The responsible engineering organization shall document an engineering evaluation that includes any calculations performed and a drawing on each new fabricated or modified tool. The responsible engineering organization performing the evaluation of existing tools may use alternative methods such as strength testing in place of calculations to determine acceptability of the tool being evaluated. The method of evaluation shall be documented. Photographs and/or sketches may be used in place of drawings for existing tools. The following must be noted on the approval form:
   - Can process be classified as an approved process or a one time use
   - Describe the purpose of the tool to include why the tool needs to be fabricated or modified.
   - Include a statement that review indicates that other tools or methods to accomplish the desired task are either not feasible or are not as safe as fabrication or modification of a tool.
   - Describe any additional steps that must be taken to safely use the fabricated or modified tool.
   - For approved tools / processes assign a unique number for tracking purposes. The number assigned must be as follows: Abbreviation for organization fabricating or modifying the tool followed by the year and then a sequential number, e.g. WBN-2005-1. Exception: One time tools are not assigned a tracking number.
4. The department performing the fabrication or modification shall permanently identify (stamp) the tool with the approval tracking number.
   Note: Permanent identification is not required on tools fabricated or modified for one time use only.
5. The supervisor / lead foreman of the department performing the fabrication or modification shall verify that the approval form is properly completed and signed. The original of the completed form and a digital photograph of the tool shall be forwarded to the engineering or methods and process group, a copy to the tool room / tool owner, and a copy kept with the shop order or work order.
6. If an approved process exists and the tool cannot be located then another tool can be fabricated or modified. All instructions and inspections or tests listed on the process form are to be incorporated into the shop / work order including signoffs listed on the form. The tool number shall be established on the approval process form.

Use

1. Tools fabricated or modified in accordance with this procedure must only be used for the purpose for which they were fabricated or modified. Use for an application for which the tool was not designed is prohibited.
2. Each organization will control the storage and issue of fabricated or modified tools.

Definitions

Approved Process - A process that can be used to produce multiple tools for other TVA orders for the evaluated purpose. **One Time Use** - A process that can be used to fabricate or modify a tool that will be used one time only and the destroyed after work is complete. **Tool** - A device used to assist employees in the physical accomplishment of a given task, i.e. a device used to transfer mechanical force, cut material, shape material, measure a given property, etc.

Appendix A - Form TVA 20051, “Tool Fabrication or Modification Approval”

TVA 20051, Tool Fabrication or Modification Approval [1]

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072561520

Procedure 615 Hazardous Energy Control - Lockout/Tagout (LOTO)

TVA Safety Manual

615 Hazardous Energy Control - Lockout/Tagout (LOTO)

Procedure Number 615

TVA Safety Procedure

Hazardous Energy Control - Lockout/Tagout (LOTO)

Revision 7

April 1, 2011

The effective date of this procedure is October 2, 2009. Upon completion of TSP 615 required training, an organization may implement prior to October 2nd.

Purpose

1. This procedure establishes requirements for TVA organizations and contractors to implement a Lockout/Tagout (LOTO) program to safely control hazardous energy when the equipment does not fall under either of the following:
   - Clearances issued by a TVA plant operations organization in accordance with TSP 613, "Clearance Procedure to Control Hazardous Energy Using Group Tagout," or
   - Hold Orders issued by a Transmission Operator in accordance with the current PSO Operating Letter for Hold Orders.
2. When there is potential for unexpected activation or energy release and the machine, equipment, process, or system can be deenergized to perform the servicing or maintenance; the equipment will be deenergized and LOTO applied before performing the work.

Scope

1. TSP 615 applies to TVA, contractor, and staff augmented employees who work on TVA equipment governed by this procedure.
2. TSP 615 supersedes organizational LOTO procedures that exist on TSP 615's effective date. Organizations may incorporate TSP 615 into their own procedure if that procedure contains all the requirements of TSP 615. The organizational specific procedure must be approved by the Clearance Advisory Team (CAT) prior to initial issue and before each revision.
3. This procedure provides for protection from hazardous unexpected startup of all types of equipment, including motor vehicles and tractors, when servicing or performing maintenance including inspecting, adjusting, installing, dismantling and removal of components.
4. Servicing and/or maintenance that takes place during normal production operations is covered by this procedure as outlined in paragraph 1.1 if:
   1. An employee is required to remove or bypass a guard or other safety device; **or**
   2. An employee is required to place any part of his or her body into an area on a piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during an equipment operating cycle.

Note: Exception to item 4 of this section: Minor tool changes and adjustments and other minor servicing activities, which take place during normal production operations, are not covered by this procedure if they are routine, repetitive, and integral to the use of the equipment for production, provided that the work is performed using alternative measures which provide effective protection to the employee. Minor servicing may include changing a tool bit on a milling machine or a drill bit on a drill press, connecting test equipment, venting pumps and piping, calibrating instrumentation, and connecting test instruments to circuits.

5. This procedure does not apply to the following:
    1. Locations where TSP 613 is used to control hazardous energy. TSP 613 is the only approved procedure for clearing for generating plant equipment controlled by the plant operations organization. At generating plant sites, equipment not under operation's control may be cleared using TSP 613 when approved by the Management Official-In-Charge (MOIC).
    2. Transmission components, lines, and equipment where the current PSO Operating Letter is used to control hazardous energy. The current PSO Operating Letter is the only approved method of establishing a hold order for transmission components, lines and equipment controlled by a Transmission Operator.
    3. Servicing and maintenance performed when the energy required by the equipment is present and that energy does not present a hazard of personal injury, damage to facilities or equipment; or operation outside established safe operating parameters.
    4. Tasks where it is not possible to control or remove hazardous energy by implementing the requirements of this procedure. If hazardous energy can not be controlled, the work is considered "working on energized equipment" or "hot work" and must be approved by the MOIC (refer to TSP 1021 Working On / Or Near Energized Electrical Equipment). When work activities must be performed with energy present that presents a hazard of personal injury or damage to equipment or facilities, control methods must be identified and implemented to provide demonstrable and adequate protection. These controls must be documented and include the following as a minimum:
        - Job hazard analysis / plan which complies with the TVA Safety Manual.
        - Signed concurrence of the MOIC.
        - Documentation of the above in the work package or similar work document.

        Note: COO Work Management, Appendix C, provides the requirements for Work Packages/Work Orders.
    5. Electric cord and plug connected equipment, where the plug can be disconnected from the energy source and kept under the exclusive control (reach and sight) of the LOTO-Competent Employee performing the servicing and/or maintenance.
    6. Key–ignition type equipment (motor vehicles, tractors, etc), where the key is removed from the ignition and kept under the exclusive control of the LOTO-Competent Employee doing the servicing and/or maintenance.
    7. "Hot tap" operations involving transmission and distribution systems for substances such as gas, steam, water or petroleum products when they are performed on pressurized pipelines, provided that:
        - Continuity of service is essential,
        - Shutdown of the system is impractical; **and**
        - Approved documented procedures are followed, and special equipment is used which will provide proven effective protection for employees.
6. This procedure applies to contractor owned and operated equipment/facilities or equipment/facilities under contractor construction and installation only where such equipment/facilities are physically connected at an energy connection point to TVA operated equipment/facilities.
7. When TVA and the contractor contractually agree to the use of this procedure for contractor operations, it will apply to that contractor's owned and operated equipment/facilities and/or those under construction by that contractor.
8. When a contractor's LOTO procedure is in use at a contractor construction site or contractor operated facility on TVA property, TVA employees must have the appropriate level of training consistent with the requirements of

the contractor's procedure. This training is only required when TVA employees are physically on the construction site or in the contractor's facility. TVA employees on the construction site or in the contractor facility must comply with the contractor LOTO procedure.

Roles and Responsibilities

1. A LOTO-Administrator, defined in paragraph 15.12, is responsible for the following:
    1. Oversight of the LOTO process.
    2. Preparation of required equipment specific LOTO procedures.
    3. Approving equipment specific procedures prior to their use. Equipment specific LOTO procedures may be developed on an as needed basis.
    4. Maintaining approved written LOTO procedures for future use within the organization.
    5. Maintaining the list of plant equipment/systems that may be cleared using this procedure (See item 5 of this paragraph).
2. A LOTO-Competent Employee, defined in paragraph 15.13, is a person who applies LOTO devices and/or performs servicing, maintenance, and/or modification on equipment that is under LOTO. Each LOTO-Competent Employee is responsible for the following:
    1. Requesting equipment specific LOTO procedures (equipment not exempted from written procedures) for servicing and maintenance from the LOTO-Administrator.
    2. Implementing generic and equipment specific LOTO procedures for servicing or maintenance of equipment or systems.
3. Supervisors of LOTO-Competent Employees and/or Affected Employees are responsible for implementing the requirements of this procedure.
4. The generating plant MOIC approves the use of this procedure on equipment not cleared by TSP 613 through a written work agreement with the servicing organization that will apply LOTO devices. Written work agreements for the use a LOTO procedure other than one based on TSP 613 that were established prior to the effective date TSP 615 must be canceled. A new agreement must be established for the use of TSP 615 if such use is approved by the organization and the plant MOIC.
5. The generating plant MOIC may maintain an approved list of plant areas/components/systems not cleared by TSP 613. Examples of equipment not under the control of TSP 613 are shown in Appendix A, "Examples of Plant Areas / Components / Systems not under the Control of Plant Operations." The approved list of plant areas/components/systems will be provided to the servicing organization's LOTO-Administrator.
6. A TVA policy and oversight team, Clearance Advisory Team, is established to serve as an advisory group to review TVA's hazardous energy control procedures periodically, provide interpretations, and recommend revisions to the procedures. This team is represented by all organizations utilizing hazardous energy control procedures and is composed of persons with experience in the hazardous energy control process. The Clearance Advisory Team is responsible for recommending changes to TVA hazardous energy control procedures. Team members participate, as appropriate, with TVA Safety in conducting annual evaluations of hazardous energy control procedures.
7. The Designated Agency Safety and Health Official receives proposed improvements to safety documentation, obtains and resolves comments on draft procedures; refers significant unresolved issues to the TVA Executive Committee for disposition; and approves and issues new or revised safety procedures.

Train Personnel

1. Employees, contractors, and vendors who are Affected Employees, LOTO-Competent, and LOTO-Administrator Employees are initially trained and examined; and re-training is conducted at least annually relative to their responsibilities contained in this procedure. The training courses are as follows:
    1. LOTO Procedure Training for LOTO Administrator and LOTO-Competent Employees
       This course will include recognition of energy sources, identification of the types and magnitude of energy sources, explanation of the scope of this procedure versus TSP 613, and methods and means for isolation and control of hazardous energy sources in accordance with this procedure.
       Note: For NUCLEAR, training in Clearance Procedure, SPP-10.2, and its interface with TSP 615 procedure is required for all Authorized (TSP 613), LOTO-Administrators (TSP 615), and LOTO-Competent (TSP 615) Employees at the nuclear plant sites.
    2. LOTO Procedure Training for Affected Employees
       This course will include instruction on the purpose and use of this procedure with emphasis on the absolute prohibition of operating locked out and/or tagged out equipment.
       Note: Hazardous energy control procedures Affected Employee training is not required for visitors who are escorted at all times when they are in areas where LOTO may be established.
2. Training on TSP 615 will include the limitations of tagout only (when a lockout device can not be used) as follows:
    - Tags do not provide a physical restraint.
    - Tags, which are warning devices, may evoke a false sense of security unless their meaning is clearly understood.
    - Tags-plus devices are used to add another level of safety.
    - Tags must be legible and understandable by all employees.
    - Tags and their means of attachment must withstand hostile environmental conditions in the workplace and must be securely attached so that they cannot be inadvertently or accidentally detached. See Appendix B, “Tagout Devices.”
    - Tags are never removed, bypassed, ignored, or otherwise invalidated. The only exception is removing a tag in the absence of a LOTO-competent employee in accordance with the provisions in Restore Equipment After Servicing and Maintenance item 2.
3. Additional training will be provided as follows:
    1. When revisions are made to this procedure that change the procedure’s requirements or the performance of assigned roles and responsibilities. Training is not required for minor changes.
    2. When changes are made in job assignments, machines, equipment, or processes that present a new hazard.
    3. When a LOTO audit reveals deviations from this procedure or inadequacies in an employee’s knowledge or use of this procedure.
    4. When a supervisor or the LOTO-Administrator determines that there are deviations from or inadequacies in an employee’s knowledge or use of this procedure.
4. LOTO procedure training for employees, contractors, and others must be maintained in an approved tracking system. TVA annual and staff augmented employee training records will be maintained in the Human Resources Information System-Automated Training Information System (HRIS-ATIS).
   Note: In NUCLEAR, the below process for tracking managed task employees, vendors, etc. training does not apply. Training for NUCLEAR employees, NUCLEAR contractor employees, vendors, etc. is tracked using HRIS-ATIS.
5. The process for maintaining records for managed task employees, vendors, etc. is as follows:
    1. The individual is trained on this procedure, as required.
    2. The individual successfully passes the associated test on his or her training.

3. The instructor has the individual complete a TVA training roster.
4. The instructor presents the individual with a pocket card (form TVA 20095) that includes the person's full name (printed); one box is checked for the course completed: Affected Employee LOTO-Administrator, or LOTO-Competent Employee. The instructor signs and dates the card. If more than one box is checked on the card, the certification card is invalid.
   NOTE: The pocket card may be ordered as form TVA 20095 and charged to a TVA short code by completing form TVA 51.
5. The instructor maintains the original training roster for facility / organizational use to validate managed task employee completion of training. The instructor mails a copy of the training roster to Technical Training, LP-5B-C, for filing. If the person trained is a managed task employee and the employer is currently using the MARSH database to track managed task employee training, a record of completion of TSP 615 training will be entered into the Marsh database by the employer.
6. If a TSP 615 training certification card has more than one box checked or if it is not possible to determine by looking at the card what level of training the employee has received, the training record will be reviewed for level of training completed or the employee must be retrained in accordance with the above.

Lockout and Tagout Devices

1. Lockout devices will be in accordance with Appendix C. "Lockout Devices."
2. Tagout devices will be in accordance with Appendix B, "Tagout Devices."
3. Personal LOTO devices (locks and tags) will be issued to each LOTO-Competent Employee who applies lockout devices to equipment.
4. The supervisor of each LOTO-Competent Employee or the LOTO-Administrator will maintain a list of the issued LOTO locks by LOTO-Competent Employee name and assigned lock identification number.
5. Whenever replacement or major repair, renovation, or modification of equipment is performed and whenever new equipment is installed, energy isolating devices for such equipment must be designed to accept a lockout device as defined in item 17 of section Definitions.

LOTO Procedures

1. Equipment to be serviced or maintained must have its own written LOTO specific procedure in accordance with appendix D or G prior to applying LOTO devices.
2. LOTO specific procedures written for equipment must comply with the applicable requirements listed in Appendix E, "Special Requirements for Electrical Equipment LOTO," and/or Appendix F, "Special Requirements for Mechanical Equipment LOTO."
3. Up-to-date drawings or other approved documents must be used to identify equipment isolating devices in LOTO specific procedures. If up-to-date documents are not available, the LOTO-Administrator and/or the manager who is responsible for the equipment must conduct a walk down of the equipment to determine the energy isolation control points. The information identified by the walk down is provided to LOTO-Administrator responsible for ensuring that corrections are made to drawings and other documents.
4. A generic LOTO procedure may be used instead of a specific written procedure for the exempted equipment defined below. The use of the generic procedure in Appendix G, "Generic LOTO Procedure - Equipment Exempted from Specific Procedures," meets this requirement. Equipment exempted from having a specific written procedure must meet **all** the following requirements:
   1. Have no potential to endanger LOTO-Competent Employees from stored or residual energy or re-accumulation of stored energy after shut down,
   2. Have a single energy source which can be readily identified and isolated by the LOTO-Competent Employee. Equipment that is isolated by unplugging a cord **and** closing a valve **DO NOT** meet the criteria for having a single energy source.

3. Be completely de-energized and deactivated by the isolation and locking out of a single energy source by a single lockout device,
4. Allow exclusive control of the lockout device by the LOTO-Competent Employee performing the servicing or maintenance,
5. Create no hazards for employees during the servicing or maintenance, **and**
6. Have had no accidents in the past involving unexpected activation or energization of the equipment during servicing or maintenance.

LOTO of Equipment

1. A lockout device (lock) must be used if the energy isolating device is capable of accepting a lock. In addition to the lockout device, a tagout device ("Do Not Operate" tag) is required to be affixed to the energy isolating device at the same attachment point as the lockout device.
2. When an energy isolating device will not accept a lockout device, the requirements of Train Personnel item 2 and Appendix H, "LOTO Requirements for Tagout ONLY," must be met.
3. Before applying LOTO devices to equipment at a generating plant, the LOTO-Competent Employee must verify that the equipment for LOTO is on the approved list of plant areas / components / systems not under the control of TSP 613. This verification includes communication with plant operations such as the Shift Manage/Shift Operations Supervisor or their designee, as necessary.
4. Affected employees who operate equipment or who work in the area of the equipment will be notified that equipment service or maintenance will be performed under a LOTO before applying the LOTO.
5. The LOTO-Competent Employee applies LOTO devices in accordance with the equipment's LOTO procedure (generic or specific procedure). A paper copy of the procedure must be used when applying LOTO.
6. The LOTO-Competent Employee or the LOTO-Competent Supervisor completes a LOTO Log in accordance with paragraphs 7.7, 7.8, and 7.9 documenting that all isolating devices were positioned and lockout/tagout devices were attached in accordance with the equipment's LOTO procedure.
7. Each facility/organization will establish a logging system for LOTO similar to the example in Appendix I, "Lockout/Tagout (LOTO) Log." The LOTO log must contain, as a minimum, the information shown in Appendix I. Completed logs will be auditable and retained by the LOTO-Administrator for a minimum of one year.
8. In addition to the logging system, a LOTO Record Sheet similar to the example in Appendix J, "Lockout/Tagout Sheet," must be completed for each lockout/tagout of equipment except as described in item 9 below. The information shown in Appendix J is the minimum required on a record sheet. Upon completion of the work, the lockout/tagout record sheet will be included with other work package documentation and have the same records retention requirements.
9. The LOTO Record Sheet described in paragraph 7.8 is not required for lockout/tagout (1) where the work is completed and the equipment restored on a single shift or (2) controlled at a single isolating point with a single lockout device and tagout tag.
10. Any discrepancies which prevent safe LOTO of the equipment will be reported by the LOTO-Competent Employee to their LOTO-Administrator for resolution before anyone starts servicing or maintenance activities on the equipment.
11. "Do Not Operate" tags must not be altered or removed until the LOTO is removed in accordance with section Restore Equipment After Servicing and Maintenance.
12. An energy isolating device with a "Do Not Operate" tag affixed to it will not be operated.
13. Service and maintenance will not be performed on any energy isolating device used to establish a LOTO, unless such service and maintenance does not adversely affect the capability of the isolating device to function as an energy isolating device for the LOTO.
14. Each LOTO-Competent Employee who performs servicing and maintenance will walk down the LOTO using the equipment's LOTO procedure and attach his or her individual lockout device and tagout device to each energy

isolating device. The walk down must be completed and locks and tags affixed prior to the LOTO-Competent Employee starting to work on the equipment.

15. When it is known that the equipment will be out of service for an extended period of time and will not be needed, the LOTO-Competent Employee(s) who placed the equipment under LOTO may leave his or her lockout device attached until the work is completed.
16. When a LOTO-Competent Employee must leave equipment unattended with LOTO applied and will not return; the LOTO Master Lock procedure will be used as follows:
    1. The departing LOTO-Competent Employee removes his/her individual LOTO lock(s) and tag(s). The removal of his/her individual LOTO lock(s) is recorded on the LOTO Record Sheet in the restoration column on the line used when the individual lock was placed.
    2. The departing LOTO-Competent Employee will affix a LOTO master Lock(s) and master tag(s) to the equipment's isolating device(s) to maintain the LOTO. The LOTO tag is marked "Master" in the blank space after "Name" on the front of the tag; no name is required. The replacement of the LOTO master lock(s) is recorded on the LOTO Record Sheet in the Placement column on the next available line.
    3. The arriving LOTO-Competent Employee removes the LOTO master Lock(s) and master tag(s). The removal of the master lock(s) is recorded on the LOTO Record Sheet in the Restoration column on the line used when the master lock was placed.
    4. Before starting to work on the equipment, the arriving LOTO-Competent Employee will affix his/her individual LOTO lock(s) and tag(s) to the isolating devices in accordance with the equipment's LOTO procedure. The individual LOTO lock(s) is record on the LOTO Record Sheet in the Placement column on the next available line.

Verify Equipment Isolated

Using the appropriate drawings, equipment shutdown procedures, and/or test instruments; the LOTO-Competent Employee verifies that the equipment has been de-energized. Operating controls are returned to the off or neutral position after each test for the absence of energy. Components with LOTO devices or with Danger Do Not Operate Tags affixed are not to be operated for energy verification.

Prevent Re-Accumulation of Energy

1. Each LOTO-Competent Employee complies with the LOTO procedure for preventing the deenergized equipment from re-accumulating energy to a hazardous level in any form.
2. Where re-accumulation of energy cannot be completely prevented, the LOTO-Competent Employee(s) and LOTO-Administrator will determine the actions necessary to protect the employee(s) from accumulating energy. Prior to starting work, a means of monitoring the accumulating energy and communicating danger to any LOTO-Competent Employee working on the equipment will be established by LOTO-Administrator.
3. If temporary protective grounds are required, an electrically qualified employee will install the temporary protective grounds or be present and observe installation in accordance with TSP 1008, "Temporary Protective Grounding for Generating Stations and Other Non-Transmission Facilities."
4. If temporary protective grounds are used, each ground jumper installed must be accounted for with an accountability system in accordance with Appendix K, "Temporary Protective Grounding Discs."
5. When a section of equipment is de-energized by the LOTO, but there are still normally exposed energized electrical parts that may be inadvertently contacted, a LOTO-Competent Employee must control exposure to the parts. For example, normally exposed electrical parts that remain energized and subject to inadvertent contact must have an insulating barrier installed or some other method to isolate employees from hazardous electrical exposure.

Test for Absence of Energy

1. Each LOTO-Competent Employee is responsible for verifying the absence of hazardous energy. Verification is accomplished by the best method available, i.e., testing circuitry, cycling, visually inspecting, manually trying; monitoring movement or discharge; observing bleeds, gauges, indicators, etc. See Appendix E, "Special Requirements for Electrical Equipment LOTO," paragraph 12, for Live-Dead-Live test requirements.
2. If hazardous energy is detected on cleared equipment, all LOTO-Competent Employees will immediately stop work and report the presence of the hazardous energy to their LOTO-Administrator and supervisor. The LOTO-Administrator and supervisor will ensure that the equipment is safe before any work is performed on the cleared equipment.
3. Any time all work is suspended on cleared equipment and prior to resuming work, normally energized parts are tested for the absence of hazardous energy in accordance with paragraph 10.1. Work is "suspended" when all work activities have stopped on the cleared equipment. Before work activities are resumed at a later time, such as later in the day, the next shift, or some other time in the future, an LOTO-Competent Employee(s) will test for the absence of energy on normally energized parts.
4. If cleared equipment is located remotely from its isolation devices, the cleared equipment is tested for the absence of energy at the work location before beginning work. If the work is mechanical, for example, there is no work to be performed on normally energized exposed electrical parts; Live-Dead-Live checks are made at the electrical isolating device, e.g., breaker. If the work is electrical, such as working inside the motor casing, Live-Dead-Live checks are made at the equipment location, e.g., motor.
5. If a LOTO-Competent Employee is qualified to perform electrical tests, he/she conducts necessary tests using an electrical test instrument. If not qualified, the LOTO-Competent Employee requests an electrically qualified employee to perform the tests and observes the tests being performed. The electrical test instrument used must be in accordance with organizational requirements. See Appendix E, "Special Requirements for Electrical Equipment LOTO," paragraph 12, for Live-Dead-Live requirements.

Apply Energy for Test, Alignment, Positioning, Etc.

1. The normal energy source is the energy that is designed to be applied for operating the equipment. An external energy source is not a part of normal system energy. External energy may be in the form of electrical, mechanical (e.g., using a come-along to rotate a shaft), pneumatic, hydrostatic test, local leak rate test, MEGGER® test, "manual" motion of a shaft, etc.
2. The LOTO-Competent Employee who has a need to apply energy, external or normal system, to the equipment under LOTO is responsible for the following:
    1. Evaluating the application of energy for any hazards and taking action to protect LOTO-Competent Employees, Affected Employees, and the equipment while energy is applied.
    2. Identification of all LOTO-Competent Employees working on the cleared equipment to be energized. This includes the identification of any employees who may be endangered by working on other equipment in the area.
    3. Notifying all LOTO-Competent Employees who have locks on the cleared equipment that they can not work on the equipment while energy is being applied and must remove their lockout devices from the equipment's energy isolating devices. The lockout devices must be removed before any energy is applied.
    4. No hazardous voltage or voltage that will be transformed to a hazardous magnitude is applied to any equipment unless all personnel are in the clear and informed of the application of the hazardous energy.
    5. Installing appropriate temporary barricades and barriers in accordance with TSP 602, "Barricades and Barriers (Temporary)" or TSP 1107, "Identifying Electrical Hazards," that may be necessary as a result of energy application.

6. Verifying that the worksite and equipment is ready for application of energy by removing tools, instruments, special equipment, etc., from danger areas and installing necessary items for the application of the energy source.
7. Verifying that any employees who are assisting with the application of the energy are in the clear, safely positioned, and the equipment is ready for energy application.
8. Applying the energy for test, alignment, positioning, etc.

3. After the application of energy is complete, the LOTO-Competent Employee who applied the energy is responsible for notifying other LOTO-Competent and Affected Employees that the application of energy is complete. LOTO-Competent Employees may now re-install their locks on the isolating devices in accordance with the steps in the LOTO procedure equipment, as needed, to establish LOTO of the equipment.

Restore Equipment After Servicing and Maintenance

1. **Removal of LOTO Devices**
    1. Each LOTO-Competent Employee is responsible for verifying that equipment is ready to have the lockout devices removed. This includes removing tools, instruments, special equipment, all components are operationally intact, and cleanup jobsite.
    2. If temporary protective grounds are installed, an electrically qualified employee removes or obverses the removal of temporary protective grounds in accordance with TVA SP 1008, “Temporary Protective Grounding for Generating Stations and Other Non-Transmission Facilities.”
    3. The LOTO-Competent Employee uses the equipment’s LOTO procedure to remove his/her lockout/tagout devices. Each LOTO device is removed from the energy isolating device only by the LOTO-Competent Employee who attached it. The LOTO-Competent Employee completes the LOTO Log and the LOTO Record Sheet entries, as appropriate.
    4. The equipment’s normal start up procedure or method is used to restore the equipment.
2. **Removal of an Absent LOTO-Competent Employee’s LOTO Devices**
    1. For a LOTO-Competent Employee who is absent from the facility/site, the LOTO-Competent Employee’s supervisor makes an effort to contact the LOTO-Competent Employee by phone. If the supervisor makes contact with the LOTO-Competent Employee, the supervisor informs the LOTO-Competent Employee that their personal lockout device(s) will be removed and the LOTO released.
    2. The LOTO-Competent Employee’s supervisor is responsible for a review of the associated work documents and a walk down of the equipment to determine if the equipment and work status will allow the equipment to be safely returned to service. This review must be performed by the supervisor or his/her designee who has the appropriate knowledge of the equipment and work being performed to make the determination.
    3. After attempting to contact the LOTO-Competent Employee and a determination has been made that the equipment is safe for the removal of the LOTO, the LOTO-Competent Employee’s supervisor may approve the removal of the absent LOTO-Competent Employee’s LOTO devices using the appropriate steps of item 1 listed above in this section.
    4. The LOTO-Competent Employee’s supervisor makes a note in the Remarks Section of the LOTO Log, Appendix I, that “The LOTO devices were removed in the absence of the LOTO-Competent Employee” with the supervisor’s signature, date and time.
    5. The LOTO-Competent Employee’s supervisor is responsible for notifying the LOTO-Competent Employee as soon **as they return to work and before they start to work** that his or her LOTO has been removed and is no longer in effect.

LOTO Process Audits

1. **LOTO Process Evaluation**

   TVA Safety conducts periodic LOTO process evaluations in accordance with TVA Safety Procedure 14, "Conduct Safety Program Assessments." The TVA Clearance Advisory Team members participate, as appropriate, to assess the adequacy of the LOTO process and recommend changes to this procedure.

2. **Local LOTO Process Audit**

   1. At least annually, the MOIC will designate a LOTO-Competent Employee, who may be from outside the organization, to conduct an audit of the LOTO process. An employee who establishes a LOTO can not audit his own LOTO.
   2. The audit includes the following:
      1. Ensure that employees are knowledgeable of the LOTO process and utilize LOTO when performing servicing, maintenance, or modification on equipment.
      2. At least a 10% sample of the annual LOTOs established will be audited to determine if the procedure is effective and is being followed.
      3. If tagout devices **only** are used without lockout devices, the following is required:
         - Verify that tags-plus is being used. Examples of tags-plus are in Appendix H, "LOTO Requirements for Tagout ONLY."
         - Interview the LOTO-Competent Employee(s) on their responsibilities under the specific LOTO being audited to ensure they understand the limitations of a tagout only system.
         - Interview affected employees whose work activities are or may be in the areas of the equipment under the specific LOTO being audited to make certain that they are aware of and understand the purpose of the LOTO procedure and its tagout system.
      4. A determination that LOTO-Competent Employees are trained in accordance with this procedure.
      5. A determination that LOTO Logs and LOTO Record Sheets are being maintained in accordance with this procedure.
      6. A walk down inspection to verify the following:
         - LOTO boundaries are adequate to perform the specified scope of work.
         - All information on each LOTO tag is legible, accurate and complete.
         - Each LOTO tag is on the proper component and in good condition.
         - The component, on which there is a LOTO tag, is in the required position.
         - Nomenclature on the LOTO tag adequately describes the device held for LOTO.

3. **Document LOTO Process Audit**

   The LOTO audit form, Appendix L, "Lockout/Tagout Audit Form", identifies the equipment on which the LOTO is used, the date of the audit, the employees interviewed during the audit, any problems/resolutions, and the person performing the audit. The auditor forwards the LOTO audit to the MOIC or the MOIC designee for corrective action with a copy to the LOTO-Administrators. Any discrepancies identified during the audit are corrected by the responsible manager and the resolution noted on the LOTO audit form. A copy of this report is transmitted to the Program Manager, Corporate Safety.

Document LOTO Process

QA Records - None.

Non-QA Records

The report of the annual program audit as transmitted to Corporate Safety is retained for a period of three (3) years.

Definitions

1. **Affected Employee** - Employees, contractors, and others who are required to operate or use equipment identified for servicing, maintenance, or modification under a LOTO or who works in an area where such servicing, maintenance, or modification is being performed. Affected Employees include the general population who work in an area where equipment are under LOTO or may observe lockout/tagout devices on such equipment. An affected employee becomes an LOTO-Competent Employee when that person performs servicing, maintenance, or modification on equipment under LOTO. An Affected Employee may become an LOTO-Competent Employee based on the level of training received and work functions assigned.
2. **Capable Of Being Locked Out** - An energy-isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy-isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy-isolating device or permanently alter its energy control capability.
3. **Do Not Operate Tag –** A prominent warning tag used to identify energy-isolating devices that must not be operated. See Appendix C, “Tagout Devices.”
4. **Electrically De-energized** - Free from any electrical connection to a source of potential difference and from electric charge; not having a potential different from that of the earth.
   Note: The term is used only with reference to current-carrying parts, which are sometimes electrically energized (live).
5. **Electrically Energized (live)** - Electrically connected to a source of potential difference, or electrically charged so as to have a potential significantly different from that of earth in the vicinity.
6. **Energy** - Any electrical, mechanical, hydraulic, pneumatic, chemical, nuclear, thermal, motion or gravity energy source that could cause injury to personnel.
7. **Energy Isolating Device –** A device that physically prevents the transmission or release of energy including, but not limited to, the following: An electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated independently; a line valve; a block; and any similar device with a visible indication of the position of the device used to block or isolate energy. Push buttons, selector switches and other control-circuit type devices are not energy-isolating devices.
8. **Equipment** - A word that includes components, machines, processes, or systems.
9. **External Energy Source** - Any electrical, mechanical (e.g., rotation of a shaft with a come-a-long), hydraulic, pneumatic, chemical, nuclear, thermal, or other energy source that is not provided by the equipment’s normal designed energy source(s).
10. **Hot tap** - A procedure used in the repair, maintenance and services activities which involves welding on a piece of equipment (pipelines, vessels or tanks) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.
11. **LOTO –** A condition established by placing LOTO devices (locks or tags) such that all energy sources of feed and feedback have been isolated, locked, and tagged in accordance with this procedure are complete.
12. **LOTO - Administrator** - Designated employees or contractors who are responsible for the development of LOTO procedures for non-exempted equipment and approving the procedures. The LOTO-Administrator must

have successfully completed the appropriate level of training and the associated qualifying examination(s) required by this procedure and systems and electrical training on the equipment and systems for which they have LOTO procedure responsibilities. The required systems and electrical training is determined by the administrator's organization.

13. **LOTO Boundary –** Points at energy-isolating devices established in accordance with this procedure that allows LOTO-Competent Employees to safely work on the equipment that is under a LOTO.
14. **LOTO - Competent Employee –** Employees, contractors, and others who (1) apply LOTO to clear equipment and (2) perform servicing, maintenance, or modification on equipment cleared by a LOTO in accordance with this procedure. LOTO-Competent Employees may write draft LOTO procedures for approval by the LOTO-Administrator. LOTO-Competent Employees must successfully complete the training for LOTO-Competent Employees required by this procedure.
15. **LOTO - Competent Employee's Supervisor –** Persons who are responsible for the safety of LOTO-Competent Employees and assign and direct the work activities of the LOTO-Competent Employee.
16. **Lockout** - The placement of a lockout device on an energy-isolating device, in accordance with a LOTO procedure, which ensures the energy-isolating device and the equipment being controlled cannot be operated until the lockout device is removed.
17. **Lockout device - A device that utilizes a positive means such as a keyed lock to hold an** energy isolating device in the safe position and prevent the energizing of equipment. Included are blank flanges, bolted slip blinds, and valves that will accept an external locking mechanism that can be secured with a lock. A slip or pancake blind is a round metal plate that is slipped between the loosened flanges of a piping connection to prevent flow.
18. **Management Official-In-Charge –** This means the facility, project, site manager, or building manager.
19. **Master Lock** - A lock which has multiple keys distributed to multiple employees for opening the lock.
20. **Normal Energy Source –** This is the energy normally available to the equipment for its proper operation. There may be more than one type of normal energy source supplied such as electric, mechanical, hydraulic, pneumatic, etc.
21. **Restore Equipment from LOTO–** A LOTO is removed when all actions required to remove a LOTO are completed and the LOTO-Competent Employee removes all the LOTO devices from the equipment.
22. **Servicing, Maintenance, and Modification** - Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing equipment. These activities include lubrication, cleaning or un-jamming of equipment and making adjustments or tool changes where the employee may be exposed to the unexpected energizing or startup of the equipment or release of hazardous energy.
23. **Tagout** - The placement of a tagout device on an energy-isolating device, in accordance with a LOTO instruction, to indicate that the energy-isolating device and the equipment being controlled must not be operated until the tagout device is removed.
24. **Tagout device** - A prominent warning tag and a means of attachment, which can be securely, fastened to an energy-isolating device in accordance with a LOTO instruction, to indicate that the energy isolating device and the equipment being controlled must not be operated until the tagout device is removed. See Appendix C, "Tagout Devices."
25. **Tags-plus** - Tags-plus is an additional measure (tags-plus device) to protect a LOTO-Competent Employee from inadvertent re-energization resulting from a single human error or mistake at a tagged energy-isolating device. "A single error or mistake" means operation of one tagged energy isolation device. Examples of tags-plus are shown in Appendix H, "LOTO Requirements for Tagout ONLY."

References

Title 29 CFR 1910.147, “The Control of Hazardous Energy (Lockout/Tagout).”

Title 29 CFR 1910.333, “Selection and Use of Work Practices.”

29 CFR 1926.417, “Lockout and Tagging of Circuits.”

American National Standard, ANSI/ASSE Z244.1-2003, “Control of Hazardous Energy Lockout/Tagout and Alternate Methods.”

Appendices

Appendix A - Examples of Plant Areas / Components / Systems Not Under the Control of Plant Operations

Equipment Not Under Shift Manager (SM) / Shift Operations Supervisor (SOS) Control For LOTO Purposes	
Equipment Location	Responsible Manager
West Access Control Portal: Excludes Security Equipment	Facilities Manager
Unit 1,2,3 Maintenance Building	Facilities Manager
Central Alarm Station: Excludes Security Equipment	Facilities Manager
Service Building (Electrical, HVAC Equipment, Potable Water and 480V Vent Boards)	Facilities Manager
Plant Office Building	Facilities Manager
Plant Office Building Penthouse 480V Vent Board	Facilities Manager
Security Shift Coordinator Building (Old CAS)	Facilities Manager
NRC & Scheduling Building	Facilities Manager
Plant Engineering Complex	Facilities Manager
East Access Facility	Facilities Manager
Secondary Alarm Station: Excludes Security Equipment	Facilities Manager
Modifications Administration Building	Facilities Manager
Modifications FAB Shop	Facilities Manager
Modifications Paint Shop	Facilities Manager
Contractors Facilities Complex	Facilities Manager
Common Maintenance Building	Facilities Manager
Administration Building	Facilities Manager
Telecommunications Building (Node-2)	Facilities Manager
Environmental Complex	Facilities Manager
Materials and Procurement Complex (including Warehouses)	Facilities Manager
Gasoline/Diesel Fuel Station	Facilities Manager
Security Training Complex/Firing Range	Facilities Manager
Low Level RADwaste Storage Building	Facilities Manager
Waste Oil Storage Building	Facilities Manager
Heavy Equipment Shop	Facilities Manager
Training Center	Facilities Manager
Livewell Center	Facilities Manager

All modular units: such as Jim Walter buildings & office trailers (inside and Old Construction 4160V Loop Line beyond the Switchgear) (Note 2)	Facilities Manager
Potable water located in yard area (inside and outside the Protected Area) (Note 2)	Facilities Manager
Sewage lift pumps at the Training Center, Common Maintenance Building, and two lift pump stations at the Old Central Alarm Station inside the Protected Area	Facilities Manager

NOTE 1 Fire Protection systems are not INCLUDED in this list. For these systems, contact must be made with the SM to determine which procedures are to be used.

NOTE 2 For these areas, the SM must be contacted. The SM will determine the tagging procedure to be used on a case-by-case basis.

Appendix B - Tagout Devices

"Do Not Operate" Tag

1. The TVA tagout device is the "Do Not Operate" tag shown in Figure B-1. This tag is used in conjunction with a lockout device for creating a LOTO. This tag may not be used for any other purpose. TVA has standardized the print and format on the tag. The TVA Catalog Identification (CAT ID) for the "Do Not Operate" tag is CPA247G.

Figure B -1 "Do Not Operate" Tag

2. The tag is installed on all energy-isolating devices, including drains and vents, used to isolate equipment from all sources of energy and to permit work to be safely performed on the equipment. The "Do Not Operate" tag(s) identifies the boundaries of the de-energized equipment.
3. A "Do Not Operate" tag may be attached to non-energy-isolating devices such as local push buttons, control switches, etc. of cleared equipment to indicate that the associated equipment is under a LOTO.
4. A "Do Not Operate" tag is never affixed to equipment that is energized or in service.
5. Equipment will not be energized until after the LOTO has been removed including all "Do Not Operate" tags.
6. Each LOTO-Competent Employee must sign and date the "Do Not Operate" tag when affixing it to the equipment's energy isolating device(s) at the same location as the lockout device is affixed.

7. The “Do Not Operate” tag must be substantial enough to prevent inadvertent or accidental removal and be capable of withstanding the environment to which it is exposed for the maximum period of time that the tag will be affixed to the equipment. Information written on the tag must be such that exposure to corrosive environments, weather conditions, or wet and damp locations will not cause the message on the tag to become illegible. The LOTO-Competent Employee is responsible for replacing tags that are damaged or become illegible.

Tagout Device Attachment

1. The means of affixing the “Do Not Operate” tag must be substantial enough to prevent inadvertent or accidental removal and be capable of withstanding the environment to which it is exposed for the maximum period of time that the tag will be affixed to the equipment. The “Do Not Operate” tag attachment means must have the following characteristics:
    1. Non-reusable,
    2. Attachable by hand,
    3. Self-locking, and
    4. Non-releasable with a minimum unlocking strength of no less than 50 pounds. The tag attachment means must have the general design and basic characteristics of being at least equivalent to a one-piece, all environment-tolerant nylon cable tie. In normal situations, the only acceptable means of attachment of tags is a nylon cable tie.
2. The tags are attached in a manner that the message is visible and at the same location that a lockout device is attached, if the energy isolating device has an attachment point for a lock.
3. If the energy isolating device has no attachment point for a lock, the tag is affixed to the device so as to be obvious to anyone not to operate the isolating device.
4. Where the tag cannot be affixed to the isolating device, the tag is located as close as safely possible to the device so as to be obvious to anyone not to operate the isolating device.
5. Where a tag and lock cannot be used directly on the isolating device, an adapter such as that shown in Figure B -2 is used to enable the attachment of the tag.

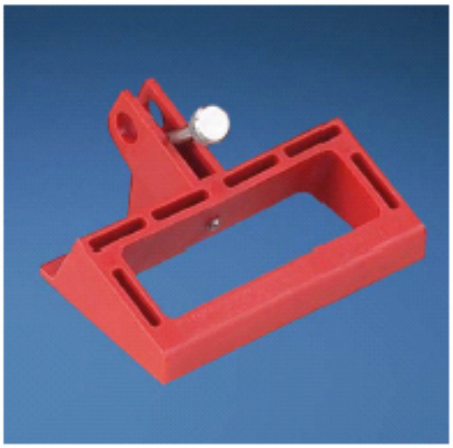


Figure B -2

Appendix C - Lockout Devices

1. Keyed locks will be used as lockout devices. The locks will be (1) singularly identified for controlling energy; (2) not be used for other purposes; and (3) meet the following requirements:
   - Be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.
   - Be standardized within the facility or organization in at least one of the following criteria: Color; shape; or size.
   - Be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.
2. A personal LOTO lock will have a **maximum** of two (2) keys and be standardized like those shown in Figure C-1. The lock must be good quality with a serial number / identification number. The identification number may be stamped or engraved on the lock.

Figure C-1 Example of Lockout Locks

3. Locks will be assigned by the identification number on the lock to a specific LOTO-Competent Employee. Each LOTO-Competent Employee will receive a key for his/her assigned locks. The LOTO-Competent Employee's supervisor may hold the other key.
4. To remove a lock in the absence of the LOTO-competent employee, the supervisor has the following options: (1) using the second key that the supervisor may be holding, (2) using a master key that the supervisor may be holding for all the locks issued to his/her LOTO-Competent Employees, or (3) using a bolt cutter.
5. LOTO master locks with multiple keys are used by LOTO-competent employees for the purpose of transferring an established LOTO from one LOTO-competent employee to another LOTO-competent employee(s). The LOTO master lock is used when the departing employee remove his/her personal LOTO locks and leaves the site before the arriving employee has applied his/her personal locks to the isolating devices.
6. Figure C-2 shows examples of lockout devices that permit multiple locks to be applied to a single energy isolating device. These type devices will be used when more than one LOTO- competent Employee must attach his/her lock to the isolating device.

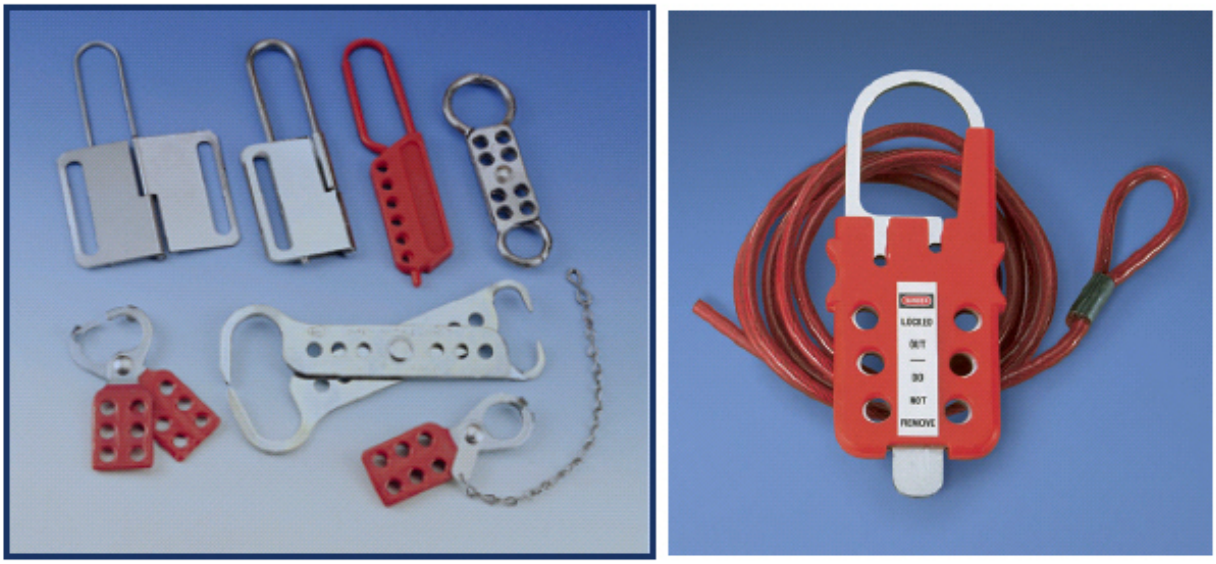


Figure C-2 Examples of Hasps that Accept Multiple Locks

7. Whenever replacement or major repair, renovation, or modification of equipment is performed, and whenever new equipment are installed, energy isolating devices for such equipment must be designed to accept a lockout device as defined in paragraph 15.17.
8. Where a lock cannot be used directly on the isolating device, an adapter such as those shown in Figure C-3 is used to enable the attachment of the lock and tag.

Figure C-3 Brady (left), PowerBloc (center), and Panduit (right) Adapters

Appendix D - Lockout/Tagout (LOTO) Specific Procedure

TVA 20244 Lockout/Tagout (LOTO) Specific Procedure [1]

Appendix E - Special Requirements for Electrical Equipment LOTO

Appendix E

Special Requirements for Electrical Equipment LOTO

1. Live parts to which an LOTO-Competent Employee may be exposed must be deenergized before the employee works on or near them, unless it can be demonstrated that deenergizing introduces additional or increased hazards or is infeasible due to equipment design or operational limitations.
   Note: Examples of **increased or additional hazards** include interruption of life support equipment, deactivation of emergency alarm systems, shutdown of hazardous location ventilation equipment, or removal of illumination

for an area that introduces increased or additional hazards.

Examples of work that may be performed on or near energized circuit parts because of infeasibility due to equipment design or operational limitations include testing of electric circuits that can only be performed with the circuit energized and work on circuits that form an integral part of a continuous industrial process in a chemical plant that would otherwise need to be completely shut down in order to permit work on one circuit or piece of equipment.

2. Live parts that operate at less than 50 volts to ground need not be deenergized if there will be no increased exposure to electrical burns or to explosion due to electric arcs.
3. Only component hand-switches that meet the definition of an energy isolating device may be used as a LOTO energy isolation device. Component hand-switches not meeting the definition of a LOTO isolating device may be tagged as indication/information that associated equipment is under a LOTO.
4. If potential or service transformers are outside of the LOTO zone, they may be cleared from the primary side. If they are inside the LOTO zone, they must be cleared from the secondary side.
5. Coupling capacitors within a LOTO boundary must have their secondary circuits shorted if work is to be performed on or within the minimum approach distance to the capacitors.
6. Static capacitors within a LOTO boundary must be grounded. The LOTO-Competent Employee who will perform the servicing and maintenance is responsible for discharging and grounding the static capacitors.
7. All disconnecting devices or breakers that establish a LOTO boundary must be opened and made inoperable with a LOTO device applied to ensure that they will not be closed.
8. Gang or motor-operated disconnects or air-break switches must be mechanically locked in the open position and visually checked to verify that all blades are open.
9. When placing or removing LOTO inside electrical boards, the LOTO-Competent Employee will ensure that no loose materials remain in the breaker compartment.
10. Control power circuits must be de-energized, locked, and tagged if (1) the work is on the control circuit, (2) the proximity of work is near the energized control circuit, or (3) there exists a possibility of grounding the control circuit that would adversely affect equipment or personnel safety.
11. LOTO on fused circuits other than control circuits must have a “Do Not Operate” tag attached to the fuse compartment door after the fuses have been removed from the circuit. The fuses must be placed in a safe storage location.
12. Live-Dead-Live (LDL) Checks
    1. Breakers may be locked under a LOTO as an isolating device for performing either mechanical or electrical work on the associated equipment. Electrical work involves work on electrical components and/or bare electrical parts and conductors.
    2. When a draw-out type breaker is locked for performing mechanical work within a LOTO boundary, it is sufficient to verify that the breaker is physically disconnected from the electrical bus via inspection at the breaker compartment.
    3. When a draw-out type breaker is locked for performing electrical work within a LOTO boundary, verify the breaker is physically disconnected from the electrical bus via inspection at the breaker compartment and perform a LDL check at the location of the work activity.
    4. When a molded case breaker is locked for performing mechanical work within LOTO boundary, perform a LDL check on the load side terminals of the breaker and observe at the equipment location that deenergizing has been accomplished. Observations of deenergizing include equipment not running, control push buttons do not start equipment, normally on lights are off, use non-contact voltage detection devices to verify feeder conductors are deenergized, motor controller controls are deenergized, etc.
    5. When a molded case breaker that has a motor contactor between the breaker and the load is locked for performing electrical work within a LOTO boundary, a LDL check on BOTH the load side of the breaker AND at the location of the work activity is required.

6. Regardless of the breaker type (molded case or draw-out), LDL checks are always required at the location of the work activity when the breaker is locked as an electrical boundary to allow personnel to perform maintenance on electrical circuits.
7. In all cases, the LOTO-Competent Employee working under a LOTO is responsible for ensuring that LDL checks are performed by an employee qualified to perform tests for the absence of electrical energy.

Appendix F - Special Requirements for Mechanical Equipment LOTO

Appendix F

Special Requirements for Mechanical Equipment LOTO

1. An air-operated valve that fails open on a loss of air is not considered closed for blocking purposes unless it is held closed with an installed jacking device or device used to secure the valve in the required position. A LOTO device will be attached to the jacking or other device used to hold the valve.
2. An air-operated valve that fails closed must have its air supply electrically or mechanically isolated, depressurized and the valve visually checked-to-be-closed by local or remote indication. The air supply energy-isolating devices must have a LOTO device applied to it.
3. An air-operated valve that fails “as is” will be closed and mechanically restrained. Its air supply should be electrically or mechanically isolated, depressurized, and the valve visually checked to be closed by local or remote indication. The air supply energy-isolating devices and mechanical restraint must have a LOTO device applied to them.
4. In cases where it is not possible to physically secure an air operated valve that fails “as-is” in the closed position, the valve will be locked closed by applying closing air to the valve diaphragm by the use of the solenoid valve air overrides and applying LOTO to both the hand-switch in the closed position and the solenoid valve air overrides. Prior to allowing work to begin, the equipment will be drained and de-pressurized to ensure the boundary valves are holding. The solenoid value must be attended/monitored by a LOTO-Competent Employee to ensure that it is maintained closed until all work is completed. Communications must be maintained between the attendee/monitor and the LOTO-Competent Employee(s) while servicing and maintenance is being performed.
5. Pressure controlled valves, relief valves, and check valves will not be used as isolation boundary valves under normal conditions. Where such a valve is used, additional protection must be used, i.e., the valve being physically restrained in the required position.
6. LOTO for entry into permit required confined spaces with piping, lines, or ducts (steam, water, inert gases, chemicals, etc.) must be completely protected against the release of energy and material into the space by such means as blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; or a double block and bleed system , such as two closed valves in series with an open vent between the valves.. Entry into the confined space will be in accordance with Safety Procedure 801, “Confined Space Entry.” Entry into such confined spaces must comply with Safety Procedure 801, “Confined Space Entry.”
7. LOTO for work on high energy systems (operating with temperature greater than 200 F or pressure greater that 500 psig), lethal chemical systems, or systems connected to high energy systems shall when possible isolate the work area by two closed valves in series. If equipped, a tell-tale vent or drain between the isolation valves should be opened. LOTO for entry into permit required confined spaces involving such systems must comply with the requirements in paragraph 6, Appendix F, TSP 615.

Appendix G - Generic LOTO Procedure for Execmpted Equipment

TVA 20243 - Generic LOTO Procedure for Exempted Equipment [2]

Appendix H - LOTO Requirements for Tagout ONLY

Appendix H

LOTO Requirements for Tagout ONLY

When it is physically not possible to use a lockout device, a tags-plus device must be used in addition to the tagout device. The **LOTO-Competent Employee must apply** additional measure (tags-plus device) to protect the LOTO-Competent Employee from inadvertent re-energization resulting from a single human error or mistake at a tagged energy-isolating device. “A single error or mistake” means operation of one tagged energy isolation device.

Examples of tags-plus devices include, but are not limited to, the following:

1. “Checking it open/making it non-operative, e.g., Motor Operated Disconnects and Motor Operated Valves.
2. Fuse removed and blocking device installed.
3. Secure placement of a barrier or blocking device adequate to physically prevent a tagged isolating device from being inadvertently operated, e.g., “clam” shell cover over a valve handle and a closed switchgear compartment door.
4. Two valves tagged in the closed position in series (Figure H-1).

Figure H-1

5. An air-wrench operated valve is inherently Tags-Plus by design (Figure H-2). It requires a hose, socket, and air motor to operate the valve.

Figure H-2

6. One valve blocked and tagged in required position. Figure H-3 shows a blocking device (Master Lock Company) with an arm to secure a quarter-turn ball valve.

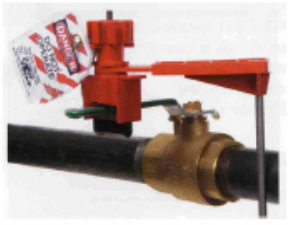


Figure H-3

7. One tagged valve with a nylon tie-wrap or cable device (Master Lock Company) connecting the valve handle to the pipe, valve yoke, or other fixed location (Figure H-4), thus preventing the valve from being operated. A retractable cable device (Brady Company) used to prevent the value handle (Figure H-5) from being operated. Nylon tie-wraps/cable-ties having the following TVA CAT ID numbers are available: 21-inch cable-tie (**CLQ079C**), 28-inch cable-tie (**CLL878B**), and 40-inch cable-tie (**CLQ067K**).

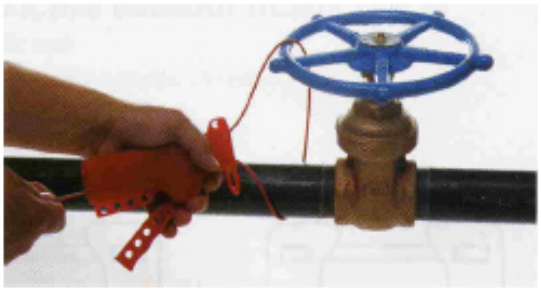


Figure H-4

Figure H-5

8. An example of tags-plus devices from the Brady and Panduit Companies is shown on low voltage circuit breakers in Figure H-6.

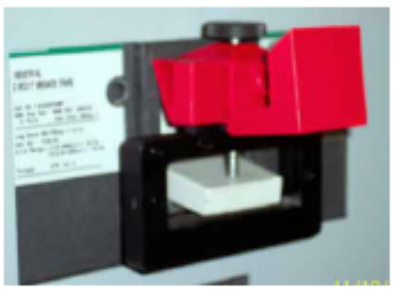


Figure H-6

Figure H-

9. Molded case circuit breakers in a panel (Figure H-7) are shown blocked by a device called Power/Bloc™ by Safety Design, Inc.

Figure H-7

10. Examples of tags-plus devices on a knife blade electrical switch are shown in Figure H-8.

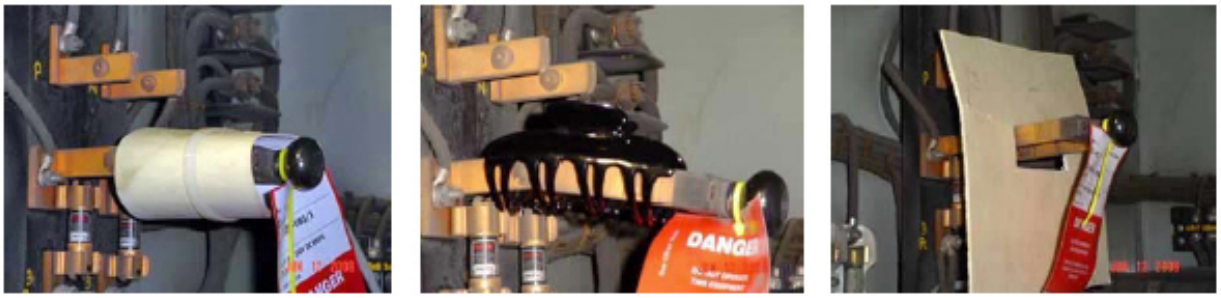


Figure H-8

11. Attachment devices shown in Table H-1 are available from Porter Walker, LLC, in Columbia, TN. Their BPO number is 3628 and their phone number is 1-800-737-1631.

Table H-1 Examples of Tagout Attachment Devices from Porter Walker, LLC

	TVA CAT ID	DESCRIPTION	MFR	PN
	CGT862L	LOCKOUT, ELECTRICAL, QA 0, CIRCUIT BREAKER, SINGLE POLE	MASTER LOCK	492
	CJQ398H	LOCKOUT, ELECTRICAL, QA 0, CIRCUIT BREAKER, MULTI-POLE, UNIVERSAL	MASTER LOCK	495
	CKA130A	LOCKOUT, ELECTRICAL, QA 0, OVERSIZED, 480/600 VOLT BREAKER	MASTER LOCK	491
	CKA133Q	LOCKOUT, ELECTRICAL, QA 0, CIRCUIT BREAKER, 277 VOLT, SINGLE POLE, NO HOLE	MASTER LOCK	493
	CKA132T	LOCKOUT, ELECTRICAL, QA 0, CIRCUIT BREAKER, 480/600 VOLT, NO HOLE	MASTER LOCK	494

Appendix I - Lockout/Tagout (LOTO) Log

TVA 20246 - Lockout/Tagout (LOTO) Log [3]

Appendix J - Lockout/Tagout (LOTO) Record Sheet

TVA 20245 - Lockout/Tagout (LOTO) Record Sheet [4]

Appendix K - Temporary Protective Ground Discs

Appendix K

Temporary Protective Ground Discs

1. Ground Discs
    1. This appendix outlines the expectations for placing and removing protective grounds. This systematic method to account for grounds increases the awareness of the importance of protective ground removal and reduces the risk of leaving grounding jumpers in place erroneously.
    2. Anyone who installs protective grounds on equipment cleared by a LOTO in accordance with TSP 615 must comply with this appendix. This appendix requires individuals to fully document the location of each protective ground they install and to use that documentation to verify that all protective grounds are removed.
2. Preparing Grounding Discs
    1. A ground jumper disc will be made of one and one quarter inch or similar circular brass or Lamicord™ tag material.
    2. These discs will be issued to individuals and will be marked with a unique identifier and sequential numbering system. Discs will be provided with a metal snap-type clip.
3. Installing Protective Grounds
    1. The LOTO-Competent Employee installing the grounding jumpers records the disc numbers used in the Placement Ground Disc column of the LOTO Record Sheet to record the grounding jumper installed.
    2. The ground discs may be attached to the equipment end or the ground end of the grounding jumper before the ground is installed. Individuals installing and removing ground discs are responsible for ensuring the proper use of ground discs and recording the disc numbers on the LOTO Record Sheet. Never hang a protective ground without a numbered disc attached to the ground.
4. Removing Protective Grounds
    1. After protective grounds are removed from the conductor or equipment, each disc is documented as removed by recording the disc number in the Restoration Ground Disc column.
    2. The discs will be maintained by the LOTO-Competent Employee who was issued the discs. The discs may be stored attached to the ground jumpers or separately.
    3. Discs may remain attached to ground jumpers until a jumper is retired. When a jumper is retired, the disc will be removed and:
        1. Attached to another serviceable ground jumper,
        2. Maintained by the LOTO-competent employee to whom the disc was assigned, or
        3. Returned to the LOTO-competent employee’s supervisor.

Appendix L - Lockout/Tagout (LOTO) Audit Form

TVA 20247 - Lockout/Tagout (LOTO) Audit Form [5]

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=083370041

[2] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=083370038

[3] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=083370047

[4] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=083370045

[5] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=083370050:

Procedure 616 Movement of Items Using Materials Handling Equipment

TVA Safety Manual

616 Movement of Items Using Materials Handling Equipment

Procedure Number 616

TVA Safety Procedure

Movement of Items Using Materials Handling Equipment

Revision 6

May 2, 2011

Purpose

This procedure provides requirements for the safe movement of all loads using hand trucks, platform trucks, shop cranes, pallet jacks, and air pallets, or any other mechanical device used to handle material that is not specifically addressed by TVA or OSHA requirements.

This procedure applies to all employees, including contractors that are involved in the storage, requisitioning, inspection, or use of materials handling equipment and hardware. This procedure is applicable to all TVA work locations. No site specific changes to this procedure may be made.

Requirements

Program Components

The Materials Handling Program shall consist of governing procedures from the TVA Safety Manual, applicable industry standards, and technical input from equipment manufacturers.

Roles and Responsibilities

1. **Executive Vice President / Vice President**
   Provide senior management expectation that this TSP will be implemented and enforced for their organization.
2. **Manager in Charge of the Workplace (Plant / Site / Area Manager, etc.)**
   Responsible for the administration of and compliance with this TSP and all other related material handling documents and procedures.
3. **Modifications / Maintenance Manager, Transmission Service Manager, or Equivalent**
   1. Responsible to the Plant / Site Manager for implementation of this TSP.
   2. Ensure the availability and selection of the appropriately qualified personnel to perform materials handling activities.
4. **Supervisor / Foreman / Person-in-Charge**
   1. Ensure that individuals are proficient in materials handling tasks.
   2. Ensure that individuals performing materials handling activities know and understand their responsibilities and comply with the requirements of this procedure.
   3. Ensure that vendor and contractor individuals are proficient in materials handling tasks prior to being authorized to do work.

4. Be aware of the environmental effects and surrounding conditions of the area where materials handling operations will be performed.
5. Ensure that prior to use inspections are performed prior to using material handling equipment.
6. Ensure that hardware and equipment discrepancies are reported.

5. **Materials Handling Personnel**
   1. Be approved to perform materials handling activities by their supervisor, lead foreman, or foreman.
   2. Have demonstrated proficiency in the use of material handling equipment as observed by the supervisor, lead foreman, or foreman.
   3. Provide instruction for teammates.
   4. Use the appropriate procedures and other reference documents, as needed.
   5. Obtain weight and center of gravity of the load by drawings, engineering, or conservative estimating, as appropriate.
   6. Understand limits of the equipment and ensure that limits are not exceeded.
   7. Use materials handling equipment within its design capabilities and features.
   8. Determine and understand the specific requirements for materials handling in specific or local surroundings (environment, site procedures, and unique characteristics).
   9. Ensure clear movement path for materials handling equipment (carts, dollies, pallet jacks, hand trucks, etc.).
   10. Determine appropriate lifting points for materials that will provide the best stability and not damage the load.
   11. Ensure compliance with materials handling program requirements for the task(s) being performed and the equipment being utilized.

Job Safety Analysis Requirements

Regardless of the method used to perform material handling activities, there are inherent dangers associated with the movement of loads. To ensure appropriate consideration is given to the handling of these loads, the Materials Handling Safety Checklist is provided in Appendix A to determine the necessity for a task specific Job Safety Analysis. This Appendix shall be completed to ensure an appropriate determination is made as to whether a JSA is required or not if the load to be moved with material handling equipment is greater than 75 pounds.

Material Handling Equipment Inspection

1. Prior to use Inspections – All material handling equipment shall receive an inspection prior to use by the material handler to ensure the following:
   - Rated capacity / safe working load is readily visible
   - No obvious mechanical defects (cracked or distorted parts, bent members, etc.)
   - Properly inflated tires (as applicable)
   - No hydraulic leaks (as applicable)
   - Hooks shall be inspected for cracks, any twist from the plane of the unbent hook, or throat opening is less than 5% of new hook dimensions (not to exceed 0.25”)
   - Proper operation of moving parts and load restraint devices (as applicable)
   - Proper operation of load limiting devices (as applicable)
2. Any deficiencies affecting safe operation identified by this inspection shall be corrected prior to use of the subject material handling device. If the deficiency cannot be corrected immediately, it shall be tagged with a Defective Equipment Tag (form TVA 18004) and removed from service.

Hand / Platform Trucks (Including All Types of Wheeled Carts, i.e. Push Carts, Dollies, Buggies)

1. Hand or platform trucks are simple wheeled devices that are operated without power. Hand trucks are used to transport various types of relatively small loads over short distances. Hand trucks are usually made of steel or aluminum tubes or angles. They have small to medium sized wheels that can be made of rubber, plastic or metal, with a band of rubber. A suitable harness and restraint are used to bind the load being transported to keep it firmly in place. A long handle ensures that less effort is required to move the load. Hand trucks are classified by: the load they can carry, the wheel size, the type of handle, the construction and their overall dimensions, etc. A typical hand truck is shown in Figure 6-1. Other hand trucks may differ in appearance with some being designed for a specific task, i.e. moving barrels; however the safety precautions are the same.

Hand Truck
Figure 6-1

2. Platform trucks, push carts, dollies, buggies, etc. are very similar to hand trucks with the exception that they generally involve a four to six wheeled cart and are capable of handling substantial loads. A typical manually operated platform truck is shown in Figure 6-2 and a buggy for handling pipe is shown in Figure 6-2A as examples of types of wheeled carts. Other trucks, carts, dollies, buggies, etc. may differ in appearance, i.e., truck with a detachable tongue used to push or pull the truck; however, the same safety precautions need to be followed.

Platform Truck
Figure 6-2

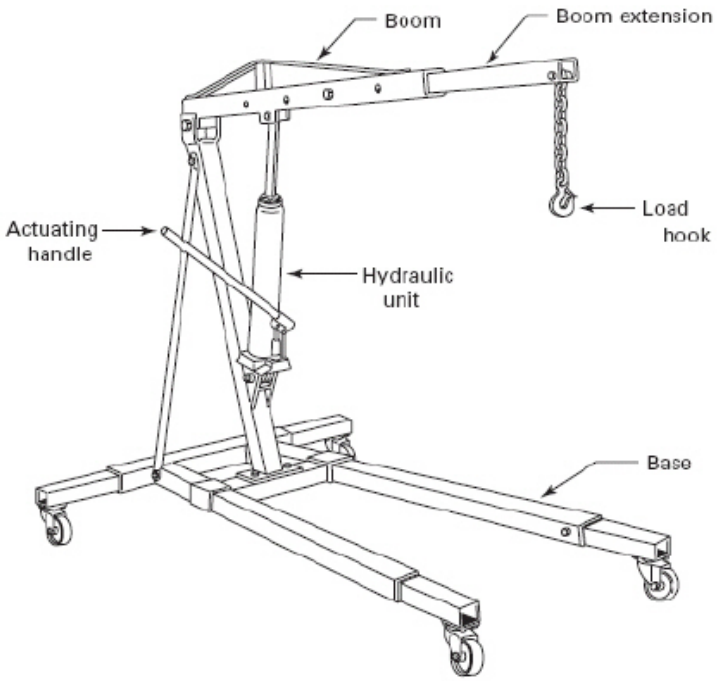
Figure 6-2A

3. Hand / Platform Truck (Push Cart or Dollies) Operations
    1. When loading hand trucks, keep your feet clear of the wheels.
    2. Do not exceed the manufacturer's load rated capacity. Ensure platform trucks are loaded evenly to prevent tipping.
    3. The size and strength of the individual operating the truck plays a large role in determining the maximum size of the load to be carried. Never attempt to move a load that is difficult to tilt or control and maintain balance.
    4. Place the load so that it will not slip, shift, or fall. Use straps to secure the load to the truck, as necessary. Load only to a height which will allow a clear view ahead.

5. If provided with wheel locks, they shall be used when loading or unloading material. If wheel locks are not provided on the platform truck, an approved method for securing the truck shall be used to prevent movement (chock wheels, someone holding the truck, etc.).
6. Gas cylinders may only be transported on a hand truck when securely strapped or chained to the hand truck and the safety cap(s) installed.
7. Tip the load slightly forward so that the tongue of the hand truck goes under the load as far as possible.
8. Keep the center of gravity of the load as low as possible by placing heavier objects below the lighter objects.
9. When using a hand truck, push the load so that the weight will be carried by the axle and not the handles.
10. Do not walk backward with the hand truck, unless going up stairs or ramps.
11. When going down an incline, keep the truck in front of you so that it can be controlled at all times.
12. Move trucks at a walking pace only. Let the truck carry the load. The operator should only maintain its balance and provide the motive power.
13. Store hand trucks with the tongue under a pallet, shelf, or table.
14. If moving a load that weighs in excess of 1,000 pounds on a wheeled cart see Appendix B for additional requirements.

Shop Cranes

1. This section applies to self-contained shop cranes characterized by a pair of laterally spaced legs, an upright mast, pivoting boom with a boom extension and hook, and a power unit to move the boom up and down at a pivot point for the purpose of raising, transporting, and lowering loads in a material handling function. A typical device of this type is shown in Figure 7-1.



Shop Crane
Figure 7-1

2. Operation of shop cranes shall be in accordance with the following:
    1. Study, understand, and follow the manufacturer's instruction before operating this device.
    2. Do not exceed the rated capacity.
    3. Use only on a hard level surface.
    4. Before transporting a load, lower the load to the lowest possible point.

5. Use only slings or chains with a rated capacity greater than the weight of the load to be lifted.
6. Do not allow the load to swing or drop violently while lowering or moving.
7. No alterations shall be made to this device without written authorization from the manufacturer.

Pallet Jacks

1. Pallet jacks incorporate tines like a forklift, but they are specially designed for the purpose of lifting pallets sufficiently off the ground so that they may be wheeled from one location to another. Their design incorporates specially wheeled forks that are designed to go between the top and bottom boards of a double-faced pallet. Although there are some special high-lift designs in use, most pallet jacks have a maximum lift height of approximately 6 inches.
2. Pallet Jack Design
    1. All pallet jacks incorporate essentially the same design. There is a centrally located steering wheel (or pair of wheels) at the leading end of the pallet jack that is connected to a hydraulic ram. Linkage is also connected between the hydraulic ram and mechanical jacking devices for small outrigger rollers located under each tine. Pumping the steering handle extends the hydraulic ram thereby raising the steering wheel and extending the jacks for each of the outrigger rollers. Refer to Figure 8-1.
    2. Some pallet jacks are power operated. Lifting is still done by manual hydraulics and mechanical linkage, but the steering wheel is driven and brakes are provided by an electrical motor. Refer to Figure 8-2.

Hand Operated Pallet Jack

Figure 8.1

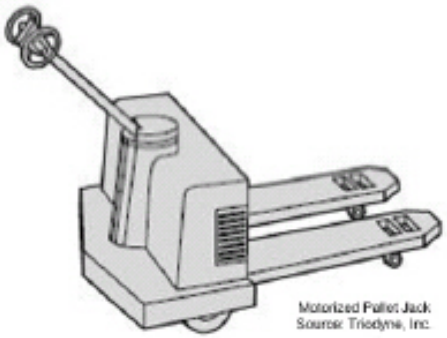


Figure 8.2

3. Pallet Jack Use
    1. Only personnel familiar with this device are allowed to use pallet jacks. Prior to use personnel will review the operator's manual and be supervised by an experienced operator until operational skills are demonstrated.
    2. Never exceed the manufacturer's load capacity specifications.
    3. Start and stop the pallet jack gradually to prevent the load from slipping or shifting.
    4. Pull manual pallet jacks when transporting loads horizontally. Push pallet jacks only when going down an incline or passing close to walls or obstacles.
    5. Ask a spotter to assist in guiding the load if your view is blocked.
    6. Stop the pallet jack if anyone gets in your way.
    7. Never place your feet under the pallet jack.
    8. Never use a second piece of equipment to push, pull, or lift a pallet jack.
    9. Move slowly when making sharp turns to prevent tipping
    10. Keep hands, feet, and other body parts confined to the running lines of the pallet jack.
    11. Never ride pallet jacks.
    12. Some pallet jacks are capable of carrying 5000 pounds or more; therefore, great care must be taken when maneuvering such loads as it is extremely difficult for one person to stop the pallet jack once in motion.

Air Pallets

1. Air pallets are an ideal alternative to regular platform and fabricated steel transporters when loads sizes do not overhang the transporter base. Sizes are available in different widths and lengths by most manufacturers and can usually be customized to suit plant specific needs.
2. Air pallets are usually equipped with a push handle assembly at the rear which allows the operator tighter control of the transporter's operational settings. Air pallets are most often constructed from aluminum extrusion which affords light weight and durability, combined with a very low profile, usually around two inches in height. This affords the capability to maintain a low center of gravity of the load to be handled facilitating a much safer material handling operation.
3. Generally speaking, these devices are available in load capacities from 500 pounds to 20 tons and beyond. These transporters only need a constant supply of compressed air to operate. A typical air pallet transporter is shown in Figure 9-2.
4. Requirements on the use of and inspection of air pallets will be in accordance with the manufacturer's recommendations. As a minimum, the general guidelines provided for "Pallet Jack Use," as provided in Section 8.3, shall be followed when operating air pallets.

Air Pallet Transporter
Figure 9-2

Hilman Rollers

1. Hilman rollers are typically used to move heavy loads over a relatively short distance for the purpose of installation or removal large components or subcomponents. Figure 10-1 depicts a Hilman Roller in use.

Hilman Roller Application
Figure 10-1

2. **Operation and Installation of Hilman Rollers**
    1. Each roller must be inspected before each use.
    2. Select an area that is easily accessible, and provided the best load distribution.
    3. Care should be taken when installing the rollers including lifting, prying, and/or jacking of the loads.

4. Ensure that all of the rollers to be used are exactly aligned to ensure minimal friction which could result in shifting of the load.
5. The roller top should always be fully supported and kept parallel to the floor.
6. When using large capacity rollers with a machined chain track raceway, ensure the chain roll is positioned properly in the track at dead center of the roller frame.
7. If the object being moved has limited contact area, the roller should be affixed to the load in at least some temporary manner. This method shall be able to withstand any horizontal force that could result from load shift.
8. Special care shall be taken when moving top heavy equipment or equipment with a high center of gravity.
9. When using swivel models with a locking device, lock all rollers before aligning and placing them under the load. The rollers must be aligned parallel.
10. Ensure the load rests upon the entire roller assembly. If a swivel or swivel lock model is used, the load shall cover the entire area of the swivel top plate.
11. The floor surface or path upon which the roller transports the heavy load shall be clean of all debris and shall not have sharp protrusions of any sort. A clean floor surface that is damaged by the rollers can introduce debris causing roller malfunction. The floor surface must be monitored for damage that can result in debris. If damage to the floor surface occurs, actions must be taken to keep rollers free of debris.
12. Ensure the floor surface over which the load will be transported is able to support the load concentration that will be generated by each of the rollers.
13. Steering handles are only to be used for steering only and never used for pulling or towing the load.
14. The roller can be towed only when it is permanently affixed to the load.
15. Hilman rollers should be periodically inspected in accordance with Hilman Maintenance Instructions to ensure all parts are fully functional.

Proper Materials Handling Practices

1. Determining Weight of Load
    1. Knowing the weight of an object to be moved, especially heavy objects is very important. Ultimately the weight of an object will determine what sort of equipment will be necessary to safely move the object (Refer to Item 2 below), and considerations that need to be given as to how the object is moved. (Refer to Item 3 “Establishing a Safe Travel Path” below). The capacity of the material handling device used must exceed the weight of the load. The capacity of material handling device must be on the device either as provided by the manufacturer or be added to the device based on manufacturer documentation.
    2. There are multiple ways to determine the weight of an object that needs to be moved. The first and most accurate is to simply weigh it using calibrated weight scales. Some more common methods include obtaining the weight from either a shipping ticket or drawings or vendor provided information.
    3. Another more practical means for determining weight is to estimate the weight of the object based upon the primary type of material the object is made of and its approximate volume. When using this method always apply conservatism to ensure the actual weight is bounded by the estimate.
2. Determining Type of Materials Handling Equipment to be Used

    Several factors must be considered when determining which type of materials handling equipment to use:
    1. Personnel safety – First and foremost should be the consideration of personnel safety. Anytime equipment like forklifts can be used instead of hand trucks and ladders, the risk to personnel will be reduced.
    2. The weight of the load – Obviously the greater the weight of the load the greater the amount of equipment required to move it. Capacity factors for carts and pallet jacks must be considered. Additional weight also means additional dangers to materials handling personnel.
    3. Load center of gravity – Loads that are top heavy or of awkward shape need to be given special attention to ensure they are properly secured and can not topple over or fall while being transported. This may require, for

example, that the load be secured to a suitable pallet before moving.

4. The distance the load is to be moved – Loads that need to be moved over substantial distances are more practically transported by mechanized means. In the case of materials handling, this usually means a forklift, or perhaps a flatbed truck.
5. Obstructions and confinement issues – How high is the object to be moved stored above the floor? How high does the object need to be raised at its destination? Are there low clearances or floor grating that would preclude the use of material handling equipment? For additional considerations that can determine the types of equipment appropriate for the job, refer to Item 3 “Establishing a Safe Travel Path” below.

3. Establishing a Safe Travel Path
    1. Moving a load from one place to another always involves more than just selecting equipment with adequate load capacity to do the job. Whether inside the warehouse or out in the plant; before a load is moved the entire load path needs to be walked down to check for hazards, obstructions, inclines, drop-offs, low clearances, floor load capacities, and personnel traffic.
    2. Inside the warehouse, challenges are usually confined to obstructions, inclines, and drop-offs. Materials handling personnel need to ensure that there is adequate space to maneuver the equipment they plan to use, and that personnel are clear of the area when the load is in transit. Extra caution needs to be used around loading dock drop-offs and inclines.
    3. Transporting materials out in the plant is a completely different environment. Unlike warehouses which were designed for materials handling activities, many areas of the power plant are not. Material handling personnel need to use extreme caution to avoid high pressure / high temperature piping, high voltage cables, pumps, motors, and switchgear. Much of this equipment is in tight quarters and at low clearances. Additionally, many areas of the plant use metal grating on the floors. The load capacity of this grating may not be adequate for material handling equipment and its cargo.
    4. It is recommended that these types of high hazard areas which are potentially accessible with material handling hardware be clearly marked with signs or barricades to prevent this equipment from entering.
4. Potential Hazards
    1. Potential hazards when performing materials handling activities can come from a number of sources. Obviously there are the hazards of working around the load and equipment itself. These include crushing or pinching hazards, and tripping hazards. Other sources of hazards can be just as dangerous, however. Power plants and their surrounding sites contain many environmental hazards. Material handling personnel need to be ever vigilant in identifying and avoiding sources of electrical contact including bus bars, and cable trays. Material handling personnel may also be operating around high temperature and pressure piping systems, and critical equipment vital for safe operation or shutdown of the plant. Simply working near high voltage equipment can cause rubber-tired equipment to accumulate potentially dangerous static charges. Moving radioactive materials can pose serious contamination hazards should the load be accidentally dropped or tipped.
    2. The time to identify all sources of potential hazards is during the Pre-Job Briefing. Identified hazards must be adequately controlled or eliminated prior to performing work.
5. Pinch Points
    1. Working around material handling hardware can put materials handling personnel in danger of pinching or crushing type injuries. Next to back injuries, pinching and crushing type injuries are the leading types of accidents experienced by materials handling personnel.
    2. General rules to protect materials handling personnel from pinch points and crushing injuries include:
        - Keep hands and feet away from the wheels of platform / hand trucks.
        - Never allow feet to be positioned under pallet jacks.
        - Never operate equipment without all proper guards and covers in place.

- Never place your body or any extremity where sudden or unexpected movement could create a pinch point.
- Ensure all powered equipment is tagged out prior to performing any maintenance or repair activities.

Loading / Unloading Trucks

This section applies to loading and unloading material from flat bed trucks where the material and securement method can result in the load falling when the means to secure the load is being applied / removed. An example would be a load of pipe secured with straps, i.e. removal of the straps can result in the pipe rolling from the truck and striking personnel.

1. The following requirements must be met to ensure loads covered by this section do not fall and strike personnel working in the area.
    1. A single JSA must be prepared to cover unloading loads covered by this section. This JSA would be used in the pre-job briefing required in paragraph 3 below. Specifics of a given load not covered in the JSA must be covered in the pre-job briefing.
    2. The truck must be parked on a level surface and secured against movement, i.e. parking brake, block wheels, etc.
    3. The loading / unloading crew and truck driver will jointly participate in a pre-job briefing prior to loading / unloading material.
    4. Prior to loading/unloading material the driver and operator of equipment to be used to load/unload material will inspect the load. The loads must be secured to prevent movement or load falling from the truck prior to removal/attachment of straps or other means used to secure the load during transit.
    5. Ensure that no one, other than loading / unloading equipment operators, is allowed within the load drop zone while material is being loaded / unloaded. The load drop zone is defined as the distance from the truck that the load could fall and strike personnel plus 10 feet, but no less than 10 feet. Material that can roll such as pipe requires placement of personnel out of the potential path of a rolling object. Traffic cones will be used to mark the load drop zone.
    6. The blind side of the load must remain clear at all times.
    7. Loading / unloading will be immediately stopped if the location of the driver cannot be confirmed or any person enters the load drop zone.
    8. A spotter positioned outside of the load drop zone will be used at all times and maintain visual contact with the equipment operator and the load drop zone. The duty of the spotter is to ensure that no on enters the load drop zone and to assist the equipment operator in observing the load. The spotter will have no other assigned duty while material is being loaded / unloaded. The truck driver can act a spotter for the equipment operator. The spotter is not the same as the signal person required when using a crane to load / unload a truck. When a crane is being used a qualified rigger must act as the signal person for the crane operator and a spotter would still be used to keep the load drop zone clear of personnel.
    9. TVA Form 20366, TVA Material Loading / Unloading Checklist, [1] must be completed prior to loading/unloading material.
2. Equipment Used to Load/Unload Trucks
    1. Loading / unloading equipment, i.e. forklifts, cranes, etc., must be used in accordance with the applicable requirements in the TVA Safety Manual for the equipment being used.
    2. Equipment operators must be certified on the equipment being operated. If rigging is used the rigger must be qualified in accordance with TSP, 721A Rigging (Non-Nuclear) or TSP 721B Rigging (Nuclear Power Group).

Reference

- TVA Safety Procedure 609 “Lifting / Handling Materials”
- TVA Safety Procedure 610 “Motor Vehicle Operations”
- TVA Safety Procedure 805 “Forklift Operations”
- TVA Safety Procedure 721 “Rigging”
- ASME PALD-2003, “Safety Standard for Portable Automotive Lifting Devices”

Appendices

Appendix A - Materials Handling Safety Checklist

Appendix A

Materials Handling Safety Checklist

The following checklist is designed to evaluate the need for additional guidance when handling materials using a mechanically aided device, such as but not limited to, platform truck, hand truck, push cart, dolly, floor crane (engine lift), industrial cart, pallet jack, air pallet, block and tackle, etc. As a minimum, this checklist will be incorporated into pre-job briefs when material handling activities are to be conducted with loads that exceed 75 pounds. Duplication of this checklist is not required for repetitive material handling operations using the same material handling device and the same crew of material handlers.

Note: If the load is being moved on a wheeled cart and the load weighs in excess of 1,000 pounds, **THEN GO TO APPENDIX B**.

1	Is the weight of the material to be handled unknown? Or, will the weight of the material to be handled exceed 90% of the load capacity of the mechanical device used to transport the material?
2	Is the height of the center of gravity of the material to be handled greater than either one half of the width or the length of the mechanical device used to transport the material?
3	Will the material be transported either up or down an inclined path that exceeds a 10 degree slope? NOTE: A 10 degree slope is a rise of 1.7 feet vertical in a 10 foot horizontal run. An easy formula to determine if a given slope exceeds 10 degrees is as follows: If the Vertical Rise (in a horizontal run) divided by the Horizontal Run is greater than .176, then the slope is greater than 10 degrees. For example if the slope rises 1 foot vertical in a horizontal length of 4 feet, then 1 divided by 4 equals .25 which is greater than .176, therefore,, the slope is greater than 10 degrees.
4	If transported across floor grating, are the loads imposed on the grating by the mechanical device loaded with the material greater than the grating capacity?
5	If restrained in the horizontal direction by block and tackle and / or other types of restraints (i.e., rope, etc), is it possible that the forces imposed by the material handling process will exceed the capacity of either the attachment point and / or the restraint used to secure the load?

If **“yes”** was answered to any of the questions above, a specific Job Safety Analysis (JSA) for this activity shall be developed and approved in accordance with TVA Procedure, Plan Jobs Safely prior to conducting this “Material Handling” activity.

Evaluation Performed by _____/_____

Supervisor Date

Appendix B - Movement of Loads in Excess of 1,000 lbs on Wheeled Carts

The movement of loads in excess of 1,000 pounds on wheeled carts presents a potential safety risk to TVA employees. TVA experienced a fatality at BFN in October 2005 that involved moving a heavy load on a wheeled cart. Therefore, to ensure the safe movement of loads weighing in excess of 1,000 pounds on wheeled carts, this appendix outlines extra measures to be taken prior to the movement of such a load. Because of the nature of these extra measures, it is important to identify the need to move a load in excess of 1,000 pounds on a wheeled cart early in the work planning process. This will ensure the actions below are completed prior to the movement of the load.

Safety Measures to be performed when moving a load in excess of 1,000 pounds on a wheeled cart include:

- The completion of a Job Safety Analysis (JSA) per TVA Safety Procedure 6, "Plan Jobs Safely." The JSA shall consider any potential ramps the load may traverse, the stability of the load, the methodology used to move the load; any horizontal restraint systems that may be used to control movement of the load, the load drop zone should the load tip over or control of the load is lost (see definition in Paragraph 5 below), and the use of spotters to guide movement.
- The assignment of a First Line Supervisor to oversee the movement of the load on the wheeled cart.
- Verification of the following by the assigned First Line Supervisor:

1. The load will be moved on a platform cart with an adequate load rating (Note: The load rating must be clearly displayed on the cart)
2. The wheeled cart is not equipped with pneumatic tires smaller than 12" in diameter (Pneumatic tires greater than 12" are acceptable if properly inflated).
3. The wheeled cart is equipped with tie down points or can accept tie down attachments and the load is secured in accordance with Appendix C.
4. The travel path has been evaluated for the load. Any load weighing in excess of 1,000 lbs moved on a wheeled cart that will travel over floor grating shall have the travel path evaluated by Plant/Site Engineering.
5. **Personnel are not in the load drop zone at any time while the load is being moved.** Load drop zone is defined as follows for this application: The area around the load that represents a struck by or caught between hazard if the load tipped over or control of the load was lost. This includes the travel path on inclines at the grade lower than the item being moved (behind the item if ascending and in front of the item when descending).

Appendix C - Securement of Loads on Wheeled Carts

1. **Applicability of the Securement Loads on Wheeled Carts Rules**
    1. This appendix provides load securement guidance which is based on the Federal Motor Carrier Safety Administration (FMCSA) requirements. Loads on wheeled carts must be secured in accordance with this appendix regardless of the location they are being used.
    2. The load securement rules in this appendix apply primarily to wheeled carts. However, for loads moved on other types of material handling equipment (motorized or manually operated, excluding commercial motor vehicles), this same guidance may be applied.
2. **Approved Securement Devices**
    1. Approved securement device for loads on wheeled carts include -
        - Ashley Sling Product Number 003000-10200 - standard ratchet type tie down with 1 inch webbing, wire hook, and a 800 pound working load limit.
        - Ashley Sling Product Number 200-10100 - heavy-duty ratchet type tie down with 2 inch webbing, flat hook, and a 3,000 pound working load limit.
        - Ashley Sling Product Number 200-10300 - heavy-duty ratchet type tie down with 4 inch webbing, wire hook, and a 5,000 pound working load limit.

- Load Grip Cargo Restraint (Friction) Mats meeting the requirements of the Federal Motor Carrier Safety Administration (Coefficient of Friction greater than 0.8)

2. Other securement devices may be used with approval of the Rigging Program Coordinator or Site Engineering.

3. **Use of Tiedowns**
   1. Tiedowns and securing devices must not contain knots.
   2. If a tiedown is damaged, it shall be removed from service, a Defective Equipment tag attached to it, and returned to the Tool Room or supervisor for disposition.
   3. Each tiedown must be attached and secured in a manner that prevents it from becoming loose, unfastening, opening or releasing while the wheeled cart is in transit.
   4. Approved edge protection must be used whenever a tiedown would be subject to abrasion or cutting at the point where it touches an article of the load. The edge protection must resist abrasion, cutting and crushing.
4. **Load Placement and Restraint**
   1. Loads that are likely to roll must be restrained by chocks, wedges, a cradle or other equivalent means to prevent rolling. The means of preventing rolling must not be capable of becoming unintentionally unfastened or loose while the wheeled cart is in transit.
   2. Multiple loads on the same wheeled cart placed beside each other and secured by transverse tiedowns must either:
      1. Be placed in direct contact with each other, or
      2. Be prevented from shifting towards each other while in transit.
   3. Loads placed on a Load Grip Cargo Restraint Mat do not require additional securement devices.
5. **Capacity of Tiedown Securement Systems**
   1. The total working load limit of any tiedown securement system used to secure a load or group of loads against movement must be at least one-half times the weight of the load or group of loads being secured. The total working load limit is the sum of:
      1. One-half of the working load limit for each tiedown (see Table 1) that goes from an anchor point on the wheeled cart to an attachment point on the load; and
      2. The working load limit for each tiedown (see Table 1) that goes from an anchor point on the wheeled cart, through, over or around the load and then attaches to another anchor point on the wheeled cart.

Table 1. Working Load Limits for Webbing Type Ratchet Tiedowns

Ratchet Model Number	Webbing Strap Width	Working Load Limit	1/2 working Load Limit
003000-10200	1”	800 lbs	400 lbs
200-10100	2”	3,000 lbs	1,500 lbs
200-10300	4”	5,000 lbs	2,500 lbs

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=101191181:1

Procedure 617 Color Code Idenfification - Safety Test / Inspection of Material and Equipment

TVA Safety Manual

617 Color Code Identification - Safety Test / Inspection of Material and Equipment

Procedure Number 617

TVA Safety Procedure

Color Code Identification - Safety Test / Inspection of Material and Equipment

Revision 0

December 18, 2009

Purpose

The purpose of this procedure is to establish requirements for color coding material and equipment to signify completion of a required annual safety inspection as required by various procedures in the TVA Safety Manual.

Requirements

A. Annual safety inspections of material and equipment will be color coded in accordance with the color code schedule in Table 1 below signifying that the material/equipment passed the required inspection. The color code applied at the time of the inspection shall serve as the record of inspection.

Table 1 Completed Inspection Color Codes

2010	Green
2011	Blue
2012	Red
2013	Green
2014	Blue
2015	Red

NOTE
This color code cycle repeats itself every three years and shall be followed in sequence for additional inspections.

B. The color code can be applied by means of colored tape, paint, colored tie wraps, etc. The method used to apply the the color code should be durable for the intended use of the material or equipment. Organizations may elect to include the year of inspection with the color code. Inclusion of the year prevents and item that has not been inspected for a three year period appearing to have a current year inspection.

Chapter 2 Section 7 Mechanical

Procedure 701 Abrasive Blast Cleaning

TVA Safety Manual

701 Abrasive Blast Cleaning

Procedure Number 701

TVA Safety Procedure

Abrasive Blast Cleaning

Revision 0

January 6, 2003

Purpose

This procedure provides minimum safety, health, and environmental guidelines for protection from the hazards associated with abrasive blast cleaning.

General Requirements

1. During blasting the abrasive medium is pulverized and may release hazardous respirable contaminants (for example, silica) into the air. In addition, blasting painted surfaces that contain lead and zinc primer may release hazardous zinc and/or lead chromates in respirable dust form.
2. The preferred method of protecting personnel from potential workplace hazards arising from abrasive blast cleaning is to use all feasible engineering controls. If engineering controls fail to reduce the hazard potential sufficiently, employees should use personal protective equipment (PPE). Finally, if the potential hazard has still not been eliminated, administrative controls should be put in place.
3. The engineering, PPE, and administrative controls discussed in this procedure apply to all personnel exposed to the potential physical and/or health hazards of the blasting operation.

Operator Qualification

Only a qualified trained operator may operate abrasive blast cleaning equipment.

Hazards

1. Anyone planning a blasting job must be aware of the hazards involved. Abrasive blast cleaning involves physical, health, and environmental hazards.
2. Planning must include precautions to protect all personnel not involved in the blasting operation from any potential health or physical hazard. Signs stating “Sandblast Area - Do Not Enter” must be used in conjunction with perimeter barricades, containment structures, and other physical barriers. Perimeter boundaries must be established and maintained based on air-monitoring results.
3. Adequacy of containment structures and other physical barriers should also be confirmed by air monitoring.

4. Consult a TVA safety professional and site environmental coordinator for further information on evaluating conditions surrounding abrasive blast cleaning.
   Physical Hazards - Abrasive blast cleaning involves the potential for injury from the impact of the abrasive blasting medium. Both the operator and, if exposed, the standby or attendant inside the barricaded area and anyone else exposed to physical hazards of the blasting must be protected from these hazards.
   Health Hazards - Airborne contaminants released by the pulverized blasting medium (for example, silica) may present health hazards to both the operator and standby or attendant inside the barricaded area. Abrasive blast cleaning presents potential hazards from possibly toxic materials being removed or blasted. Noise is another health hazard associated with abrasive blast cleaning.
   Environmental Hazards - Abrasive blast cleaning presents the potential for contamination of the environment by the material being blasted (for example, environmentally hazardous run-off).
5. Spent abrasives may contain contaminants. It may be necessary to analyze spent abrasives to determine if special handling is required to comply with applicable environmental regulations. Consider PPE as well as necessary environmental precautions during cleanup. Consult the site environmental coordinator when planning measures for controlling environmentally hazardous run-off.

Engineering Controls

Engineering controls are the preferred method for controlling workplace hazards. Engineering controls that can help maintain airborne contaminants below the prescribed limits include the following:

- nontoxic, silica-free blasting agents
- ventilation
- dust-suppression techniques such as water mists or steel shot
- containment

Respiratory Protection Devices

During manual blast cleaning, the operator must wear an MSHA/NIOSH-approved abrasive blasting hood. See TVA Safety Procedure 312, “Respiratory Protection".

NOTE: Also, industrial hygiene services can be obtained by contacting the industrial hygiene contractor. Utilize the SRNET, industrial hygiene for additional information.

Blasting Operator Protection

Blasting operators must wear the following PPE when working inside a blast-cleaning room or when performing manual blast cleaning:

- MSHA/NIOSH-approved abrasive blasting hood
- durable apparel closeable at wrists, ankles, and other openings to prevent entry of abrasive dust
- leather or similar heavy -duty apron
- current ANSI Z87.1-approved side-shield industrial safety glasses worn under the hood unless the hood manufacturer confirms that the face shield assembly meets current ANSI Z87.1 requirements
- heavy canvas or leather gloves with gauntlets
- hearing protection

Administrative Controls

Administrative controls that can be used to minimize personnel exposure to potential hazards include the following:

- scheduling blasting operations during off-shift hours
- locating permanent sandblasting facilities in remote areas
- rotating affected personnel to manage exposure to heat and noise

Operations

1. An operator may work alone when operating a blast-cleaning cabinet.
2. An operator should not work alone under the following conditions:
   - when performing any manual blast cleaning
   - when in a blast-cleaning room
   - when using a bottled air breathing system
   - when the operator's ability to receive emergency alarms and communications is impaired
   - when barricades must be maintained

Monitoring

Monitoring for airborne contaminants must be performed. Air-sampling monitoring results should be the primary means for determining respiratory protection requirements, for determining and reconfirming perimeter work-area boundary locations, and for confirming compliance with applicable safety, health, and environmental regulations.

Breathing Air

Breathing air systems shall be tested every six (6) months for grade "D" level air. Reference TVA Safety Procedure 301, "Breathing Air Systems".

Blasting Equipment

1. Abrasive blasting equipment must be equipped with a dead man switch at the nozzle that automatically shuts off the machine at the nozzle when released. An automatic shutoff valve (excess-flow valve) must be provided between the compressor and the air-supply hose.
2. Maintain equipment according to manufacturers' instructions and governmental regulations.
3. Blasting or removing certain materials may generate flammable or explosive dust mixtures. Although sandblasting material is inorganic and nonflammable, the material being blasted, in the form of airborne particles, could be organic and could, therefore, generate flammable or explosive dust mixtures. When blasting such materials, or when blasting in areas containing potential fire or explosion hazards, take the following precautions:
   - All tanks and equipment being blasted must be grounded. Ensure that the blast machine is electrically connected to the same ground.
   - The blast hose must be the antistatic type.
   - The blast nozzle must be electrically bonded and grounded to prevent buildup of static charges. For areas where static charge is a hazard, consider the use of a blast medium that does not produce static

Scarifying

Scarifying operations share some safety, health, and environmental hazards with other blast operations. Protect employees from the shot and from the release of potential contaminants.

Housekeeping

The orderliness of both the inside and outside of the abrasive blast cleaning room is the direct responsibility of those craft that work in this area. Blast media should be cleaned up each day the room is used and all related safety gear and other equipment should be stored properly.

Definitions

Abrasive Blasting Hood - A continuous-flow air-line respirator with a helmet and shroud constructed to protect the head, neck, and shoulders from airborne abrasives. The hood must be MSHA/NIOSH-approved.

Blast-Cleaning Cabinet - An enclosure protecting the operator, who stands outside and operates the blasting nozzle through openings in the enclosure.

Blast-Cleaning Room (Blasting Booth) - A complete enclosure in which blasting is performed. The operator stands inside the enclosure to operate the blasting nozzle.

Dead Man Switch - For the purposes of this procedure, a remote control device that the operator must manually hold open to operate the blast machine. The machine must shut off when the dead man switch is released.

Manual Blast Cleaning - A blasting operation in which the operator is potentially exposed to the blasting nozzle and blast.

Qualified Operator - An experienced craftsperson who has received training and demonstrated competency to operate a specific piece of equipment.

Scarifying - Breaking up, loosening, or removing a surface through powered mechanical means, such as slinging steel shot against a surface or finding a surface with toothed rotating disks.

Reference

TVA Safety Procedure 301, “Breathing Air Systems”

TVA Safety Procedure 312, “Respiratory Protection”

Procedure 702 Aerial Lifts

TVA Safety Manual

702 Aerial Lifts

Procedure Number 702

TVA Safety Procedure

Aerial Lifts

Revision 5

April 18, 2008

Purpose

The purpose of this procedure is to establish requirements for the safe use of aerial lifts which include any device used to position personnel at elevated locations. This includes scissor lifts; articulating boom aerial lift platforms; extendable / telescoping boom aerial platforms; vehicle mounted aerial lifts (bucket truck type) non-Insulated; insulated aerial devices; etc.

General Requirements for all Aerial Lift Devices

1. All aerial lifts shall be designed and constructed in accordance with the applicable national consensus standard and OSHA requirements governing the specific type of aerial lift in question, i.e. ANSI A92.2-1979, "Vehicle-Mounted Elevating and Rotating Aerial Devices;" ANSI A92.3-1973, "Elevating Work Platforms;" ANSI A92.6-1979, "Self- Propelled Elevating Work Platforms;" 29 CFR 1910.67, "Vehicle Mounted Elevating and Rotating Work Platforms".
2. All aerial lifts must be equipped with a manufacturer's model specific operating manual. Qualified personnel must review the operating manual whenever they have any questions or concerns with safe operation.
3. Each aerial lift shall be conspicuously identified with the following information:
   - Make
   - Model
   - Insulated or non-insulated
   - Qualification voltage and date of test (if insulated)
   - Serial number
   - Rated load capacity of boom and basket
   - Maximum working height
   - Aerial device system pressure or aerial device system voltage, or both
   - Each control shall be marked as to its function
4. Only designated qualified / certified personnel (those persons qualified through training and experience and designated by their supervisor) or trainees/apprentices under the direct supervision of a qualified / certified employee shall operate an aerial lift.
5. All controls shall be checked before moving the unit into work position including proper placement of outriggers.
6. Before starting aerial work, check the condition, leveling, and position of the aerial lift. Closely inspect and check distances to structures, conductors, and any other potential obstruction.
7. Prior to the hoisting of personnel, an aerial lift shall be operated through its normal operating positions using ground controls. The manufacturer's operating manual which is located on the lift is followed for aerial lift

warm-up procedures.

8. Aerial lifts must not be used on soft or uneven surfaces. Where use requires set-up in areas with uneven terrain and soft ground conditions, proper pad preparation and cribbing techniques will be used to meet equipment set-up requirements.
9. Platforms shall be kept clear of any slippery substances. Loose objects and tools should be secured.
10. Boom and bucket load limits specified by the manufacturer shall not be exceeded.
11. The insulated portion of an aerial lift shall not be altered in any manner that might reduce its insulating properties.
12. Fueling operations are not permitted:
    - When the engine is running
    - When personnel are in the basket
    - In 161-kV or 500-kV switchyards
13. All personnel working from an elevated basket must wear a hard hat and a body harness attached to the manufacturer-supplied attachment point or to a boom strap anchorage device. If a safety lanyard greater than two (2) feet in length is required it shall be a “DECELERATING” type.
14. Employees working from a lift must not belt to structures or equipment, unless the worker is entering or exiting an aerial lift. A worker may enter or exit an aerial lift (at heights above 6 feet) provided that fall protection such as guard rails or a fall arrest system is used while the worker moves between the lift and the working surface. The fall arrest system must provide 100% fall protection during this move. During entry to and egress from the lift, a worker may tie off to the lift (if the lift is designed to withstand the vertical and lateral loads imposed by the employee’s movement itself or by an arrested fall) or to a nearby structure capable of sustaining the same loads. The worker may be connected to both the lift and a nearby structure only for the brief period it takes to connect to the location moving to and disconnect from the location the worker is leaving.
15. Personnel will not sit on or climb onto the lip of the basket (or the mid or top rail of the basket) or use planks, ladders, etc., in the basket for a work position. Both feet shall be kept on the bottom of the bucket.
16. Pole climbers shall not be worn while performing work from an aerial lift bucket.
17. Aerial lift vehicles, if provided with outriggers, shall be operated with the outriggers extended and firmly set for stability. The vehicle brakes shall be set and outriggers positioned on either pads or a solid surface. The unit shall be leveled using the outriggers before the boom is raised. If possible, wheel chocks shall be used. Aerial lifts without outriggers will be positioned and chocked in accordance with manufacturer’s instructions. Exception: If the manufacturer provides conditions under which lifts can be made without the use of outriggers, then outrigger use is not required if all manufacturer conditions are followed.
18. Outriggers shall not be extended or retracted outside clear view of the operator unless all employees are outside the range of possible equipment motion.
19. Lower (ground-level) lift controls on aerial lifts with upper (controls in the bucket) shall not be operated with an employee in the lift bucket, except in case of emergency. Ground level lift controls may be operated for testing provided the basket is empty.
20. An aerial lift truck shall not be moved when the boom is elevated or when personnel are in the basket. For other types of aerial lift devices movement is permitted only if permitted by manufacturer’s instructions (all manufacturer’s requirements must be met).
21. Aerial lifts used on public roads shall conform to ANSI D6.1-1971.
22. All components of the hydraulic or pneumatic systems shall have a minimum bursting strength of at least four times the maximum operating pressure for which the system is designed.
23. Each lift device with the boom fully extended in the horizontal position shall be capable of sustaining a static load 1-1/2 times its rated capacity when the vehicle is on a firm and level surface.
24. Articulating boom and extendible boom lifts, primarily designed as personnel carriers, shall be equipped with both platform (upper) and lower controls. The upper controls shall be within easy reach of the operator in the

platform basket. A foot-operated constant pressure switch shall be installed in the basket. Upper controls shall be protected to prevent jamming. Lower controls shall be provided for overriding the upper controls in the event of an emergency. The functions of all controls shall be plainly identified.

25. Where the elevation of the boom is accomplished by means of a hydraulic cylinder assembly, the system shall be equipped with pilot-operated check valves or other appropriate devices to prevent free fall of the boom in the event of hydraulic line failure.
26. Booms utilized for bare-hand, live-line, high-voltage work shall have built-in, selfcontained electrodes and testing circuitry for ease in checking and testing the dielectric characteristics of the boom and its associated components.
27. Aerial lifts utilized for bare-hand, live-line, high-voltage work shall be provided with an audible leakage current alarm (which is activated when current leakage exceeds the permissible limits) or with a meter that can be monitored from the ground.
28. A leveling system shall be provided which automatically maintains the basket in a level position through all elevations of the working boom.
29. On equipment provided with hydraulic outriggers, the outriggers shall be provided with check valves to lock the outriggers in the extended position during operation and in the retracted position for road travel.
30. Each aerial lift shall be equipped with at least a 2 ½ pound dry chemical fire extinguisher located to be accessible from the ground.
31. Aerial ladder trucks shall be provided with a locking device on top of the truck cab and a manually operated device at the base of the ladder for securing the ladder in the lower traveling position.
32. Never use any part of a lift as a fulcrum for prying.
33. Persons who drive aerial lift truck should be constantly aware that there is exposed equipment above the cab of the truck and should make sure there is adequate clearance.
34. When aerial lift trucks are being driven, the arms or boom should be properly stowed and the outriggers should be retracted. Outrigger pads should be removed and properly stored before driving over-the-road.
35. When aerial lift trucks are positioned for work, they should be legally parked whenever possible with approved safety signs, traffic barricades, and lights placed as needed.
36. Positioning aerial lifts into opposing traffic lanes is hazardous and should be avoided whenever possible.

Insulated Aerial Lifts-Energized Work

1. Before energized work is started the weather forecast must be checked to ensure that weather conditions will be suitable at the location work is to be performed. Energized work will be suspended if weather conditions change making it unsafe to continue the operation.
2. Before starting actual work, check the condition of the lift, bucket liner, and bonding leads.
3. Before actual work is started, the truck shall be grounded in accordance with TVA Safety Procedure 1109, “Protective Grounding,” or TVA Safety Procedure 1008, “Temporary Protective Grounding for Generating Stations and Other Non-Transmission Facilities.”
4. Visual inspections shall be made to determine that the equipment is in good condition prior to its use each day.
5. All controls (ground level and bucket) shall be checked before moving lift into work position.
6. A leakage-current reading shall be made before starting work each day and each time during the day when any higher voltage is going to be worked on. This test shall consist of placing the bucket in contact with an energized source equal to the voltage to be worked on for a minimum time of three minutes. The leakage current shall not exceed one micro-ampere per kilovolt of nominal phase-to-ground voltage.
7. Leakage-current meters shall be re-calibrated annually.
8. When the lift is used for energized work, an employee trained and qualified in the emergency let-down procedure shall be onsite and available.

9. Before contacting any conductor or device, workers shall attach bucket bonding leads to the conductor or device, thus establishing themselves at the same potential as the conductor or device to which they are clipped. If you are not at the same potential, do not touch it.
10. Work only on one phase at a time. Bonding leads from a single aerial lift shall be attached to the same conductor or subconductor and only one phase worked at a time.Minimum clearances shall be maintained (see TVA Safety Procedure 1110, “Minimum Clearance Distances for Energized Work”).
11. The Minimum Clearance Distances for Energized Work (TVA Safety Procedure 1110) shall be maintained from all grounded objects and from lines and equipment at a potential different from that to which the live-line, bare-hand equipment is bonded.
12. While an employee is approaching, leaving, or bonding to an energized circuit, the Minimum Clearance Distances for Energized Work (TVA Safety Procedure 1110) shall be maintained between the employee and any grounded parts, including the lower boom and portions of the truck.
13. While the bucket is positioned alongside an energized bushing or insulator string, the phase-to-ground minimum clearance distances shall be maintained between all parts of the bucket and the grounded end of the bushing or insulator string or any other grounded surface.
14. Operations shall be suspended immediately and the bucket returned to ground as soon as safely possible when the leakage current meter alarm sounds.
15. Operations shall be suspended immediately upon indication of a malfunction in the aerial lift that would render the job unsafe.
16. Do not bridge the insulated section of the arm with un-approved equipment while doing energized work.
17. A designated safety observer other than the equipment operator shall observe the clearance distance of the non-insulated portion of the boom to energized lines and equipment and give timely warning before the minimum clearance distance is reached. The observer may be on the ground or in the bucket. Warnings may be given via verbal instructions (voice or radio) or hand signals.
18. Uninsulated tools, equipment, or materials from any ground source shall not violate the required working clearance around the employee and the bucket while the bucket is bonded to an energized part. Overhead ground wires not grounded at the work site should be considered energized.
19. Only ropes or lines maintained especially for live-line work (Yale Cordage Hy-Dee Braid rope, green in color) shall be used from an insulated aerial lift while work is being performed on energized lines or equipment.
20. Before starting actual work, closely inspect and check distances to structures and conductors. In addition check the tightness and integrity of the vehicle ground.
21. Protective equipment of properly rated voltage, such as line hose, insulator hoods, and rubber blankets, should be used as required. This equipment shall be properly rated for the voltage where the work is being performed.
22. In the performance of energized work, workers should enter or leave an insulated aerial lift basket only under the direction of the responsible supervisor.
23. In the event of an emergency, arc, or flashing, workers should crouch as low as possible in the bucket.
24. Follow manufacturer’s recommended procedures to ensure that all the air is bled out of the hydraulic hoses every day before using the aerial lift on any work.

Non-insulated Aerial Lifts

1. Before work is begun near energized or deenergized equipment, the truck or similar equipment shall be properly grounded.
2. When noninsulated aerial lifts are used to work on grounded conductors, the equipment shall be grounded to the work site equipotential protective safety ground system.
3. When aerial lifts or crane baskets are used to lift workers, an employee trained and qualified in the emergency letdown procedure shall be onsite and available.
4. Before touching or working on grounded conductors from non-insulated aerial lifts, clip lead or other bonding connection shall be placed between the basket and the conductor.
5. Operations shall be suspended immediately if there is any indication of an equipment malfunction that could affect safe performance of the job.
6. No load shall be lifted with a crane when personnel are being lifted in a man basket attached to the crane boom or the load line.
7. A designated safety observer other than the equipment operator shall observe the clearance distance to exposed energized lines and equipment and give timely warnings before the minimum clearance distance is reached. The observer may be on the ground or in the basket. Warnings may be given via verbal instructions (voice or radio) or hand signals.
8. If during operation of the equipment, the equipment could become energized by contact, the operation shall comply with at least one of the following:
   - The energized lines exposed to contact shall be covered with insulating protective material that will withstand the type of contact that might be made during the operation.
   - Each employee shall be protected from hazards that might arise from equipment contact with the energized lines. The measures used shall ensure that employees will not be exposed to hazardous differences in potential. The measures used may include all, a combination of the following safe work practices or additional safe energized work practices not listed.
     - Heavy equipment and vehicles used in the performance of energized transmission work shall be properly grounded.
     - Bonding equipment together to minimize potential differences.
     - Providing ground mats to extend areas of equipotential.
     - Employing insulating protective equipment or barricades to guard against any remaining hazardous potential differences.

Inspections and Tests

1. A preventive maintenance, inspection, and test program shall be established in accordance with the manufacturer's instructions, ANSI A92.2-1979, and/or other governing requirements.
2. An inspection checklist encompassing the requirements shown in Appendix A, B, and C of this procedure is utilized for inspections and maintenance at the indicated frequencies. Copies of the checklist and the operator's daily checklist log (Appendix D) shall be available in the vehicle.
3. The checklist listed as Appendix E of this procedure shall be used to verify proper pre-lift activities each time the lift is positioned for use. This checklist is completed and the prelift checklist log (Appendix F) signed by the operator prior to each lift. Copies of the checklist and log shall be available in the vehicle.
4. Only replacement parts, components, and hydraulic fluid approved by the manufacturer shall be utilized.
5. Aerial lifts may be "field modified" for uses other than those intended by the manufacturer, provided the modification is certified in writing by the manufacturer or a nationally recognized testing laboratory. Insulation tests shall be performed after any alterations which could affect insulating characteristics.

6. Before an aerial lift is placed in service, stability tests shall be performed in accordance with the applicable standard, i.e. ANSI A92.2.
   Exception: Written certification verifying stability tests performed by the manufacturer are acceptable in lieu of physical tests by TVA.
7. All electrical tests of aerial lifts shall comply with the requirements of ANSI A92.2-1979 Vehicle Mounted Elevating and Rotating Work Platform. However, equivalent direct current voltage tests may be used in lieu of the alternating current voltage tests.
8. All insulated aerial lifts to be used for live-line, bare-hand work shall be subjected to a leakage-current test in accordance with ANSI A92.2-1979 before starting work each day, or each time during the day when higher voltage is going to be worked, or when the job location is changed.
9. Insulated aerial booms shall be kept clean from accumulations of dirt and conducting or other contaminating materials which could reduce the dielectric characteristics of the boom. The boom shall be cleaned semiannually or more often if exposed to adverse environmental conditions. The boom shall be wiped with clean rags or washed with a mild household detergent, rinsed with cold water, and dried. Pressurized water or steam is not to be used.
10. The manufacturer's recommendations shall be consulted for instructions on removal of substances such as tar from the boom. A silicone compound may be used to help prevent accumulation of contaminating materials.
11. The boom shall be inspected annually and at more frequent intervals if exposed to heavy uses or adverse environmental conditions. The inspection shall include, but is not limited to, the following:
    - Light spots caused by impact blows. Light spots may not significantly reduce the mechanical strength or dielectric properties of the boom. Repair is not necessary unless surface roughness exists or dielectric tests indicate reduced insulating characteristics caused by the light spots.
    - Surface ruptures may be repaired by removing the damaged fibers, cleaning the void with acetone or methyl ethyl ketone, and applying epoxy bond to the damaged area. The epoxy bond shall be allowed to harden a minimum of four hours before the boom is used. Methods and material used for repair must conform to manufacturer's recommendations. Applicable safety and environmental regulations must be met in the use and disposal of solvents used.
    - Damaged areas where there is considerable fiberglass rupture. The mechanical strength and dielectric properties of the boom may have been affected if a large number of glass fibers have been cut or broken. The boom shall be thoroughly examined to determine if replacement is necessary. Cut or broken glass fibers cannot be satisfactorily mended. If the mechanical strength or dielectric properties have been affected, a defective equipment tag shall be attached to the boom and the equipment withdrawn from service for replacement.
    - After cleaning and repairing the boom, the fiberglass finish shall be restored by applying a wipe or brush coating of polyurethane. Appropriate personal protective equipment shall be utilized during the cleaning, repairing, and restoration operations.
12. Before an aerial lift is transported, the aerial lift shall be inspected. Ensure the boom is properly cradled, secured, retracted, and in the stowed position.
13. All inspection records shall be retained for a period of one year and shall be readily available for review.

Training

1. All employees who operate aerial lifts shall complete the training course “Aerial Lifts”, ATIS Number 00059101. This course will cover information relative to the classifications of aerial lift devices listed in 6.2 below. Refresher training is required every 3 years.
2. A skills proficiency demonstration is required in accordance with requirements established in TVA Safety Procedure 403, “Aerial Lifts Course Standard.” The skills proficiency demonstration shall be conducted on the same classification of aerial lift as shown below and be recorded in ATIS as follows:
   - Articulating Boom Aerial Lift Platforms ATIS 00059200
   - Extendable / Telescoping Boom Aerial Platforms ATIS 00059201
   - Vehicle Mounted Aerial Lifts (Bucket Truck Type) Non-Insulated ATIS 00059202
   - Scissor Lifts ATIS 00059203
   - Insulated Aerial Devices ATIS 00059204
3. Employees shall review and be familiar with the manufacturer’s operating manual for the specific manufacturer and model of equipment being used. A copy of the manufacturer’s operating manual is required to be with each aerial lift device.

Appendices

Appendix A - Aerial Lift Maintenance Checklist

Appendix A

Aerial Lift Maintenance Checklist

Annual (or in the Event of Damage)

Boom and Basket

- Check tightness of insulated boom sections where they attach to steel sections of the boom. Retorque if unit is so equipped.
- Check all pivot pins; be sure they are restrained properly and that they are not worn excessively.
- Check steel sections of boom for physical defects such as cracks, dents, corrosion, or bends.
- Check all hydraulic hose and tubing connections and clamps for tightness and proper lay and freedom of movement during boom operation.
- Check all cap screws in the basket rotation and basket mounting mechanism for tightness and proper safety lock wiring or pinning.

Boom and Cylinders

- Check cylinder end gland retaining mechanism for tightness.
- Check for signs of leakage at end gland and holding valves.
- Check all hydraulic tubing hose connections for tightness.
- Inspect all hydraulic tubing and hoses for wear and abrasion. Replace any crushed, permanently deformed, or deteriorated hydraulic lines and hoses.

Leveling System

- Inspect leveling cables in the upper and lower booms for evidence of wear, fraying, or rust.
- Check the cable anchor bracket pins and cap screws in the rotation mechanism for proper physical condition and tightness.
- Check the cable sheaves at the middle and lower hinge points for wear and for tightness of the cable-attaching devices.
- Check for proper position of the top cable at the basket and at the upper boom. Make sure the cable-attaching device is tight and that the basket is properly leveled in all positions of the arms.

Lift Controls

- Test the lift and traverse controls through all work positions.
- Check all cap screws, pins, jam nuts, etc., for proper installation and tightness.
- Check control placard and replace it if it is defaced or illegible.

Mainframe and Turret

- Check all structural members for defects such as cracks, dents, bends, or corrosion.
- Check all cap screws, bolts, and nuts for tightness.
- Check all straight cotter pins, hairpin cotters, and rod-eye bolts for proper installation.
- Check the turret-drive motor for proper installation and tightness of the mounting bolts.
- Check all hydraulic hose and tube connections for leaks.
- Check the turret gearbox drains and check plugs for tightness; refill as necessary.
- Check the outrigger pins and retainers for proper installation and tightness.
- Check the outrigger cylinders, check valves, and turret for signs of leaks.
- Check all hydraulic lines for signs of wear or damage. Replace any cut, extremely worn, bent, or crushed lines or hoses.
- Check the mainframe mounting bolts for tightness. Retorque as necessary

Mainframe Controls

- Check all linkage jam nuts and cap screws for tightness.
- Check all pins, safety wire, and cotters for proper installation.
- Check all hydraulic valves for leaks and freedom of movement of spools; check all placards and control knobs.

Sub-frame and Rear Outriggers

- Check all structural members for physical defects such as cracks, bends, dents, or corrosion.
- Check all hydraulic connections for leaks.
- Check all hydraulic lines for signs of wear, damage, or deterioration. Replace any extremely worn, crushed, bent, or deteriorated hoses and lines.
- Check the outrigger cylinders and check valves for leaks.
- Check the outrigger securing pins and the retainer for proper installation.
- Check all frame-mounting bolts for tightness. Retorque as necessary.

Power Takeoff Drive

- Check power takeoff and pump mounting bolts for tightness and proper installation.
- Check power takeoff and pump for leaks.
- Check all hydraulic lines and hoses for signs of wear or damage. Replace any cut, extremely worn, crushed, bent, or deteriorated lines or hoses.
- Check hydraulic lines for proper securing. Clamp or otherwise secure them free of moving parts.

Unit Inspected _____

Date _____

Signature _____

Appendix B - Operator Checklist - Monthly

Appendix B

Operator Checklist – Monthly

	Approve	**Reject**	**NA**
1. Verify that the hydraulic oil and filter cartridges have been serviced as recommended by manufacturer			
2. Check complete operation of aerial device by running through at least two cycles of all functions.			
*Check automatic engine speed control for proper actuation and proper engine speed, if the truck is equipped with such a device.			
*Check holding valves on upper and lower booms by stopping engine and operating ground controls. If upper boom is overcenter type, check valve in upper boom for both fold and unfold operations.			
3. Check leveling cables for proper tension adjustment.			
4. Check all leveling cable turnbuckles and rod connections for tightness of jam nuts and safety tie wiring.			
5. Check rotation mechanism and its mounting for defects or malfunctions.			
6. Check all accessible hydraulic lines, hoses, and fittings for evidence of leaks or excessive wear or bent, crushed, or deteriorated lines and hoses.			
7. Check all aerial lift attachments to chassis frame, etc., to be sure they are tight.			
8. Check basket liner for high-voltage breakdown.			
9. Check fire extinguisher for proper charge.			
Unit Inspected:			
Date:			
Signature:			

Note: Items not applicable to a specific type of aerial lift device must be checked NA.

Appendix C - Aerial Lift Operator Checklist

Appendix C

Aerial Lift Operator Checklist

Operator Checklist - Daily (when lift is in operation)

1. Check vehicle to ensure proper operating condition.
   - Check tire inflation pressure.
   - Check vehicle brakes for proper operation.
   - Check parking brake and be sure wheel chocks are in their designated storage place.
2. Visually inspect the aerial lift for loose or missing components, any signs of hydraulic leaks, and any obvious external damage to the structural members.
3. Check the hydraulic fluid level in the reservoir and the level of lubricant in the truck and auxiliary power sources. Maintain fluid level at the full mark.
4. Check fuel supply in truck and the tank of auxiliary engine if unit is so equipped and refuel if necessary.
5. Inspect all insulated components of the aerial equipment and perform leakage-current test if unit is to be used on live-line, bare-hand work. Ensure all insulated components are clean, dry, and free of damage. Wash dirty components with a mild detergent and water; wipe dry.
6. Make sure all loose equipment is properly stowed.
7. Check the operation of the engine-kill circuit and auxiliary power circuit if unit is so equipped.

TVA number of unit _____

Appendix D - Aerial Lift Operator Daily Checklist Log

Appendix D

Aerial Lift Operator Daily Checklist Log

Sign and date this sheet each day before making a lift to certify that you have performed all applicable items on the Aerial Lift Operator checklist (Appendix C).

Signature	Date	Signature	Date

Appendix E - Pre-lift Checklist

Appendix E

Pre-Lift Checklist

S - Satisfactory U - Unsatisfactory N/A - Not Applicable	S	U	N/A
1. A pre-job safety briefing shall be completed and documented prior to operating the lift.			
2. Special emphasis must be placed on maintaining minimum approach distances (MAD) for energized equipment / conductors in the work area.			
3. The truck must be set up and operated within proper electrical clearance and grounding requirements. Set-up will provide maximum clearance to energized sources and minimize bucket movement consistent with work to be performed.			
4. A Safety Observer shall be assigned and have no other duties while bucket is being moved. Establish clear communications prior to bucket movement to ensure that Safety Observer and person(s) in bucket know movement is to take place.			
5. The work activity to be performed is within the safe operating limits as prescribed by the manufacturers' capacity chart. Special emphasis must be placed on ensuring the aerial device is level within manufacturer's requirements and the voltage rating of the aerial device.			
6. Outriggers and stabilizer when provided are extended and locked. Wheels are a minimum of two (2) inches above the working surface with outriggers extended or wheels are properly chocked.			

7. After setup and prior to lifting personnel use the ground lift control to cycle the boom and basket through all of its anticipated working positions to check clearances and proper operation.			
8. All employees in the basket are wearing a safety harness with a lanyard attached to a manufacturer-supplied attachment point.			
9. Do not rest the boom or basket on a steel structure of any kind.			

Appendix F Pre-lift Checklist Log

Appendix F

Pre-lift Checklist Log

(Sign the log, enter the date, and record the time the pre-lift checklist was performed before making each lift.)

Operators Signature	Date	Time

Procedure 703 Brush Cutting & Trimming

TVA Safety Manual

703 Brush Cutting & Trimming

Procedure Number 703

TVA Safety Procedure

Brush Cutting & Trimming

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish the safety requirements while performing brush cutting and trimming operations.

Roles and Responsibilities

Each supervisor is responsible for ensuring employees are aware of the requirements and adhere to safe work practices.

All employees have safety responsibilities and are responsible for following proper procedures.

General Tips When Using Grass Trimmers and Brush Cutters

1. Make sure you are trained in the proper use of this equipment. Rotating cutting tools can throw objects or cut the operator.
2. Read, understand, and follow instructions in the manufacturer's operating manual.
3. Hold the unit firmly with both hands.
4. Ensure that the cutting part is adjusted properly and is tight.
5. Replace bent, warped, damaged or dull cutting apparatus.
6. Check that the throttle springs back to idle position.
7. Select equipment with anti-vibration components.

Basic Requirements

1. Do not leave running tool unattended.
2. Do not wear short pants or short sleeves.
3. Do not use rigid blades in stony areas.
4. Do not overreach. Keep proper footing and balance at all times.
5. Do not repair damaged attachments - discard them.

Clothing and Personal Protective Equipment

The following clothing and personal protective equipment should be worn when using grass trimmers or brush cutters:

- Sturdy and well-fitting overalls, jeans or long pants,
- Heavy-duty, non-slip gloves,
- Safety boots with non-slip soles,
- Safety goggles, or face shield and safety glasses, and
- Hearing protection (muffs or plugs).

Checklist for Using Grass Trimmers and Brush Cutters

1. Keep people away from starting and operating areas.
2. Check area for stones, glass, metal and debris.
3. Refuel the engine before starting work while the engine is cool. If refueling is required before the job is completed, wait for the engine to cool if there is a likelihood that fuel can spill or splash on the hot engine.
4. Make sure that shields, guards, and other safety devices are in place and working properly.
5. Replace or tighten all loose or damaged parts or guards.
6. Make sure muffler is in good condition. In dry weather, use a fire-safe muffler.
7. Start the unit on firm ground or other solid surfaces in an open area.
8. Maintain good balance and secure footing when operating.
9. Adjust harness and hand grip to suit work positions.
10. Use unit at ground level only.
11. Shut off engine before cleaning out clogged or stuck cutter.
12. Stop the engine before putting cutter down.
13. Disconnect the spark plug when the equipment is left unattended.
14. Secure cutter to prevent fuel spillage and damage during transport.
15. Keep the cutter tool covered with the carrying guard.

Weed Trimmers

1. When fueling weed eaters, use funnels.
2. Make sure protective equipment is on before beginning job function. The required PPE includes as a minimum safety glasses, chaps and hard hat.
3. Be sure to check area for trash and debris. Pick up bottles, cans, and paper before commencing work.
4. Store weed eater in a properly designated area and store gas in a fire proof cabinet.

Power Pruners

1. Inspect equipment for startup. The equipment should be checked for wear, adjustment, and leakage, as applicable. Failure to perform these checks may cause work delays and damage to the equipment.
2. Correct only those problems for which you are adequately trained and for which the proper tools and assistance are available.
3. Report problems of a recurring nature to the foreman and/or supervisor (e.g., abnormal wear of bar and chain, cracks in metal) that may indicate a more complicated problem.
4. Report all problems that are not readily correctable to the foreman and/or supervisor. The foreman and/or supervisor should take the necessary steps to correct the problems before allowing further operation of the equipment. This will minimize equipment wear and damage caused pre-operational conditions and work disruptions caused by equipment breakdowns.
5. Make sure all caps opened in the inspection are properly closed and/or tightened.

6. While transporting to the work site, secure personal protective equipment (PPE) in vehicle.
7. Wear gloves while handling the power pruner.
8. Do not place power pruner, fuel, or oil inside vehicle without an approved barrier guard installed to separate equipment from passengers. No smoking allowed.
9. Analyze the work site. Watch for cut limbs falling on operator and trip hazards. Determine limbs to be cut - height, live or dead, diameter, and length.
10. Determine escape route and remove trip hazards.
11. Supervision will determine if safety requires more than one person.
12. Put on PPE and ensure it is snug, comfortable, and fits properly.
13. Ensure that other safety equipment is functional and is in sufficient supply.
14. Use safety footwear, protective gloves, eye, hearing, and head protection devices. Never wear loose fitting clothing, jewelry, or items which could be caught in the unit or brush. Wear eye protection goggles that meet ANSI Z87.1 requirements. (Z87 is stamped on the goggles).
15. Before starting the engine, make sure the chain bar is not in contact with anything. Start the pruner on the ground or in a stable, secure location.
16. Obtain full throttle speed before cutting or resuming previous cut.
17. Do not operate when under the influence of alcohol, medications, or substances which can affect your vision, dexterity, and judgment. Employees must be in good physical and mental health in order to operate the equipment safely.
18. When pruning, plan a retreat path from the falling branch. Never stand directly under the branch being pruned, and wear a hard hat and eye protection at all times.
19. When pruning, limbs will fall branch tip first. Smaller branches will create a spring effect. Operator should be prepared for the butt end of the limb to be propelled toward him/her.
20. Carry the power pruner with the engine stopped and the HOT muffler away from your body. Prevent any contact with the cutting chain.
21. When cutting a limb that is under tension, be alert be spring-back.
22. Do not alter the tool in any way. Only power pruner replacement parts should be used.
23. The power pruner should only be used in cutting wood, brush, and trimming trees.
24. Never start or run the engine indoors or where there is poor ventilation.
25. Keep the chain lubricated and properly tensioned.
26. On limbs greater than four inches in diameter, always make a small undercut to avoid pinching the chain bar.
27. Plan cutting to avoid situations which might cause the chain bar to be pinched in a cut. If it does become pinched, stop the engine before removing. Avoid prying the bar loose, you could cause damage to the drive shaft.
28. Obtain full throttle speed before cutting or resuming previous cut.
29. Kickback can lead to dangerous loss of control of the pruner and result in serious injury to the operator or anyone standing close by. Kickback may occur when the moving chain at the nose or tip of the chain bar touches an object, or when the wood closes in and pinches the saw in the cut. In some cases, this may cause a lightening-fast reverse action, kicking the chain bar up and back or down and back towards the operator. Either of these reactions may cause the operator to lose control of the pruner which could result in serious personal injury. With a basic understanding of kickback, you can reduce or eliminate the element of surprise which contributes to accidents.
30. Avoid contact of the chain bar tip with any object while the chain is moving.
31. Hold the pruner firmly with both hands. Be aware of the downward and outward path the pruner will take after the wood is cut.
32. Cut only wood. Avoid striking concrete, metal, wire, or other obstructions which could cause kickback or damage to the saw chain.
33. Carry fuel in approved containers and store away from heat, open flame, and out of reach of children.

34. Stop the engine and slowly loosen fuel tank cap to release any pressure buildup in the tank before refueling your pruner. Never refuel the engine when it is hot or running.
35. Refuel your pruner outdoors in a safe, clear area away from ignition sources or open flame.
36. To avoid carbon monoxide poisoning from gas exhaust, never start or run the engine indoors or where there is poor ventilation.
37. Wipe pruner clean of any spilled fuel or oil and move at least 10 feet (3 meters) from fueling area before starting engine.
38. Do not smoke while refueling or operating your pruner.
39. Keep hands and tools dry, clean, and free of fuel mixture.
40. Do not set a hot engine down where flammable material is present. Never run the engine without the muffler or muffler screen.
41. Do not use engine fuel for starting fires.
42. Do not use the pruner as a leverage device or to pry tree branches. Creating an undue pressure could damage the drive shaft, housing, cutting head, or chain bar.
43. Never operate a pruner that is damaged, improperly adjusted, or not completely and securely assembled.
44. Keep pruner clean and free of gas, oil, and sawdust to avoid the hazards of fire and to provide a sure grip.
45. Maintain the pruner in good working condition. Keep all caps, fasteners, bolts, and screws snug.
46. Adjust the throttle cable so that the chain stops when the trigger throttle is released.
47. Make all adjustments (except carburetor) with engine stopped and spark plugs disconnected.
48. Stop pruner engine before setting it down or carrying it to another location.
49. Cool pruner completely before transporting in any vehicle. Do not transport the pruner in the crew compartment.
50. Do not store the pruner for a prolonged period of time (60 days or longer) without performing protective storage maintenance, which includes the following:
    - Store unit in a dry, dust free place, out of the reach of children.
    - Place the ignition in the “OFF” position.
    - Remove accumulation of grease, oil, dirt, and debris from exterior of unit.
    - Perform all periodic lubrication and services that are required.
    - Tighten all the screws and nuts.
    - Drain fuel tank.
    - Do not store in enclosure where fuel fumes may accumulate or reach an open flame or spark.
51. As a minimum, personal protective equipment shall include:
    - Gloves
    - Hard hat
    - Safety shoes with slip resistant soles
    - Eye protection (safety glasses with side shields or ventilated goggles)
    - Work trousers
    - Hearing protection

Brush Chippers

1. Brush chippers shall be equipped with a locking device in the ignition system.
2. Access panels for maintenance and adjustment of the chipper blades and associated drive train shall be in place and secure during operation of the equipment.
3. Brush chippers not equipped with a mechanical infeed system shall be equipped with an infeed hopper of length sufficient to prevent employees from contacting the blades or knives of the machine during operation.
4. Trailer chippers detached from trucks shall be chocked or otherwise secured.
5. Each employee in the immediate area of an operating chipper feed table shall wear personal protective equipment.

Stump Cutters

1. Stump cutters shall be equipped with enclosures or guards to protect employees.
2. Each employee in the immediate area of stump grinding operations (including the stump cutter operator) shall wear personal protective equipment.

Reference

29 Code of Federal Regulations 1910.243, “Guarding of Portable Powered Tools”

Procedure 704 Chain Saw Operations

TVA Safety Manual

704 Chain Saw Operations

Procedure Number 704

TVA Safety Procedure

Chain Saw Operations

Revision 2

March 5, 2010

Purpose

The purpose of this procedure is to establish requirements for the safe use of chain saws.

Specifications for Chain Saws

Every chain saw shall be equipped with a chain brake and shall otherwise meet the requirements of the ANSI B175-1.1991 "Safety Requirements for Gasoline-Powered Chain Saws".

Operating Chain Saws

1. Removing or disabling anti-kickback devices is prohibited.
2. Each gasoline-powered chain saw shall be equipped with a continuous pressure throttle control system which will stop the chain when pressure on the throttle is released.
3. The chain saw shall be operated and adjusted in accordance with the manufacturer's instructions.
4. The chain saw shall be fueled at least 10 feet (6 m) from any open flame or other source of ignition.
5. The chain saw shall be started at least 10 feet (3 m) from the fueling area.
6. The chain saw shall be started on the ground or where otherwise firmly supported.
7. The chain saw shall be started with the chain brake engaged.
8. The chain saw shall be held with the thumbs and fingers of both hands encircling the handles during operation.
9. The chain saw operator shall be certain of footing before starting to cut. The chain saw shall not be used in a position or at a distance that could cause the operator to become offbalance, to have insecure footing, or to relinquish a firm grip on the saw.
10. Prior to felling any tree, the chain saw operator shall clear away brush or other potential obstacles which might interfere with cutting the tree or using the retreat path.
11. The chain saw shall not be used to cut directly overhead.
12. The chain saw shall be carried in a manner that will prevent operator contact with the cutting chain and muffler.
13. The chain saw shall be shut down or the chain brake shall be engaged whenever a saw is carried farther than 50 feet (15.2 m). The chain saw shall be shut down or the chain brake shall be engaged when a saw is carried less than 50 feet if conditions such as, but not limited to, the terrain, underbrush and slippery surfaces may create a hazard for an employee.
14. Do not use chain saws to cut wood that may contain nails or bolts.
15. Fuel for chain saws shall not be used for starting fires or as a cleaning agent.

Personal Protective Equipment for Chain Saw Operations

Personal protective clothing, including gloves, chaps or other approved chain saw leg protection, safety footwear (See Procedure 307 Foot Protection), hard hat, hearing protection and eye protection must be worn at all times when operating any chain saw.

Inspection of Chain Saws

The chain saw operator shall make frequent inspections (more than once per day) to ensure that:

- Chain saw handles and guards are in place and tight. This includes having an operational chain brake.
- All chain saw controls function properly. This includes having saw equipped with a safety throttle which shuts off power after pressure on the throttle is released.
- The cutting chain is properly adjusted, and that the saw chain will not continue to be driven after the throttle is released.
- The muffler is operative (and equipped with a spark arrester).
- Chain brakes and all other manufacturers' safety features remain operational.
- Saw will idle without the chain moving.
- Chain saws without all safety devices operational or in need of repair or parts or otherwise not safe for use shall immediately be tagged out and marked "out of service".
- Manufacturer's instructions for operation and adjustment shall be followed and worker training must include specific details in the chain saw operator's manual.

Training

Basic chain saw operators (see definition) shall receive the training course “Basic Chain Saw Safety,” ATIS Number 00059214. Chain saw operators (see definition) must take course number ATIS 00059105, “Chain Saw Safety.”

NOTE: The training course “Basic Chain Saw Safety,” ATIS Number 00059214 has not been developed. Completion of this training course is not required until the course is available.

Definitions

Basic chain saw operation – includes the occasion (non-daily) need to utilize a chain saw to cut dunnage, railroad ties, construction grade lumber, general landscape maintenance, line-clearance tree trimming, rubber/plastic pipe, and storm restoration.

Chain saw operation – includes daily use of chain saws as a primary/daily part of an employee’s job that may include among other tasks felling trees, limbing, etc.

Reference

29 Code of Federal Regulations 1910.266(e), “Logging Operations”

29 Code of Federal Regulations 1910.269(r), “Line-Clearance Tree Trimming Operations”

ANSI B175-1.1991 "Safety Requirements for Gasoline-Powered Chain Saws".

Procedure 705 Compressed Air

TVA Safety Manual

705 Compressed Air

Procedure Number 705

TVA Safety Procedure

Compressed Air

Revision 1

August 15, 2008

Purpose

The purpose of this procedure is to establish requirements for the use of compressed air.

Hazards from Using Compressed Air

1. Compressed air is used to operate a variety of tools and equipment. Compressed air is a form of energy, and as such it has the potential to cause serious injury.
2. There are two major causes of compressed air injuries:
   - One is the force of the air itself. When compressed air enters an opening in the body, even through a scratch or puncture wound it can cause swelling and intense pain. If an air bubble travels to the brain the result can be death. Compressed air discharged close to a person can also cause a ruptured eardrum and other serious injuries.
   - The second serious hazard associated with compressed air is that of flying debris and materials which can cause serious injury especially to the eyes.
3. Always wear eye protection to avoid eye injuries when using compressed air.
4. In addition to the danger of air bubbles entering the bloodstream through a cut, a stream of compressed air can damage an eardrum or eye or inflate a part of the body.
5. Avoid blowing dust and dirt from their clothing, body or hair with compressed air. Even if the pressure is as low as 20 to 25 psi, when directed toward openings in the skin or body, air can penetrate and cause serious injuries.

Safety Requirements for Using Compressed Air

1. Avoid using compressed air for any type of cleaning except as a last resort. Maximum static pressure shall be no greater than 30 psi at the orifice. Chip guarding and proper personal protective equipment must be used. To prevent injuries it is best to use a vacuum-type cleaner with a brush attachment to help dislodge the dust and dirt. Sometimes, however, compressed air may be the only practical method of cleaning machinery unless such equipment is dismantled
   NOTE: Using compressed air may be prohibited by other TVA procedures.
2. Compressed air used for cleaning shall be limited to 30 psi. at the nozzle.
   Exception: Compressed air used with an air lance.
3. Before operating an air hose, examine all connections to make sure they are tight and will not come loose under pressure; hold the nozzle when turning air off and on. Use safety pins with Chicago couplings to assure that the line is secure.

4. When using pneumatic drills, the drill guide plate should be in place when drilling into hard surfaces such as granite or concrete.
5. Do not kink the air hose to stop the air flow; always turn off at the control valve.
6. Inspect the air hose carefully to make sure it is in good condition before opening the valve to let air into the hose; when the job is finished, turn off the valves on both the tool and the air line.
7. Keep air hoses out of aisleways where they can be damaged by traffic or be a tripping hazard.
8. Never point a compressed air hose nozzle at any part of your body or at another person; never use compressed air for a practical joke.
9. When operating an air hammer; goggles, foot shield and ear protection must be used.
10. Before turning on the air pressure, make sure that dirt and debris from the machinery being cleaned will not be blown onto other workers.
11. The operator and any other workers who must be in the immediate cleaning area must wear eye protection and other necessary personal protective equipment.
12. Observe warning signs about compressed air lines and locations. Permanent compressed air lines should be appropriately labeled and colored.
13. Never lift air tools by the cord.
14. Before using an air tool, make sure it is in good repair and properly attached. Make sure that the pressure rating for the tool is not exceeded.
15. Pneumatic tools used on energized equipment or where energized equipment may be contacted shall have protection against accumulation of moisture
16. When changing parts first turn the air off, disconnect the tool and bleed the line.
17. Do not substitute any other gas such as oxygen for compressed air because of the fire and explosion hazard.
18. Make sure any compressed air equipment is maintained on a regular basis. If you find something wrong, report it to your supervisor. Compressed air equipment must be repaired by qualified personnel only.

Procedure 706 Compressed Gas Cylinders

TVA Safety Manual

706 Compressed Gas Cylinders

Procedure Number 706

TVA Safety Procedure

Compressed Gas Cylinders

Revision 3

July 15, 2006

Purpose

The purpose of this procedure is to establish requirements for handling, use and storage of compressed gas cylinders.

Compressed Gas Hazards

1. Compressed gases expose users to both chemical and physical hazards.
2. Gases contained within compressed gas cylinders can be toxic, flammable, oxidizing, corrosive, inert, or some combination thereof.
3. Because the chemical is in gaseous form and pressurized, it can quickly contaminate a large area in the event of a leak in the cylinder, the regulator, or in the tubing coming off of the cylinder, therefore, familiarity with the chemical hazards of the gas is necessary.
4. In addition to the chemical hazards, the amount of energy resulting from the compression of the gas makes a compressed gas cylinder a potential physical hazard.

General Requirements for Compressed Gas Cylinders

1. All portable cylinders used for the storage and shipment of compressed gases shall be constructed and maintained in accordance with the regulations of the U.S. Department of Transportation, 49 CFR Parts 171-179.
2. Compressed gas cylinders shall be equipped with connections complying with the American National Standard Compressed Gas Cylinder Valve Outlet and Inlet Connections, ANSI B57.1-1965.
3. Contents of the gas cylinder shall be clearly identified by means of stenciling, stamping, or labeling, and shall not be readily removable with either the chemical or the trade name of the gas. Color coding is NOT a reliable means of identification. Cylinders which do not bear a legibly written, stamped, or stenciled identification of the contents should not be used: they should be segregated and returned to the vendor as soon as possible.
4. Caps used for valve protection should be securely kept on the cylinder except when the cylinder is in use.
5. Inspect all compressed gas cylinders for serviceability and properly dispose of all unserviceable cylinders.
6. Do not use compressed gas cylinders for any purpose other than the transportation and supply of gas.
7. Never tamper with or attempt to repair or alter cylinders, valves or any safety relief devices.
8. Return cylinders to the vendor for all repairs.
9. Do not place cylinders where they might become part of an electric circuit or allow them to come into contact with an electrically energized system.
10. Use "Snoop", soapy water or leak detection equipment to ascertain that there are no leaks in the gas transport system.
11. Use pressure regulators which are equipped with pressure relief devices.

Utilizing Compressed Gases

1. Before using the gas, read all label information and the data sheets associated with the use of that particular gas.
2. Before attaching cylinders to a connection, be sure that the threads on the cylinder and the connection mate, and are of a type intended for the specific gas service.
3. Always use the proper regulator for the gas in the cylinder.
4. Attach the regulator securely with the secondary valve closed and preferably with the regulator flow backed off (counterclockwise) before opening the cylinder valve wide.
5. Always use a cylinder wrench or other tightly fitting wrench to tighten the regulator nut and tube connections.
6. Teflon tape should never be used on cylinder connections or tube-fitting connections.
7. Open cylinder valves SLOWLY. Point the valve opening away from yourself and other persons. Never use a wrench or hammer to open or close a hand wheel type cylinder valve. If the valve is frozen and cannot be operated by hand, return the cylinder to the vendor.
8. Before a regulator is removed from a cylinder, close the cylinder valve and release all pressure from the regulator.

Operating Procedures for Compressed Gas Cylinders

1. Cylinders, cylinder valves, couplings, regulators, hose, and apparatus shall be kept free from oily or greasy substances especially cylinders containing oxidizing gases. Oxygen cylinders or apparatus shall not be handled with oily hands or gloves.
2. When transporting cylinders by a crane or derrick, a cradle, boat, or suitable platform shall be used. Slings or electric magnets shall not be used for this purpose.
3. Cylinders shall not be dropped or struck or permitted to strike each other violently.
4. Valve-protection caps shall not be used for lifting cylinders from one vertical position to another. Bars shall not be used under valves or valve-protection caps to pry cylinders loose when frozen to the ground or otherwise fixed; the use of warm (not boiling) water is recommended. Valve-protection caps are designed to protect cylinder valves from damage.
5. Unless cylinders are secured on a special truck, regulators shall be removed and valveprotection caps, when provided for, shall be put in place before cylinders are moved.
6. Cylinders not having fixed hand wheels shall have keys, handles, or nonadjustable wrenches on valve stems while these cylinders are in service. In multiple cylinder installations only one key or handle is required for each manifold.
7. Cylinder valves shall be closed before moving cylinders.
8. Cylinder valves shall be closed when work is finished.
9. Valves of empty cylinders shall be closed.
10. Cylinders shall be kept far enough away from welding or cutting operation so that sparks, hot slag, or flame will not reach them, or fire-resistant shields shall be provided.
11. Cylinders shall not be placed where they might become part of an electric circuit.
12. Cylinders shall be kept away from equipment, piping systems, etc., that may be used for grounding electric circuits such as for arc welding machines. Any practice such as the tapping of an electrode against a cylinder to strike an arc shall be prohibited.
13. Cylinders shall never be used as rollers or supports, whether full or empty.
14. No person, other than the gas supplier, shall attempt to mix gases in a cylinder. No one, except the owner of the cylinder or authorized agent shall refill a cylinder.
15. No one shall tamper with safety devices in cylinders or valves.
16. Unless connected to a manifold, oxygen from a cylinder shall not be used without first attaching an oxygen regulator to the cylinder valve. Before connecting the regulator to the cylinder valve, the valve should be opened slightly for an instant and then closed. Always stand to one side of the outlet when opening the cylinder valve.

NOTE: do not open the valve for radioactive or other hazardous gases.

17. Fuel-gas cylinders shall be placed with valve end up whenever they are in use. Liquefied gases shall be stored and shipped with the valve end up.
18. Before connecting a regulator to a cylinder valve, the valve shall be opened slightly and closed immediately. The valve shall be opened while standing to one side of the outlet; never in front of it. Never crack a fuel-gas cylinder valve near other welding work or near sparks, flame, or other possible sources of ignition.
19. Before a regulator is removed from a cylinder valve, the cylinder valve shall be closed and the gas released from the regulator.
20. Nothing shall be placed on top of an acetylene cylinder when in use which may damage the safety device or interfere with the quick closing of the valve.
21. Fuel-gas shall never be used from cylinders through torches or other devices equipped with shutoff valves without reducing the pressure through a suitable regulator attached to the cylinder valve or manifold.

Leaking Cylinders

1. If cylinders are found to have leaky valves which cannot be stopped by closing of the valve, the cylinders shall be taken outdoors away from sources of ignition and your supervisor notified.
2. A warning should be placed near cylinders having leaking fuse plugs or other leaking safety devices, not to approach them with a lighted cigarette or other source of ignition. Such cylinders should be plainly tagged; the supplier should be promptly notified and his instructions followed as to their return.
3. The supplier should be contacted for disposal of the cylinder once the emergency situation is stabilized.
4. If a cylinder or valve is noticeably corroded, the vendor should be contacted and their instructions followed. Any other damage that might impair the integrity of the cylinder should be called to the attention of the vendor before the cylinder is returned.
5. The practice of transferring compressed gases from one commercial cylinder to another is **NOT** permitted.

Storing Cylinders

1. All cylinder storage areas must be prominently marked with the hazard class or the name of the gasses to be stored, e.g. Flammable Gas Storage Area, and "No Smoking" signs posted where necessary.
2. Always secure gas cylinders upright (with valve end up) to a wall, cylinder hand truck, cylinder rack or post, unless the cylinder is specifically designed to be stored otherwise.
3. Secure cylinders with straps, chains, wire or nylon rope sufficient enough to prevent them from being knocked over. Cylinders shall be secured around the body of the cylinder and not the neck or valve.
4. Where gases of different types are stored at the same location, cylinders (empty or full) should be grouped by the type of gas, e.g., flammable, oxidizer or corrosive. Inert gases can be stored with any other type of gas.
5. Full cylinders should be stored separately from empty cylinders. Cylinders should be used by the "first in, first out" guideline.
6. Cylinders should be stored in a well-ventilated area away from sparks, flames or any source of heat or ignition. Cylinders may be stored outside on a slab, however, where extreme temperatures prevail, cylinders should be stored so that they are protected from the direct rays of the sun. Do not expose cylinders to temperatures above 125 degrees F.
7. Cylinders should not be exposed to continuous dampness, stored near corrosive chemicals or fumes. Corrosion may damage cylinders and cause their valve protection caps to stick. Cylinders containing corrosive chemicals should be periodically checked to ensure that the valve has not corroded.
8. Avoid prolonged storage of cylinders in corridors.
9. Never store cylinders in elevator lobbies, stair towers or any other location which could obstruct the safe exit pathway of the building occupants.

10. Empty cylinders must be marked empty by labeling the cylinder, labeling the rack that the cylinder is in or labeling the storage area the cylinder is staged in.
11. Ensure valves are closed on all cylinders and that cylinder caps are installed hand tight.
12. All cylinders must be stored upright.
13. All cylinders must be separated by type oxygen, acetylene, argon, nitrogen, etc. Empty cylinders shall be stored in a separate bay from full cylinders. Oxygen cylinders and fuel gas cylinders shall be stored in bays separated 20 feet or by a 30-minute fire wall at least 5 feet high.
14. Valve protection caps, where cylinder is designed to accept a cap, shall always be in place, hand-tight, except when cylinders are in use or connected for use.

Special Precautions for Using Oxygen and Oxidizing Gases

1. Do not permit oil or grease to come in contact with cylinders or their valves, especially cylinders containing oxidizing gases. Regulators and tubing used with oxidizing gases must be specially cleaned to remove oil and other reducing agents. Explosions may occur when pressurized oxidizers, e.g., oxygen, comes into contact with grease or oil.
2. Do not store oxidizing gases near flammable solvents, combustible materials or near unprotected electrical connections, gas flames or other sources of ignition.
3. Oxygen cylinders shall not be stored near highly combustible material, especially oil and grease; or near reserve stocks of carbide and acetylene or other fuel-gas cylinders, or near any other substance likely to cause or accelerate fire; or in an acetylene generator compartment.
4. Oxygen cylinders stored in outside generator houses shall be separated from the generator or carbide storage rooms by a noncombustible partition having a fireresistance rating of at least 1 hour. This partition shall be without openings and shall be gastight.

Special Precautions for Using Flammable Gases

1. Where a special wrench is required it shall be left in position on the stem of the valve while the cylinder is in use so that the fuel-gas flow can be quickly turned off in case of emergency. In the case of manifolded or coupled cylinders at least one such wrench shall always be available for immediate use.
2. An acetylene cylinder valve shall not be opened more than one and one-half turns of the spindle, and preferably no more than three-fourths of a turn. Acetylene cylinders should not be used at pressures greater than 15 pounds per square inch.
3. Do not store flammable or oxidizing gases near highly flammable solvents, combustible materials or near unprotected electrical connections, gas flames or any other source of ignition.
4. It is preferable to store flammable gases in a ventilated, fire resistant enclosure, e.g., an approved gas cabinet. If this is not possible, flammable gas cylinders should be stored in a well-ventilated space.
5. The quantity of flammable gases in a laboratory should be kept to a minimum.
6. It is mandatory to use flow restrictors and surge protectors on flammable gas cylinders so that there cannot be a sudden large flow of gas if a rupture or other unexpected release happens in the system.
7. Fuel-gas cylinder storage. Inside a building, cylinders, except those in actual use or attached ready for use, shall be limited to a total gas capacity of 2,000 cubic feet (56 m(3)) or 300 pounds (135.9 kg) of liquefied petroleum gas.
8. Acetylene cylinders shall be stored valve end up.
9. Both oxygen and acetylene lines shall be equipped with combination check valve/flash back arrestors that are Underwriter's Laboratories (U.L.) Listed. The combination check valve/flash back arrestor is clearly labeled and shall be installed at the base of the torch. A second combination check valve/flash back arrestor may be installed at the regulator but is not required.

Training

Employees involved in compressed gas cylinders shall receive training course “Handling Storage of Combustible / Flammable Liquids and Compressed Gases” ATIS Number 00059125.

Procedure 707 Conveyor Systems

TVA Safety Manual

707 Conveyor Systems

Procedure Number 707

TVA Safety Procedure

Conveyor Systems

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish requirements for the installation, operation, and maintenance of conveyors and related equipment.

This procedure is applicable to all conveying systems used for the movement of materials.

General Requirements

1. Conveyor equipment shall be used to convey only the specified materials within the rated capacity and the rated speed.
2. The performance of maintenance on conveyor systems shall employ the following:
   - Maintenance and service shall be performed by qualified and trained personnel.
   - No maintenance or service shall be performed when a conveyor is in operation except as provided in this procedure.
   - When a conveyor is stopped for maintenance or service, the starting device, prime movers, or powered accessories shall be tagged out in accordance with the clearance procedure. Personnel should be alerted to the hazard of stored energy, which may exist after the power source is out.
   - The emergency stop cable shall not be used in lieu of clearance procedure.
   - All safety devices and guards shall be replaced before starting equipment for normal operation.
3. Lubrication of conveyor systems shall employ the following:
   - Conveyors shall not be lubricated while in operation unless it is impractical to shut them down for lubrication. Only trained and qualified personnel who are aware of the hazards of the conveyor in motion shall be allowed to lubricate a conveyor that is operating.
   - Where the drip of lubricants or process liquids on the floor constitutes a hazard, drip pans, or other means of eliminating the hazard shall be provided.
4. When adjustment or maintenance must be done while equipment is in operation, only trained and qualified personnel who are aware of the hazard of the conveyor in motion shall be allowed to make adjustment or perform the maintenance or service.
5. When counterweights are supported by belts, cables, chains, and similar means, they shall be confined in an enclosure to prevent the presence of personnel beneath the counterweight.
6. Where necessary for the protection of personnel from hazards, all exposed moving machinery parts that present a hazard to personnel at work stations or operator's stations shall be mechanically or electrically guarded, or guarded by location or position.

7. Although overhead conveyors may be guarded by location, spill guards, pan guards, or equivalent shall be provided if material may fall off the conveyor and endanger personnel.

Conveyor System Controls

1. Control stations shall be clearly marked or labeled to indicate the function controlled.
2. A conveyor that would cause injury when started shall not be started until personnel in the area are alerted by a signal or by a designated person that the conveyor is about to start.
3. When a conveyor that would cause injury when started is automatically controlled or must be controlled from a remote location, an audible device or devices shall be provided that can be clearly heard at all hazardous points along the conveyor where personnel may be present.
4. The audible warning shall be actuated by the controller device starting the conveyor and shall continue for a required period of time before the conveyor starts.
5. A flashing light or similar visual warning may be used in conjunction with, or in place of, the audible device if a visual warning is more effective.
   NOTE: The audible/visual alarm requirement is applicable to new systems and those on which major modifications have been performed subsequent to the year 1995. If the system was installed before January 31, 1995, warning signs may be provided in place of the audible warning device until such time as the conveyor or its control system is rebuilt or rewired. These warning signs shall be clear, concise, and legible and shall indicate that conveyors and allied equipment may be started at any time, that danger exists, and that personnel must keep clear. These warning signs shall be provided along the conveyor at areas not guarded by position or location.
6. Remotely and automatically controlled conveyors, and conveyors where operator stations are not manned or are beyond voice or visual contact from drive areas, loading areas, transfer points, and other potentially hazardous locations on the conveyor path not guarded by location, position, or guards, shall be furnished with emergency stop buttons, pull cords, limit switches, or similar emergency stop devices.
   - All such emergency devices shall be easily identifiable in the immediate vicinity of such locations.
   - The emergency stop device shall act directly on the control of the conveyor concerned and shall not depend on the stopping of any other equipment. The emergency stop devices shall be installed so that they cannot be overridden from other locations.

Operation of Conveyor Systems

1. Only a trained person shall be permitted to operate a conveyor. Training shall include instruction in operation under normal conditions and emergency situations.
2. Where safety is dependent upon stopping devices or starting devices or both, they shall be kept free of obstructions to permit ready access.
3. No person shall ride on a conveyor.
4. Employees may not cross over a conveyor belt, except at walkways, unless the conveyors energy source has been de-energized and properly tagged out.
5. Personnel working on or near a conveyor shall be instructed as to the location and operation of stopping devices.
6. Routine inspections and corrective maintenance measures shall be conducted to ensure that all guards and safety features are retained and function properly.
7. Personnel should be alerted to the potential hazard of entanglement in conveyors caused by items such as long hair, loose clothing, and jewelry.
8. All openings to hoppers and chutes shall be guarded to prevent personnel from accidentally falling or stepping into them or allowing any part of their body to make contact with conveyors below them.
9. Where coal-handling operations may produce a combustible atmosphere from fuel sources or from flammable gases or dust, sources of ignition shall be eliminated or safely controlled to prevent ignition of the combustible

atmosphere.

Note: Locations that are hazardous because of the presence of combustible dust are classified as Class II hazardous locations.

Requirements for Belt Conveyors

1. Nip and shear points shall be guarded.
2. Typical locations for guarding are:
   - at terminals, drives, take-ups, pulleys, and snub rollers where the belt changes direction;
   - where belts wrap around pulleys;
   - at the discharge end of a belt conveyor;
   - on transfers and deflectors used with belt conveyors; and
   - at take-ups.
3. Take-up mechanisms may be guarded as an entity by placing standard railings or fencing around the area with suitable warning signs, as an alternative to guarding individual nip and shear points.
4. Only trained personnel shall track a conveyor belt, which must be done while the conveyor is operating.
5. Do not apply a belt dressing or other foreign material to a rotating drive pulley or a conveyor belt.

Requirements for Bucket Conveyors

1. Guards shall be provided at points where personnel could come in contact with cables, chains, belts, and runways or exposed bucket conveyors.
2. Inspection doors or maintenance doors or both should include signs warning of possible danger if opened of removed while the conveyor is in operation.

Requirements for Trippers

1. Trippers or shuttles may discharge into silo or bunker openings, with or without seals. In either case, openings shall be provided with grating to suit the material being handled, and the width of the openings shall not be large enough to permit personnel to fall through.
2. Where material size requires openings that would permit personnel to fall through, the openings shall be protected by other means.

Procedure 708 Crane Suspended Work Platforms

TVA Safety Manual

708 Suspended and Boom Attached Personnel Work Platforms

Procedure Number 708

TVA Safety Procedure

Suspended and Boom Attached Personnel Work Platforms

Revision 2

April 30, 2010

Purpose

This procedure establishes requirements for the safe design, construction testing, use and maintenance of suspended and boom attached personnel work platforms intended for use with TVA owned or leased cranes.

Roles and Responsibilities

1. Plant / facility manager is responsible for implementing and enforcing this procedure.
2. The supervisor of employees working in the suspended work platform is responsible for the implementation of this procedure.
3. The site crane coordinator and the responsible TVA safety professional are responsible for administering and monitoring this procedure.

General

1. The use of a crane or derrick to hoist employees on a personnel platform is prohibited, except when the erection, use, and dismantling of conventional means of reaching the work station, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold, would be more hazardous, or is not possible because of structural design or worksite conditions.
2. Cranes or derricks may be used to hoist and suspend personnel on a work platform or to provide access in unique work situations when such action results in the least hazardous exposure to employees. A case-by-case determination shall be made by the responsible supervisor and site crane coordinator or TVA safety professional to ensure that there is no practical alternative to perform the required work and authorize its controlled usage.
3. A TVA Form 17671, High Hazard Lift Plan [1] shall be developed whenever personnel are to be hoisted by a suspended personnel work platform from a crane or derrick.
4. A TVA Form 20182, Attached Basket Personnel Lift Plan [2] shall be developed whenever personnel are to be lifted by an attached boom basket on a crane or derrick.

Crane or Derrick Operational Criteria

1. Hoisting of the personnel platform shall be performed in a slow, controlled, cautious manner with no sudden movements of the crane or derrick, or the platform.
2. Load lines shall be capable of supporting, without failure, at least seven times the maximum intended load, except that when rotation resistant rope is used, the lines shall be capable of supporting, without failure, at least ten times the maximum intended load.
3. Boom attached platform's hoist equipment live boom or live load line capabilities shall be removed for the period of personnel lifting.
4. Load and boom hoist drum brakes, swing brakes, and locking devices such as pawls or dogs shall be engaged when the occupied personnel platform is in a stationary working position.
5. The load line hoist drum shall have a system or device on the power train, other than the load hoist brake, which regulates the lowering rate of speed of the hoist mechanism (controlled load lowering). FREE FALL IS PROHIBITED.
6. A mobile crane must be uniformly level within one percent of level grade and located on firm footing. Cranes equipped with outriggers shall have them all fully deployed when hoisting employees.
7. The total weight of the loaded personnel platform and related rigging shall not exceed 50 percent of the rated capacity for the radius and configuration of the crane or derrick.
8. Cranes and derricks with variable angle booms shall be equipped with a properly functioning boom angle indicator, readily visible to the operator.
9. Cranes with telescoping booms shall be equipped with a device to indicate clearly to the operator, at all times, the boom's extended length unless the load rating is independent of the boom length.
10. A positive acting device shall be used which prevents contact between the load block or overhaul ball and the boom tip (anti-two-blocking device), or a system shall be used which deactivates the hoisting action before damage occurs in the event of a two-blocking situation (two-block damage prevention feature).
11. Pendant supported, jib type, boom extensions without positive stops shall not be used to lift personnel.
12. A holding device (such as a load hold check valve) shall be provided in hydraulic or pneumatic systems to prevent uncontrolled movement of the hoisting equipment in the event of a system failure (e.g., supply hose).
13. Before use for lifting personnel, all cranes and derricks shall be inspected each day, and any deficiencies observed must be corrected.

Personnel Platforms - Design and Specifications

1. Consideration in terms of safety, cost and time should be given to the commercial availability of manufactured personnel platforms.
2. The personnel platform and suspension system shall be designed by a qualified engineer .
3. All field drawings, as-built drawings, and engineering calculations for each personnel platform must be maintained at the facility and readily available for management review.
4. The personnel platform itself, except the guardrail system and personnel fall arrest system and anchorages, shall be capable of supporting, without failure, its own weight and at least five times the maximum intended load.
5. The suspension system shall be designed to minimize tipping of the platform due to movement of employees occupying the platform.
6. Each personnel platform shall be equipped with a guardrail system and shall be enclosed at least from the toeboard to mid-rail with either solid construction or expanded metal having openings no greater than ½ inch.
7. A grab rail shall be provided inside the entire perimeter of the personnel platform to minimize hand exposure.
8. An access gate should be provided. The access gate shall swing inward and be equipped with a restraining device to prevent accidental opening.
9. Employees shall be protected by overhead protection on the personnel platform when employees are exposed to falling objects. Overhead protection shall have no openings greater than ½ inch.

10. Flooring shall be made with a slip-resistant surface and have provisions to facilitate the free drainage of liquids. Floor openings shall be no greater than ½ inch.
11. All welding on a personnel platform and its components shall be performed by a qualified welder and shall be inspected by a qualified person in accordance with American National Standards Institute/American Welding Society (ANSI/AWS) D.1.1-90, Structural Welding Code - Steel.
12. Bolted connections of load sustaining members or components of the platform shall be in accordance with the AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts.
13. The personnel platform shall be posted with a plate or other permanent marking which indicates the weight of the platform and its rated load capacity or maximum intended load.
14. For platforms that have installed motion/operational controls provide a weatherproof compartment suitable for storage of the operator manual and assorted documents or a weatherproof placard displaying the operator manual and readable from the platform.
15. Motion/operational controls, if installed on the platform, shall
    - Be clearly identified as to their function;
    - Be protected from inadvertent actuation;
    - Be inside the platform and readily accessible to the operator.
    - When possible, be oriented and move in the approximate direction of the function which they control
    - Return to their neutral position and stop all motion when released
16. Boom motion controls, if provided, shall additionally:
    - Include a control which must be continuously activated for controls to be operational
    - Have motion controls, accessible at ground level that can override platform controls.
    - Include an Emergency Stop Control that does not require continuous actuation for a stop condition.

Personnel Platform Loading and Rigging

1. The personnel platform shall not be loaded in excess of its rated load capacity.
2. The number of employees occupying the personnel platform shall not exceed the number required for the work being performed.
3. Personnel platforms shall be used only for employees, their tools, and the materials necessary to do their work. They shall not be used for transporting bulk materials.
4. Materials or equipment on an occupied platform shall be suitably secured and evenly distributed while the platform is suspended.
5. When a wire rope bridle is used to connect the personnel platform to the load line, each bridle leg shall be connected to a master link or shackle in such a manner to ensure that the load is evenly divided among the bridle legs. Lifting bridles shall consist of four legs (see Appendix B - TVA Form 20182, Attached Basket Personnel Lift Plan).
6. Hooks on overhaul ball assemblies, lower load blocks, or other attachment assemblies shall be of a type that can be closed and locked, eliminating the hook throat opening.
7. Wire rope, shackles, rings, master links, and other rigging hardware must be capable of supporting, without failure, at least five times the maximum intended load applied or transmitted to that component. Each leg of the suspension system must support at least five times the maximum intended load when using a two or more leg system with only two legs under stress. If a one leg system is used it must support at least seven times the maximum intended load applied.
8. All eyes in wire rope slings shall be fabricated with thimbles, flemish–eye splice and pressed/swaged sleeve fittings.
9. Synthetic webbing or synthetic round slings or natural or synthetic fiber rope slings SHALL NOT be used for any portion of the suspension systems.

10. Bridles and associated rigging for attaching the personnel platform to the hoist line shall not be used for any other purpose when not hoisting personnel.

Trial Lift, Inspection, and Proof Testing

1. A documented periodic inspection of the platform shall be performed at least annually by a qualified rigger in accordance with instructions provided by the manufacturer or as determined by site/plant engineering personnel.
2. A trial lift with the unoccupied personnel platform (suspended or boom attached) uniformly loaded at least to the anticipated lift weight shall be made from ground level, or any other location where employees will enter the platform, to each location at which the personnel platform is to be hoisted and positioned.
3. The trial lift shall be performed immediately prior to placing personnel on the platform.
4. The operator shall determine that all systems, controls, and safety devices are activated and functioning properly; that no interferences exist (overhead electrical transmission cables, etc.); and that all configurations necessary to reach those work locations will allow the operator to remain under the 50 percent limit of the hoist's rated capacity.
5. The trial lift shall be repeated prior to hoisting employees whenever the crane or derrick is moved and set up in a new location or returned to a previously used location.
6. After the trial lift, and just prior to hoisting personnel, the platform shall be hoisted a few inches above ground level and inspected to ensure that it is secure and properly balanced.
7. Employees shall not be hoisted unless the following conditions are determined to exist:
8. Hoist ropes shall be free of kinks.
9. Multiple part lines shall not be twisted around each other.
10. The primary attachment shall be centered over the platform.
11. The hoisting system shall be inspected if the load rope is slack to ensure that all ropes are properly seated on drums and in sheaves.
12. A visual inspection of the crane, rigging, attachment points, suspensions system, personnel platform, and the crane base support or ground shall be conducted at least once each day, before use by a qualified rigger. In addition, after the trial lift an inspection shall be conducted to determine whether the testing has exposed any defect or produced any adverse effect on any component or structure. by performance of a Personnel Lift Platform Pre-Lift Inspection in accordance with TVA Form 20368, Personnel Lift Platform Pre-Lift Inspection [3].
13. Any defects found during inspections which create a safety hazard shall be corrected before hoisting personnel.
14. At each new job site, prior to hoisting employees on a personnel platform, the platform and rigging shall be proof tested to 125 percent of the platform's rated capacity by holding it in a suspended position for five minutes with the test load evenly distributed on the platform (this may be done concurrently with the trial lift). Personnel hoisting shall not be conducted until the proof testing requirements are satisfied.
15. After any structural repair or modification, a platform shall be proof tested to 150% of the platform's rating of the platforms rating. After this test, the platform shall be inspected by a qualified rigger. Any damage revealed shall be corrected and another 150% proof test conducted until satisfactory results are achieved.
16. The record of the most recent proof testing shall be maintained at the job site.

Safe Work Practices

1. Personnel platforms shall not be used during high winds (not to exceed 20 mph), electrical storms, snow, ice, sleet, or other adverse weather conditions which could affect the safety of personnel in the platform or the crane or the derrick operator.
2. All employees shall keep all parts of the body inside the platform during raising, lowering, and positioning, with the exception of the signal person.
3. Occupants of the platform with controls shall be qualified to operate the controls.
4. If the personnel platform is not landed, it shall be tied to the structure before personnel get off or on.
5. Tag lines shall be used unless their use creates an unsafe condition.
6. The crane operator shall remain at the controls at all times when the crane engine is running and the platform is occupied.
7. Employees being hoisted shall remain in continuous sight of and in direct communication with the operator or signal person.
8. In situations where direct visual contact with the operator is not possible, and the use of a signal person would create a greater hazard for that person, direct communication alone, such as by radio, may be used,
9. Except over water, employees occupying the personnel platform shall use a body harness system with lanyard appropriately attached to the lower load block or overhaul ball, or structural member (grabrail) within the personnel platform capable of supporting a full impact for employees using the anchorage.
10. No lifts shall be made on another of the crane's loadlines while personnel are suspended on a platform.
11. Hoisting of employees while the crane is traveling is prohibited.

Pre-Lift Meeting

1. The responsible supervisor shall pre-plan all activities requiring the use of personnel platform and document using either the High Hazard Lift Plan (suspended platforms) or Attached Basket Personnel Lift Plan (boom attached platforms).
2. A meeting attended by the crane operator, signal person(s), employees to be lifted, and the supervisor responsible for the task to be performed shall be held to review the appropriate requirements of this procedure and the associated lift plan data.
3. This meeting shall be held prior to the trial lift at each new work location, and shall be repeated for any employees newly assigned to the operation.

Reference

1. TSP 802, Suspended and Boom Attached Personnel Work Platforms
2. 29 Code of Federal Regulations, Parts 1910 and 1926, Occupational Safety and Health Administration (OSHA), U.S. Department of Labor.
3. American Society of Mechanical Engineering (ASME) B30.23, "Personal Lifting Systems."
4. American National Standards Institute/American Welding Society (ANSI/AWS) D.1.1-90, Structural Welding Code - Steel.
5. American Institute of Steel Construction (AISC), Specification for Structural Joints Using ASTM A325 or A 490 Bolts.

Appendices

Appendix A - TVA Form 17671, High Hazard Lift Plan

TVA 17671 High Hazard Lift Plan [1]

Appendix B - TVA Form 20182, Attached Basket Personnel Lift Plan

TVA 20182 Attached Basket Personnel Lift Plan [2]

Appendix C - TVA Form 20368, Personnel Lift Platform Pre-Lift Inspection

TVA Form 20368, Personnel Lift Platform Pre-Lift Inspection [3]

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072560940
[2] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=081500094
[3] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=101240835

Procedure 709 Elevator Safety

TVA Safety Manual

709 Elevator Safety

Procedure Number 709

TVA Safety Procedure

Elevator Safety

Revision 1

June 14, 2011

Purpose

The purpose of this procedure is to establish safety requirements for elevators.

General Requirements

1. Elevators shall be used for their intended purpose.
2. Freight elevators are preferred over personnel elevators when transporting heavy or bulk items.
3. Never use the elevator during a fire or medical emergency. Employees using the elevators during emergency may seriously hinder the response of the fire or medical emergency response team or endanger their own safety.
4. The design safe loading capacity (weight or number of passengers) of the elevator shall be clearly posted on the inside wall, and shall not be exceeded.
5. The nature/hazardous properties of the material being transported in any elevator should be considered prior to use (flammable, corrosive, hazardous material, etc). Steps should be taken to mitigate/minimize exposure to employees when transporting this type of materials.
6. The EMERGENCY stop switch shall be used only in emergency situations.
7. The elevator door or gate shall remain closed while the elevator car is in motion.
8. An elevator pit shall never be used as a storage space.
9. The elevator pit shall be fully enclosed and all entrances locked.
10. Smoking is not permitted on elevators.
11. In the event an elevator becomes stalled or otherwise inoperable, the emergency alarm or telephone shall be used to report the problem. Do not attempt to leave a stalled elevator car.
12. Opening hoistway doors to stop and hold an elevator are not acceptable in lieu of opening (deenergizing) stop switches.
13. The EMERGENCY stop switch inside an elevator car shall not be used to hold hoistway doors open. This switch is EMERGENCY USE ONLY and shall be used accordingly.
14. DANGER signs shall be posted on the crossheads at the top of each hoistway indicating the clearance distance between the top of the car and hoistway ceiling.
15. When an elevator is in normal operating service, the elevator penthouse (control room) doors shall be kept locked and only authorized persons are permitted entry.
16. Dumbwaiters shall never used for the transport of personnel.

Alterations, Repairs, and Replacement of Parts

1. Alterations, modifications, repairs, and replacement of parts on elevators shall be accomplished in compliance with the applicable requirements of ANSI A17.1.
2. All hoistway doors shall be chained off with warning signs affixed to the chain, which state: TEMPORARILY OUT OF SERVICE.
3. Call buttons on each landing shall be completely covered with a warning sign or tag which states: DO NOT OPERATE, or similar wording.
4. No person shall attempt to ride a car when these signs or tags are in evidence except those persons performing the work.

Work Clearance Requirements

1. The elevator inspection mode switch shall be used and personnel shall assume a safe position when riding on top of a car to make shaft inspections.
   NOTE: It is acknowledged that it is necessary to ride a car at full operating speed to observe the automatic operation of hoistway doors. The rider(s) shall assume a safe position, and the stop switch on top of the car shall be manned at all times during these observations.
2. For any work in the penthouse involving the control circuitry, the power circuitry, the main power circuitry, or the moving machinery, the main power disconnect in the penthouse shall be used and in full view of the person doing the work. It is permissible to troubleshoot the control or power circuitry, when necessary, while the circuitry is energized.
3. Before entering an elevator pit or shaft to perform any maintenance work, the plant / facility clearance procedure / lockout/tagout shall be implemented.
4. If control circuitry permits, the elevator car shall be committed to the up-travel direction before any work is performed underneath the car.
5. At least two stop switches, excluding the emergency stop switch inside the car, shall be used (deenergized) while performing work in the shaft.
6. A HOLD ORDER / lockout shall be issued and placed on the main power disconnect in the penthouse or on the main breaker feeding the penthouse disconnect before any work is performed underneath the car.
   EXCEPTION: Should any work be necessary in the pit which requires the car to be energized and traveled, approval of the work and the method by which it is performed shall be reviewed and approved by the supervisor in charge of the crew performing the work. As a minimum a positive means to stop the car from contacting employees shall be used.
7. Elevator safety devices or electrical protective devices shall be made inoperative only as necessary for required inspection, test, or maintenance. Immediately upon completion of such inspection, test, or maintenance, such devices shall be restored to their normal operating condition.

Elevator Inspection and Preventive Maintenance

1. Management at each TVA plant / facility shall arrange for availability of certified inspectors and develop and implement a formal inspection program for elevators using certified elevator inspectors on an annual basis.
   EXCEPTION: Elevator inspections are conducted semi-annually at TVAN plants.
2. Each facility shall ensure a documented inspection and preventive maintenance program for its elevators is in place that complies with the applicable requirements of ANSI A17.2.
3. This program shall include the requirement for monthly inspections, and that corrective actions are documented and maintained on file. Additionally, each record of all elevator downtime shall be maintained, complete with identification of cause for downtime, and corrective actions, Elevator records and files shall be available for review by certified elevator inspectors.

4. This program shall include the requirement for monthly preventative maintenance of all elevators. Maintenance includes, but is not limited to, the following items.
   - Lubrication of hoisting and counterweight wire ropes and oil buffers.
   - Cleaning lubrication of guide rails, controller contractors, and relays.
   - Cleaning of hoistways, pits, machine rooms, and tops of cars.
5. Inspections shall be made to determine whether all parts of elevator machinery and equipment conform to the requirements of applicable codes and standards and whether the required safety devices function as designed. Functional tests shall be performed to determine that the equipment is in a safety operating condition.
6. Form TVA 7476, for electric elevators, and form TVA 7476A, for hydraulic elevators, or equivalent forms, shall be are used as the formal inspection reports.
7. A certified elevator inspector has the responsibility to recommend an elevator be removed from service for a deficiency (or a combination of deficiencies) that could affect life safety through its continued use. A recommendation of this nature from a certified elevator inspector requires positive action.
8. An elevator removed from service shall be reinspected by a certified elevator inspector after corrective action is completed. His / her approval is required before the elevator can be returned to service. He / she shall provide guidance and instructions concerning applicable codes and standards to expedite the return to service.
9. All elevators shall be inspected and approved for release to service by a certified elevator inspector before employees are permitted to use the elevator. The results of this inspection shall be documented and maintained in the workplace file.

Deviations From Elevator Code Requirements

1. Management at each worksite shall develop and coordinate a plan to update existing elevators to meet ASTM A 17.3, code requirements. As a minimum, this plan shall include as applicable changes or administrative controls in the following areas:
   - Oil pressure gauges are on all hydraulic elevators
   - Inspection stations are on top of elevator cars
   - Adequate illumination in hoistway pits
   - Fixed ladders are in hoistway pits (if space available permits)
   - Emergency escape hatches are not removable from inside the elevator car. Ingress is possible only from the top of the car
2. Stop switches are in the following locations.
   - Inside elevator car
   - Inspection station on top of car
   - Hoistway pit
3. Stop switches shall be the push-pull, double-pole design and highlighted with a red warning color and permanently marked STOP.

Job Planning and Coordination

It is essential that plant work performed relating to the safe operation and maintenance of elevators be planned in advance to eliminate potential hazardous situations and to minimize inconvenience during elevator downtime.

Procedure 710 Grinding and Cutting

TVA Safety Manual

710 Grinding and Cutting

Procedure Number 710

TVA Safety Procedure

Grinding and Cutting

Revision 3

July 15, 2006

Purpose

The purpose of this procedure is to ensure that grinding and cutting operations are performed in a safe manner.

Basic Requirements for Grinding and Cutting

1. All portable grinding tools shall be equipped with safety guards so as to cover the spindle end, nut and flange projections. Guards shall be mounted so as to maintain proper alignment with the wheel. Cup wheels over two inches in diameter used for external grinding shall be protected buy either a cup guard or a band type guard. The maximum angular exposure of the grinding wheel periphery and sides shall not exceed 180 degrees.
2. Before mounting a new wheel, the machine shall be checked to be certain that it does not exceed the maximum operating speed marked on the wheel.
3. Grinding wheels shall fit freely on the spindle and shall not be forced on. The spindle nut shall be tightened only enough to hold the wheel in place.
4. When safety flanges are required, they shall be used only with wheels designed to fit the flanges. Only safety flanges, of a type and design and properly assembled so as to ensure that the pieces of the wheel will be retained in case of accidental breakage, shall be used.
5. When an employee is unable to do a job using a grinding rock three inches or less in diameter, one quarter inch or less in thickness and less than 9500 SFPM (surface feet per minute) or a cut-off wheel with the tool guard on the tool, the guard may be taken off provided they wear proper clothing and protective equipment (long sleeves, leather work gloves, and hard hat with full face shield or welding hood) and the guard is replaced when finished. SFPM = 3.1416 x Diameter x RPM12**Note: For TVAN sites, whenever a handle or guard must be removed to complete a work activity, a Job Safety Analysis must be completed and approved by the employee's immediate supervisor.**
6. Always keep guards in place on the grinders.
7. All abrasive wheels must be at operating speeds with safety guards in place for at least one minute before applying work to the wheel. During this time no one will stand in front of or in line with the wheel.

Hazards of Abrasive Wheel Tools

1. Portable abrasive wheels have most of the same hazards as wheels mounted on fixed stands, but their portability makes them MORE hazardous in some ways. The BIGGEST danger is the chance of the wheel EXPLODING. Speeds of 2000 to 3000 RPM can send exploding pieces into exposed flesh, unprotected eyes, etc.
2. Protect the wheel from sharp blows, or from being dropped. If the wheel appears to have been abused in any way DON'T USE IT. OVERSPEED can cause explosion of an abrasive wheel. Be sure that the wheel is the proper size to avoid over-speed.

Inspection/Testing of Portable Grinders

1. Each portable grinder shall be visually inspected by the user prior to use.
2. Powered abrasive grinding, cutting, polishing, and wire buffing wheels create special safety problems because they may throw off flying fragments. Immediately before mounting, all abrasive wheels must be closely inspected to make sure they have not been damaged. Replace with a new wheel if the inspection reveals defects.
3. Visually inspect the wheel for defects. "Ring test" the wheel by gently tapping with a nonmetallic object. If the wheel sounds "dead" then discard it immediately. Inspect the mounting flanges. Are they clean, flat and smooth and the correct size and diameter? Is the correct mounting blotter in place? Be sure the mounting nut is not over-tightened. Is the guard on tight. Is the cord in good condition? Does the trigger work right? Does the wheel run smoothly and without vibration?
4. Formal inspections by qualified persons shall be conducted annually.
5. A record of the inspections shall be maintained. The record may be maintained in any legible form as long as a unique identifier for the tool, date of inspection, and condition of the tool are noted. This record may be destroyed after one year from the inspection date.
6. Defective tools shall be removed from service and tagged until repaired or disposed of.
7. Tools shall be marked (taping, spot painting, etc.) with a method that is well communicated to all plant/facility personnel.
8. As a minimum, a faceshield over standard goggles or safety glasses with side shields, hard hats, and gloves shall be used whenever portable grinders are used. Hearing protection shall be used with all portable grinders, which exceed 85 dBA.
9. When removing PPE such as hoods, goggles and face shields, care should be taken to prevent particles from getting into the eyes. Tilt your head back when removing a hood so that particles do not enter the eyes.
10. Vacuum clothing and PPE before removing when possible.
11. Make sure only approved PPE is used and that you inspect it for damage before use.
12. All employees involved in grinding and cutting operations shall be trained. Supplemental training shall be conducted if inspections, observations, or accident studies indicate that tools are not being properly used or maintained.
13. Never carry a grinder by the cord or hose. Never yank the cord or the hose to disconnect it. Keep cords and hoses away from heat, oil, and sharp edges.
14. Disconnect grinders when not in use, before servicing, and when changing abrasive wheels. Follow instructions in the user's manual for lubricating and changing accessories. Do not hold a finger on the switch while carrying a plugged-in grinder.
15. Route power cords or hoses around or over traffic areas and other hazards such as oil or water.
16. Portable grinders shall not be used in atmospheres containing or likely to contain explosive gases or airborne coal dusts.
17. Constant pressure switches shall be used on grinders. They may have a lock-on control, provided that turnoff can be accomplished by a single motion of the same fingers that turn it on.
18. Screens should be set up to protect nearby workers from being struck by flying fragments around grinders.

Reference

29 Code of Federal Regulations 1910 Subpart P “Hand and Portable Powered Tools and Other Hand-Held Equipment”

29 Code of Federal Regulations 1926 Subpart I “Tools - Hand and Power”

29 Code of Federal Regulations 1910.269(I), “Electric Power Generation, Transmission, and Distribution, Hand and Portable Power Tools”

TVA Safety Procedure 1012, “Portable Electrical Power Tools & Attachments”

TVA Safety Procedure 304, “Eye and Face Protection”

TVA Safety Procedure 718, “Pneumatic Tools”

Appendix

Appendix A - Portable Power Tool Inspection Matrix

PORTABLE POWER TOOL

INSPECTION MATRIX

ELEMENTS TO BE INSPECTED AND THE FREQUENCY

	Seals & Bushing	**Continuity**	**RPM**	**Open Ground**	**Double Insulation**	**Guards**	**Safety Switch**	**Mechanical Tolerance**	**Cord Condition**
ELECTRICAL *Saws		***		***	***	***		***	***
*Drills		***		***	***		***	***	***
*Grinders		***	***	***	***	***	***	***	***
*Other		***		***	***		***	***	***
*Unclassified, etc.							***	***	***
PNEUMATIC *Grinders	***		***			***	***	***	
*Drills	***						***		
*Chipping/Breaking	***							***	
*Vibrator	***							***	
MECHANICAL *Plate Dog								***	
*Powder Actuated *Stun Gun								***	
*Porta Power	***							***	
*Other								***	
*Unclassified, etc.									

Frequency: *** = Annual

Procedure 711 Heavy Equipment Operations

TVA Safety Manual

711 Heavy Equipment Operations

Procedure Number 711

TVA Safety Procedure

Heavy Equipment Operations

Revision 2

September 1, 2009

Purpose

The purpose of this procedure is to establish the safety requirements for heavy equipment operations.

Operator Training and Qualification

1. The manager/supervisor/foreman responsible for heavy equipment use must carefully select the operators for each type of equipment. Several selection factors must be satisfied:
   - each operator must be medically fit to operate the equipment,
   - each operator must be qualified to operate each type of equipment assigned and
   - each operator must be certified by the manager/supervisor/foreman to operate each type of equipment assigned.
2. Each operator must pass a TVA S-5 Medical Examination to operate heavy equipment. Periodic reexaminations are required every two (2) years thereafter.
3. Qualifications to operate each type of equipment include knowledge in the general and specific operating rules for each of the various types of equipment and instructions in the hazards associated with their work. Knowledge must also include the safe methods of operation for each type assigned.
4. Operator certification involves requiring the operator to demonstrate actual safe use of each type of equipment assigned.
5. Copies of the equipment manufacturer's instruction manual must be kept with each machine and all operators instructed to refer to it whenever any doubts concerning operating procedures become apparent. Operators should also be instructed to consult with their supervisor/foreman in the event the manual does not cover a specific situation.

Project Plan

1. The majority of heavy equipment operations are routine in that they occur on a daily basis. Examples would be dozer and pan scrapper operations on the coal pile. However, due to maintenance and/or modification activities, non-routine work occurs on a frequent basis. The nonroutine work will require a more detailed safety planning process.
2. Non-routine work with heavy equipment usually involves some type of excavation or earth removal. Such work will require more detail planning and preparation of an Excavation Permit (reference TVA Safety Procedure 804, “Excavations and Trenching”). Since the work will usually require some travel of the equipment, the path of travel should be planned. Such planning should include safe clearance under power lines and other low overhead obstructions such as plant piping, narrow bridges, capacity of bridges/grating that must be crossed, road bed

stability, roadway clearance around curves, traffic to be encountered, underground utilities that may be damaged, etc. The planning should be done jointly by the supervisor/foreman and the operator.

3. Planning for the actual site work should include a survey for nearby power lines and proper clearance, locations of underground utilities and other unique hazards. Other unique hazards would include site clearing of underbrush, digging into banks where the height could cause soil to fall onto the operator, operating near edges of excavations, banks, etc.
4. If site clearing is planned, where large trees with low limbs and high underbrush are present, use only equipment with heavy, well supported, arched steel mesh canopies to protect operators from falling dead limbs. An alternative to alleviate such hazards is to cut the roots of the tree with dead branches on three (3) sides and then apply the power to the fourth side. A long cable may be used to pull over large dead trees, but it must be determined in advance that the tractor and operator will be in the clear when the tree falls.
5. Where the site work may be remote from the plant or facility, pre-job planning should also include a method of communication should the employee be injured or become ill. The planning should also include contingencies for stormy or inclement weather.
6. Where machines must operate in close quarters, adjacent to excavations, buildings, other equipment, or near workers, a signal person should be provided.
7. Night time operations are not recommended. If they must be conducted, flood-lighting approximating daylight around the equipment shall be provided. Signal persons should be provided with reflective gloves (orange or red), a spotter's jacket and a safety hat with a couple of strips of reflectorized tape on it to assist the operator in spotting the signal person.

Traffic Control

1. Equipment movement on plant/site roadways should be during the daylight. If equipment must be moved at night, the equipment should be driven entirely off the road if possible. Warning flags and/or reflective markers should be placed at the ends of the projecting blades. It is not unusual for one or both ends of a scraper blade to project beyond the tread of the machine. These projecting ends may strike personnel or equipment. If equipment must remain parked where any portion projects into a road, day or night, the equipment should be adequately marked with barricades, red flags, red lights, or flares.
2. When equipment is in use on a section of road, it is advisable to place barrier signs at sufficient distances and at both ends of the operation to warn oncoming traffic of DANGER AHEAD. Advanced warning signs should be placed at least 1,500 feet (450m) from the starting point of the operations or barricade on the road or highway and even a greater distance if traffic speed indicates. Instructive and informational signs should also be placed as needed, between the advance warning signs and at the start of the operations.
3. Where operations are extensive, flagmen should also be stationed where they are visible to oncoming traffic for at least 500 feet (150m). Where possible, detour all traffic by way of another road around the worksite.
4. Operators should not stop or turn equipment on a curve or at the crest of a hill, unless they can clearly see approaching traffic for at least 1000 feet (300m). Flagmen should be stationed at both ends of the turning operation to warn of approaching traffic.
5. At times it may be necessary to access and use public roadways for brief periods of time. In the interest of public safety and concern for possible damage to roadways, the state transportation office, state highway department, etc. shall be consulted prior to movement.
6. Plant/site rules shall develop and communicate traffic rules for haul roads and job roadways that give loaded equipment the right-of-way. Stop signs should be placed to govern entry of light duty vehicles and cars and other equipment into haul roads or operating areas.

Personal Protective Equipment (PPE)

The following PPE is recommended for heavy equipment operators: hardhats, goggles or safety glasses with sideshields for site clearing or where there is dusty operations, gloves where cables will be handled and shoes with corded soles. Respirators are recommended for dusty operations. Operators and maintenance personnel should wear snug-fitting clothing without loose ends. Gloves and loose clothing are unsafe dress for working around moving parts.

Inspections

1. Inspections of equipment must be made to ensure safe and efficient operations. Inspections are usually of three types: periodic (annually), frequent (monthly) and daily. The upervisor/foreman shall ensure these inspections are performed by qualified persons and that identified deficiencies are promptly corrected. Equipment shall not be assigned for work if there are deficiencies that have not been corrected.
2. Daily shift inspections shall be performed on the equipment assigned for operation by the operator. Deficiencies shall be reported so that corrective action can be taken. Inspections should be documented and reports of deficiencies shall be documented. Appendix A, Heavy Equipment Checksheet – Operator/Driver – Preoperational Inspection is used to document the daily inspection. Equipment with deficiencies that affect safe operations shall not be operated. Items that should be inspected by the operator prior to each shift operation include: brakes, steering mechanisms, clutches, drives, hydraulic mechanisms, transmissions, wheel bolts and motor chassis bolts for tightness, clamps, hooks, lights(for night operations), backup alarms, oil leaks, clean windshields and other windows, fire extinguisher, electrical wiring, floors for grease and oil, running boards and steps for tripping hazards and slippery conditions, handholds, and all boom joint or pin connections. Before starting operation, the operator shall test all motions of the equipment, including the brakes.

Equipment Entry / Exit

Historically, frequent injuries occur to operators of heavy equipment when entering and exiting the operators station. Operators and/or others should never jump from the equipment to the ground. Dismounting should never be done while the equipment is in motion. Handholds and steps must be used to climb on and dismount the equipment. Steps and running boards must be kept clean of ice, mud, grease and oil.

General Operating Safety

1. Before moving earth moving equipment, operators should make certain that no other personnel or equipment are in the danger area around the equipment. The operator should walk around the machine before starting.
2. Machines should be operated at speeds and in a manner consistent with conditions of the job.
3. Machines should be driven slowly off the shoulders of roads, to avoid the sudden dropping of one wheel which could cause a sudden tilting. This could topple the machine, throw a driver off a machine or against control levers or wheel and result in a serious injury.
4. When parking a machine, the engine should be shut off, bowls or blades dropped and other attachments such as rippers and scarifiers lowered to the ground.
5. At no time should a machine be left unattended while its motor is running.
6. Operators shall not allow other personnel to ride on equipment while the equipment is in motion, except for training purposes, and then only when a seat is provided. Nobody shall be allowed to climb on equipment in motion.

Field Refueling

When remote field refueling must be accomplished, the equipment shall be shut off. Smoking is prohibited. Only approved fuel dispensing equipment will be used. The operator shall standby with a fire extinguisher. For flammable fuel transfer, i.e., gasoline, both the dispenser and the machine being refueled shall be electrically bonded.

Field Maintenance

1. Occasionally, field maintenance will be required due to the nature of the equipment size and failure. When this is the case, the operator will set the brakes, secure the boom, lower the dipper or bucket to the ground, take the machine out of gear and take other appropriate actions to prevent accidental movement.
2. Before starting any field maintenance, the mechanic shall notify the operator of the nature and location of the problem. If the repair work is to be done on or near moving parts, the controls will be locked out and tagged and the lock and tag shall be removed only by the mechanic.
3. Parts that must be in motion while mechanics are working on them should be turned slowly, by hand if possible, in response to guidance or on signal. This precaution applies particularly to work around gears, sheaves and drums. Workers who grasp cables just ahead of the sheaves risk having their hands jerked into the sheaves. To prevent hand injuries, a cable being wound on a drum should be guided with a bar.
4. If guards must be removed for the maintenance work, the job cannot be considered complete until the guards, plates and other safety devices have been replaced.

Servicing Tires

1. Only heavy equipment mechanics shall change heavy equipment tires. Operators may inflate such tires while in the field by following the procedures listed below:
   - Any operator or employee who inflates heavy equipment tires must have received training that includes the hazards involved,
   - the correct procedures for the type wheel being serviced,
   - the data in the rim manual charts,
   - use of the restraining device or barrier,
   - inflation procedures, rim inspection procedures and
   - an understanding of the necessity of standing outside the trajectory both during inflation of the tire and during inspection of the rim following inflation.
2. The following tire servicing equipment shall be used when inflating heavy equipment tires:
   - A restraining device such as a cage, rack, assemblage of bars and other components that will constrain all rim wheel components during an explosive separation of a multi-piece rim wheel or during the sudden release of the contained air of a single piece rim wheel
3. An air line assembly consisting of the following components shall be used for inflating tires:
   (a) a clip-on chuck: (b) an in-line valve with a pressure gauge or presettable regulator; (c) a sufficient length of hose between the clip-on chuck and the in-line valve(if one is used) so as to allow the employee to stand outside the trajectory and; current charts or rim manuals containing instructions for the type of wheel being serviced. These charts or rim manuals shall be available in the service areas.
4. The following safe operating procedures shall be followed when inflating heavy equipment tires while in the field:
5. The restraining device shall be installed around the tire. The restraining device shall be inspected prior to use for bent parts, corrosion damage or other signs of weakness.
6. Whenever a rim wheel is in a restraining device the employee shall not rest or lean any part of his or her body or equipment on or against the restraining device.

7. Even though the tire may be within the restraining device, the employee should stand outside the trajectory of explosion.
8. After tire inflation, the tire and wheel components shall be inspected while still within the restraining device to make sure that they are properly seated and locked. No adjustment shall be made by the operator.

Towing

1. When equipment breaks down in the field, towing sometimes is required to transport the equipment to a location where it can be repaired. The towing tractor operator shall ensure that all personnel are clear before backing to couple-up. If a ground worker is assisting, the operator should not move until signaled.
2. The towing tractor shall be stopped, the shift lever placed in neutral and the brakes set before any workers are allowed to couple the trailing equipment. Wheels of the equipment being coupled shall be chocked.
3. All equipment being towed shall be secured by a safety chain in addition to the regular hitch or drawbar.

Complete Job and Park

1. Operators shall set the brakes, land blades, put buckets on the ground, place shift lever in neutral before leaving the equipment in the field at the end of the work shift. Wheeled equipment shall have the wheels blocked if the equipment is parked on a grade. All electrical systems shall be disconnected along with the master switch, if provided.
2. When equipment is stored indoors overnight or for maintenance purposes, the equipment shall be kept away from flammable materials, welding operations and heating units.

Backhoes

1. Outriggers shall be extended for all digging. Placement shall ensure, to the extent possible that the machine is level. Cribbing may be required where the setup is in soft or muddy soil.
2. Operators shall use extreme caution when setting up and operating near the edge of an excavation. Collapse of the side of the excavation can cause tipping of the backhoe into the excavation.
3. The operator should limit the size of the shovel bite to avoid using excessive power. Such a safe practice will keep the machine from being thrown off balance. This in turn, will prevent the machine from possibly being tipped into the excavation and will prevent the operator from being thrown against the frame or other parts of the machine.
4. Buckets should not be filled to overflowing. This practice will prevent spillage, particularly to employees. Care shall be taken not to exceed the capacity of the machine, particularly in lifting large rocks/boulders.
5. Loads shall not be swung over any employees. The operator must be aware of employees who may be in or near the excavation. Loose rock and soil are a threat to such employees.
6. The operator shall not do any digging when there is an employee in the excavation in close proximity to the point of digging.

Bulldozers

1. Bulldozer blades should be kept close to the ground for balance when the machine is traveling up a steep grade.
2. When a bulldozer is to be ridden down a slope, three or four bowls of dirt should be dozed to the edge of the slope. Then operators should ride down the slope with the dirt in front of the blade.
3. If the dirt is lost on the way down the slope, operators should not lower the blade to regain the load. Lowering the blade might cause the machine to overturn.
4. Bulldozer bowls should not be used as a brake for going down a steep slope except in extreme emergencies.
5. Operators should exercise extreme care when working the bulldozer near the edges of cuts or fills.

6. Side hill travel should be avoided whenever possible. Driving up and down the slope should be done to avoid tipping over. However, if side hill travel is absolutely necessary, the possibility of capsizing can be reduced by tying a machine (using a rope) to another machine stationed at the top of the hill. This action shall require approval of the plant/site safety manager and the manager of the operation. Planning for this operation shall be documented.
7. Bulldozer operators should make sure that all workers are standing clear before pushing over trees, bulldozing rocks and rolling logs.
8. In clearing operations, operators should expect the greatest danger to occur from falling limbs or timber. Operators pushing over large trees should recognize dead limbs or dead tops as definite hazards. Abrupt contact with the butt of such a tree may crack or break off a limb that may drop on top of the machine or personnel nearby. In general excavation work, operators should be alert to dangers from overhanging dirt and rocks.

Draglines and Power Shovels

1. Cranes used as draglines that are mounted on barges shall be secured in such a positive manner as to prevent the crane from moving due to barge movement / list.
2. Since load rating of the crane may be reduced in order to stay within the limits for list of the barge, when mounted on a barge, a new load rating chart shall be calculated and provided. This calculation must be made on the drag bucket capacity and the radius of the lift, taking into account the swing of the load. Lifting to the side of a barge will tend to make the barge list more than if the lift radius is confined to the end of the barge. The capacity and limitations of use shall be based on competent design criteria. This written criteria shall be filed at the plant/site.
3. The load rating chart with clearly legible letters and figures shall be provided and securely fixed at a location easily visible to the operator.
4. The operator and other employees on the barge shall be provided and required to use personal floatation devices.
5. Cranes used as draglines for ash pond work that are not mounted on barges shall be set up on firm footing. Such footing may require the use of cribbing to ensure that the crane is not tipped from the shifting of the ground.
6. The footing/cribbing shall ensure that the crane is level.
7. Most boom failures (collapses) are caused by side loading, which is either due to the machine not being level or from swinging a load too fast. Load swings shall be smooth and at a slow to moderate pace.
8. Stopping a swinging load that is moving too fast will increase the side load on the boom and increase the potential for boom failure. Jerky swing movement will also increase the list and movement of barges where the crane is mounted on barges. Such movement, particularly to the side of the barge increase the potential for crane(and barge) tipping.

Front-end Loaders

1. Operators shall not travel at excessive speeds. Traveling empty at excessive speeds is dangerous because a front-end loader bounces or weaves. An operator who is not careful may find that his control of the machine is unstable. Once the machine begins to bounce, the operator may tend to oversteer the loader further out of control, rather than return it to stable operation. The machine may go over an edge, strike an object or turn the machine over before it can be stopped. The bouncing tendency of front-end loaders depends on the surface of the road and whether the machine is accelerating. Downgrades are particularly hazardous.
2. The machine is easier to control when loaded, when traveling good roads, when moving up grades and when accelerating.
3. Operators must use extreme caution when carrying a load. Carrying a load too high increases the potential of turning over, particularly when operating on an uneven surface. In addition, operator forward visibility is restricted when the load is carried too high.

4. The center of gravity of a loader can be affected when traveling on unstable ground, working on side slopes, traveling with bucket raised (either empty or loaded), or making sudden turns, even on level ground.
5. Always travel with the bucket low and wait until the dumping point is reached before hoisting the bucket.
6. Keep tires properly inflated and do not exceed the machine load rating.
7. Riders are not allowed on front-end loaders. This is because of the inherent instability of the loader when traveling. Additionally, on articulated loaders, the rider can be crushed when they turn to the rider's side.
8. Use of front-end loaders without a roll-over protection structure (ROPS) shall not be used where there is an operation near low-roofed areas or where there is a danger of backing into a low limb of a tree.
9. A seat belt must be provided and used by the operator when operating a loader equipped with ROPS.
10. No loader shall ever be used as a work platform or staging.
11. Sudden movement in the hoisting mechanism, caused by hydraulic or mechanical failure or operator can result in serious injury. Other unorthodox uses of the loader is forbidden. This is because such use can cause undetected damage to the loader which could lead to a future accident and because an accident can happen using the loader outside its design limitations.
12. Operators shall use extreme caution in backing a loader. Improper backing is one of the principle causes of accidents involving loaders. The operator shall use side and rearview mirrors. The operator must keep the mirrors clean and properly adjusted. In a congested area, particularly with pedestrian workers present, a signal person shall be used to signal the operator in backing.
13. When loading a truck, it shall be loaded from the truck driver's side whenever possible. The loader operator and truck driver shall agree where the truck driver will stay while the truck is being loaded. The truck driver must remain in the cab or away from both the truck and the loader. The truck driver shall never be on the truck body when loading is being accomplished.
14. When a loader is required to operate near excavations, or beams, or stop logs shall be used to guard the edge to minimize the possibility of the machine running off the side.
15. When descending grades with a loader, the speed shall be regulated, the engine left engaged, the transmission placed in a low range, and the bucket carried as low as possible and tilted back.
16. Severe brake action with a loaded bucket can cause the loader to pivot about the front axle until the bucket hits the ground, and steering control will be lost until the rear tires get back on ground. For this reason, the operator should try and back down a descending grade with a load. The operator should use the loader brakes conservatively in order to maintain good air pressure for emergencies.
17. Dropping the bucket after a runaway has gained speed appears to be ineffective as a braking device. It's use may cause the loader to swing aside and turn over. For this reason, the bucket shall not be used as a braking mechanism.
18. Buckets shall always be grounded when the operator leaves the seat. A bucket left elevated for any reason shall be securely blocked to prevent sudden drop.

Graders

1. Grader operators should be alert for rocks, logs and trees when sloping banks.
2. Graders should never be permitted to coast downhill. They should be kept in gear at all times.

Scrapers

1. When towing a scraper from job-to-job, operators should ensure maximum clearance for road projections, such as often occur at crossings. If a scraper bowl safety latch is provided, it should be used.
2. When going downhill, operators should not "kick" their machines out of gear because increased speed may make control of the machine difficult. Instead, they should leave their machine in gear and use retarders to control speed and/or use their brakes as a secondary speed control.

3. Scraper operators, when they are loading with the assistance of a push tractor or dozer, should coordinate their efforts with that of the tractor/dozer operator.
4. Scraper operators shall use extreme caution when operating near the edges of coal piles. Tipping of the scraper is a distinct possibility in these locations.

Definitions

Heavy Equipment - Any motorized equipment designed for excavating and transporting raw materials such as soil, coal, rock, debris, etc. For purposes of this work-practice/procedure, such equipment would include: bulldozers, graders, pan scrapers, front end loaders, back-hoes, dump trucks, drag lines, power shovels, etc.

Designated Authority - Any employee charged with the responsibility of ensuring that any task involving the use of heavy equipment is safely and efficiently carried out.

Qualified - Any employee who by reason of training and/or experience possesses the necessary knowledge and skill to perform a given task.

Certified - Any employee who has successfully demonstrated the necessary knowledge and skill to operate an individual type of heavy equipment. An employee must be certified for each type of equipment he/she operates.

Reference

29 Code of Federal Regulations 1926.600 - "Equipment."

29 Code of Federal Regulations 1926.601 - "Motor Vehicles."

29 Code of Federal Regulations 1926.1000 - "Rollover Protective Structures (ROPS) for Material Handling Equipment."

29 Code of Federal Regulations 1926.1001 - "Minimum Performance Criteria for Rollover Protective Structures for Designated Scrapers, Loaders, Bulldozers, Graders, and Crawler Tractors."

Appendix A - Heavy Equipment Check Sheet Operator / Driver Pre-Operational Inspection

TVA 20308, Heavy Equipment Check Sheet Operator / Driver Pre-Operational Inspection [1]

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=092320178

Procedure 712 Ladders (Fixed)

TVA Safety Manual

Procedure 712 Ladders (Fixed)

Procedure Number 712

TVA Safety Procedure

Ladders (Fixed)

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish requirements for design, installation, use, care and maintenance of fixed ladders.

Specifications

1. The minimum design live load shall be a single concentrated load of 200 pounds.
2. All rungs shall have a minimum diameter of three-fourths inch for metal ladders and a minimum diameter of 1 1/8 inches for wood ladders.
3. The distance between rungs, cleats, and steps shall not exceed 12 inches and shall be uniform throughout the length of the ladder.
4. The minimum clear length of rungs or cleats shall be 16 inches.
5. The step-across distance from the nearest edge of ladder to the nearest edge of equipment or structure shall be not more than 12 inches, or less than 2 1/2 inches.
6. On fixed ladders, the perpendicular distance from the centerline of the rungs to the nearest permanent object on the climbing side of the ladder shall be 36 inches for a pitch of 76 degrees, and 30 inches for a pitch of 90 degrees with minimum clearances for intermediate pitches varying between these two limits in proportion to the slope.
7. A clear width of at least 15 inches shall be provided each way from the centerline of the ladder in the climbing space, except when cages or wells are necessary.
8. Fixed ladders used to ascend to heights of 20 feet or greater will be equipped with a cage or equivalent protection.
9. Landing platforms will be provided for each 30 feet of ladder except when an approved ladder climbing device is provided. All landing platforms shall be equipped with standard railings and toeboards, so arranged as to give safe access to the ladder.
10. Platforms shall be not less than 24 inches in width and 30 inches in length. Each 30-foot ladder section will be offset from adjacent sections.
11. Platforms when provided for each 30 feet of ladder do not serve as a substitution for cages.
12. The use of an approved ladder climbing safety device as established in TVA Safety Procedure 311, “Ladder Climbing Safety Devices”, provided the ladder is continuous, without offsets and landing platforms, is an adequate substitute for cages and platforms.
13. Fastenings shall be an integral part of fixed ladder design.
14. Rungs, cleats, and steps shall be free of splinters, sharp edges, burrs, or projections which may be a hazard.
15. Side rails which might be used as a climbing aid shall be of such cross sections as to afford adequate gripping surface without sharp edges, splinters, or burrs.

16. All splices and connections shall have smooth transition with original members and with no sharp or extensive projections.
17. When sections of fixed ladders are spliced, they will be supported at the splice in a manner to obtain alignment and equal the original safe working design limit.
18. The ladders and their fastenings will be of sufficient strength to carry the additional load imposed upon them by the installation of a cage.
19. Metal ladders and appurtenances shall be painted or otherwise treated to resist corrosion and rusting when location demands.
20. Ladder safety devices may be used on tower, water tank, and chimney ladders over 20 feet in unbroken length in lieu of cage protection. No landing platform is required in these cases. All ladder safety devices such as those that incorporate body belts, friction brakes, and sliding attachments shall meet the design requirements of the ladders which they serve.

Inspection, Use and Maintenance

1. Fixed ladders must be maintained in a safe condition.
2. Rungs and steps should be kept free of grease, oil, ice, and snow.
3. Fixed ladders that have defects or damage sufficient to be unsafe will be identified at all access points until repaired or replaced with a form TVA 18004, Defective Equipment, tag [1].
4. Ladders should not be used by more than one person at a time.
5. Inspections for rust, corrosion, and deterioration must be made at least annually with more frequent inspections to be made as determined by use and exposure.
6. Some critical deficiencies concerning inspecting and correcting fixed ladders include:
   - Loose or broken anchorages.
   - Damaged rungs or rails.
   - Corrosion damage of components.
   - Projections inside the cage or climbing area.
   - Sharp edges, burrs, and projections on rungs, cleats, steps, and rails.

Special Conditions

1. Ladders formed by individual metal rungs imbedded in concrete, which serve as access to pits and to other areas under floors, are frequently located in an atmosphere that causes corrosion and rusting.
2. To increase rung life in such atmosphere, individual metal rungs shall have a minimum diameter of 1 inch or shall be painted or otherwise treated to resist corrosion and rusting.
3. Adequate measures will be taken to reduce the corrosion rate of rungs embedded in concrete.
4. Wood ladders, when used under conditions where decay may occur, shall be treated with a nonirritating preservative, and the details shall be such as to prevent or minimize the accumulation of water on wood parts.

Reference

29 Code of Federal Regulations 1910.27, “Fixed Ladders”

TVA Safety Procedure 311, “Ladder Climbing Safety Devices”

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=080420376

Procedure 713 Ladders (Portable)

TVA Safety Manual

713 Ladders (Portable)

Procedure Number 713

TVA Safety Procedure

Ladders (Portable)

Revision 3

February 9, 2011

Purpose

This procedure establishes requirements for the purchase, inspection, use, and maintenance of portable ladders. Portable ladders include fiberglass, wood or aluminum step ladders; extension ladders; single ladders; hook ladders and trestle ladders ranging from 3 feet to 30 feet.

Specifications for Portable Ladders

1. All ladders purchased must conform to the applicable OSHA standard as referenced in paragraph Reference.
2. All ladders shall have a minimum duty rating of type IA, industrial, extra heavy duty.
3. All newly purchased ladders should be fiberglass.
4. Metal ladders are not to be used in locations where they may come in contact with electrical conductors. Special work requiring metal ladders in the 500-kV yards must be approved by supervision prior to beginning work.
5. All portable ladders shall be equipped with approved safety feet.
6. Portable ladders are designed as one-man working ladders including any material supported by the ladders. An exception is double front self-supporting ladders which are designed to be used by two workers, one per side.

Basic Rules for Using Ladders

1. Be sure that a stepladder is fully open and its spreaders locked before you climb.
2. Never climb higher than the second step below the top step.
3. Never "walk" a stepladder while standing on it.
4. Never use a stepladder as a single ladder by leaning it against a wall.
5. Don’t reach more than arms length from a ladder.
6. Don’t overload the ladder.
7. Ladders shall be set up on a stable base.
8. Be sure to extend fully and lock platform ladders in place before using them.
9. Check all hardware, nuts, bolts, spreaders, and locks for tightness and good repair.
10. Be sure that your shoes are free of mud or oil so that they won’t slip.
11. Shoes when climbing ladders should have heels to prevent slipping.
12. A simple rule for setting up a straight or extension ladder at the proper angle is to place the base a distance from the vertical wall equal to one-fourth the working length of the ladder.
13. Ladders shall be so placed as to prevent slipping, or shall be tied off or held in position. Ladders shall not be used in a horizontal position as platforms, runways, or scaffolds.

14. The top of the ladder must be placed with the two rails supported, unless equipped with a single support attachment.
15. When ascending or descending, the climber must face the ladder.
16. Ladders shall not be used by more than one person at a time. An exception is double front self supporting ladders which are designed to be used by two workers, one per side.
17. Ladders shall not be placed in front of doors opening toward the ladder unless the door is blocked, locked, or guarded.
18. Ladders shall not be placed on boxes, barrels, or other unstable bases to obtain additional height.
19. Ladders with broken or missing steps, rungs, or cleats, broken side rails, or other faulty equipment shall not be used; improvised repairs shall not be made.
20. Short ladders shall not be spliced together to provide long sections.
21. No ladder should be used to gain access to a roof unless the top of the ladder extends at least 3 feet above the point of support, at eave, gutter, or roofline.
22. Middle and top sections of sectional ladders should not be used for bottom section unless the user equips them with safety shoes.
23. The bracing on the back legs of step ladders is designed solely for increasing stability and not for climbing.

Care and Maintenance of Ladders

1. Ladders must be maintained in good condition at all times.
2. If ladders tip over, inspect ladder for side rails dents or bends, or excessively dented rungs; check all rung-to-side-rail connections; check hardware connections; check rivets for shear.
3. If ladders are exposed to oil and grease, equipment should be cleaned of oil, grease, or slippery materials.
4. Ladders having defects shall be marked and taken out of service until repaired.
5. Metal bearings of locks, wheels, pulleys, etc., shall be frequently lubricated.
6. Frayed or badly worn rope shall be replaced.
7. Safety feet and other auxiliary equipment shall be kept in good condition to insure proper performance.

Inspections of Ladders

1. Ladders must be inspected immediately after purchase to ensure that a label identifying the manufacturer, ANSI standard, and the type IA designation is attached, and that the ladders were not damaged in shipping. Use Appendix A, Ladder Inspection Checklist.
2. Portable ladders shall be inspected frequently by the user and and after the ladder has been dropped or otherwise abused.
3. Ladders with defects such as weakened or broken treads, rungs, cleats or side rails shall be withdrawn from service and TVA 18004 - Danger Defective Equipment (TAG) Form [1] attached to the ladder.
4. Some critical deficiencies concerning inspecting and correcting ladders include:
    - Loose, worn or damaged anchorages.
    - Loose, worn or damaged rungs or rails.
    - Corrosion damage of components.
    - Projections inside the cage or climbing area.
    - Sharp edges, burrs, and projections on rungs, cleats, steps, and rails.

Storage of Portable Ladders

1. Ladders stored in a horizontal position should be supported at a sufficient number of points to prevent sagging and permanent set.
2. Ladders should be stored in a manner that provides ease of access for inspection and that does not present hazards to personnel when withdrawing a ladder for use.
3. Wood ladders, when not in use, should be stored at a location where they will not be exposed to the elements and where there is good ventilation.

Specific Requirements for Portable Metal Ladders

1. The spacing of rungs or steps shall be on 12-inch centers.
2. Rungs and steps shall be corrugated, knurled, dimpled, coated with skid-resistant material, or otherwise treated to minimize the possibility of slipping.
3. The minimum width between side rails of a straight ladder or any section of an extension ladder shall be 12 inches.
4. The length of single ladders or individual sections of ladders shall not exceed 30 feet. Twosection ladders shall not exceed 48 feet in length and over two-section ladders shall not exceed 60 feet in length.
5. Based on the nominal length of the ladder, each section of a multisection ladder shall overlap the adjacent section by at least the number of feet stated in the following:

*Up to and including 36 feet	3 feet overlap
*Over 36 feet up to 48 feet	4 feet overlap
*Over 48 feet up to 60 feet	5 feet overlap

6. Extension ladders shall be equipped with positive stops, which will insure the overlap specified in the table above.
7. Stepladders shall not exceed 20 feet in length.
8. The bottoms of the four rails are to be supplied with insulating non-slip material.
9. A metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in the open position shall be a component of each stepladder. The spreader shall have all sharp points or edges covered or removed to protect the user.
10. Trestle ladders or extension sections or base sections of extension trestle ladders shall be not more than 20 feet in length.

Specific Requirements for Portable Wood Ladders

1. Wood ladders should be coated periodically (annual or sooner is suggested) with a clear preservative material such as linseed oil, clear shellac, or varnish to prevent deterioration. Pigmented paints must not be used as they may conceal defects.
2. Check carefully for cracks, rot, shakes, splinters, broken parts or rungs, loose joints and bolts, and hardware in poor condition.
3. All wood parts shall be free from sharp edges and splinters; sound and free from accepted visual inspection from shake, wane, compression failures, decay, or other irregularities. Low density wood shall not be used.
4. Stepladders longer than 20 feet shall not be used. Type I - Industrial stepladder is the only type approved for use.
5. A uniform step spacing shall be employed which shall be not more than 12 inches. Steps shall be parallel and level when the ladder is in position for use.

6. The minimum width between side rails at the top, inside to inside, shall be not less than 11 1/2 inches. From top to bottom, the side rails shall spread at least 1 inch for each foot of length of stepladder.
7. A metal spreader or locking device of sufficient size and strength to securely hold the front and back sections in open positions shall be a component of each stepladder. The spreader shall have all sharp points covered or removed to protect the user.
8. Single ladders longer than 30 feet shall not be used.
9. Two-section extension ladders longer than 60 feet shall not be used. All ladders of this type shall consist of two sections, one to fit within the side rails of the other, and arranged in such a manner that the upper section can be raised and lowered.

Extension Ladders (Wood/Fiberglass/Metal)

1. Extension ladders must be equipped with a pulley of not less than 1 1/4 inches in diameter and with a 5/16-inch synthetic or manila rope designed for the intended use with a safety factor of 4 or have the minimum breaking strength of 560 pounds. The rope must be of sufficient length for the purpose intended. Frayed or badly worn rope must be replaced on extension ladders or the ladder taken out of service.
2. Extension ladders must be equipped with locks of either the gravity- or spring-type capable of sustaining a load of 1,000 pounds. They must be self-releasing and must operate freely and positively.
3. Two pairs of guide irons must be properly positioned and securely fastened to the upper portion of the lower ladder section.
4. Single ladders must not be combined for use as extension ladders.
5. Extension ladders must not be extended when someone is standing on the ladder.
6. When adjusting the length of an extension ladder, make sure the locking device is fully secured before using the ladder.
7. Be sure when using an extension or straight ladder that it is the proper length to extend to the desired height.
8. To prevent collapse of extension ladders, the minimum overlap of sections is.

Extension Ladder Overlap

Length of Ladder (Feet)	Two-Section Overlap (feet)	Three-Section Overlap (feet)
Through 36	3	6
Over 36 and through 48	4	8
Over 48 through 60	5	10

Training

Each employee should receive Training course “Ladder Safety”, ATIS Number 00059136, in the proper use of portable ladders before using them.

Reference

29 Code of Federal Regulations 1910.25, “Portable Wood Ladders” [2]

29 Code of Federal Regulations 1910.26, “Portable Metal Ladders” [3]

Appendix A - Ladder Inspection Checklist

LADDER INSPECTION CHECKLIST

LADDER INSPECTION ITEM	Yes	No	N/A
Are joints between steps/rungs and side rails tight and not damaged or bent?			
Are all hardware and fittings securely attached?			
Do movable parts operate freely without binding or undue play?			
Are metal spreader or locking devices on each stepladder?			
Are safety feet in good condition? Are safety shoes provided when necessary?			
Are steps/rungs free of grease, oil, ice, etc.?			
Are frayed or worn ropes replaced?			
Are extension ladders equipped with positive stops to ensure specified overlap?			
Are ladders maintained as required based on ladder construction?			
Are defective ladders tagged?			
Are ladders properly placed to ensure safe use, i.e., not placed in front of doorways without proper precautions, not placed on other objects to gain height, placed at proper angle, etc.?			
Do ladders extend at least 3 feet beyond the point of support?			
Are ladders secured against movement?			
Are ladders used only for their intended purpose?			
Are ladders stored properly?			

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=080420376:

[2] http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=9717&p_table=STANDARDS

[3] http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9718

Procedure 714 Machine Guarding

TVA Safety Manual

714 Machine Guarding

Procedure Number 714

TVA Safety Procedure

Machine Guarding

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish requirements for machine guarding.

Types of Guarding

1. One or more methods of machine guarding shall be provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips and sparks.
2. Guarding methods include:
   - barrier guards,
   - two-hand tripping devices,
   - electronic safety devices, etc.

General Requirements for Machine Guards

1. Guards shall be affixed to the machine where possible and secured elsewhere if attachment to the machine is not possible.
2. The guard shall be such that it does not offer an accident hazard in itself.

Point of Operation Guarding

1. Point of operation is the area on a machine where work is actually performed upon the material being processed.
2. The point of operation of machines, whose operation exposes an employee to injury, shall be guarded.
3. The guarding device shall be in conformity with any appropriate standards, or, in the absence of specific standards, shall be designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle.
4. Special handtools for placing and removing material shall be such as to permit easy handling of material without the operator placing a hand in the danger zone. Such tools shall not be in lieu of other guarding, but can only be used to supplement protection provided.
5. The following are some of the machines which usually require point of operation guarding:
   - Guillotine cutters
   - Shears
   - Alligator shears
   - Power presses
   - Milling machines

- Power saws
- Jointers
- Portable power tools
- Forming rolls and calenders

Barrels, Containers, and Drums

Revolving drums, barrels, and containers shall be guarded by an enclosure, which is interlocked with the drive mechanism, so that the barrel, drum, or container cannot revolve unless the guard enclosure is in place.

Exposure of Blades

1. When the periphery of the blades of a fan is less than seven (7) feet above the floor or working level, the blades shall be guarded.
2. The guard shall have openings no larger than one-half (1/2) inch.

Anchoring Fixed Machinery

Machines designed for a fixed location shall be securely anchored to prevent walking or moving.

Guarding Power Operated Tools

1. When power operated tools are designed to accommodate guards, they shall be equipped with such guards when in use.
2. Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating or moving parts of equipment shall be guarded if such parts are exposed to contact by employees or otherwise create a hazard.
3. Guarding shall meet the requirements as set forth in American National Standards Institute, B15.1-1953 (R1958), Safety Code for Mechanical Power-Transmission

Training

Training course “Machine and Equipment Safety” ATIS Number 00059138, provides safety orientation for machine and equipment safety.

Reference

29 Code of Federal Regulations 1910 Subpart O “Machinery and Machine Guarding”

Procedure 715 Mowers

TVA Safety Manual

715 Mowers

Procedure Number 715

TVA Safety Procedure

Mowers

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish requirements for the safe operation of lawnmowers

General Requirements for Power Lawnmowers

1. Power lawnmowers shall meet the design specifications in "American National Standard Safety Specifications for Power Lawnmowers" ANSI B71.1-X1968
2. All power-driven chains, belts, and gears shall be so positioned or otherwise guarded to prevent accidental contact during normal starting, mounting, and operation of the machine.
3. A shutoff device shall be provided to stop operation of the motor or engine. This device shall require manual and intentional reactivation to restart the motor or engine.
4. All positions of the operating controls shall be clearly identified.
5. The words, "Caution. Be sure the operating control(s) is in neutral before starting the engine," or similar wording shall be clearly visible at an engine starting control point on selfpropelled mowers.
6. Warning instructions shall be affixed to the mower near the opening stating that the mower shall not be used without either the catcher assembly or the guard in place.
7. The catcher assembly, when properly and completely installed, shall not create a condition which, violates the limits given for the guarded opening.
8. Openings in the blade enclosure, intended for the discharge of grass, shall be limited to a maximum vertical angle of the opening of 30 degrees. Measurements shall be taken from the lowest blade position.
9. The word "Caution", shall be placed on the mower at or near each discharge opening.
10. Blade(s) shall stop rotating from the manufacturer's specified maximum speed within 15 seconds after declutching, or shutting off power.
11. In a multipiece blade, the means of fastening the cutting members to the body of the blade or disc shall be so designed that they will not become worn to a hazardous condition before the cutting members themselves are worn beyond use.

Before Using the Mower

1. Read or review the operator's manual to familiarize yourself with the machine.
2. Learn the location and use of controls, gauges, and dials for the tractor.
3. Familiarize yourself with speeds, slope capabilities, braking and steering characteristics, and tractor-mower clearances.
4. Check that the power take off, mower input driveline, drive belts, chains, and gears are all properly guarded. Repair or replace if necessary.
5. Check the discharge chute to see that it is present and pointed downward.
6. Fill the fuel tank out of doors with the engine stopped and cool. Do not smoke while filling.
7. If you will be driving on public roads be sure the slow moving vehicle (SMV) emblem is in place. Check that the warning lights are present and operating.
8. Inspect the work area for debris, ditches, potholes, stumps, irrigation valves, etc. Clear removable items and mark the others.

Walk-behind Rotary Mowers

1. The horizontal angle of the opening(s) in the blade enclosure, intended for the discharge of grass, shall not contact the operator area.
2. There shall be one of the following at all openings in the blade enclosure intended for the discharge of grass:
3. A minimum unobstructed horizontal distance of 3 inches from the end of the discharge chute to the blade tip circle.
4. A rigid bar shall be fastened across the discharge opening, secured to prevent removal without the use of tools. The bottom of the bar shall be no higher than the bottom edge of the blade enclosure.
5. The mower handle shall be fastened to the mower so as to prevent loss of control by unintentional uncoupling while in operation.
6. Wheel drive disengaging controls, except deadman controls, shall move opposite to the direction of the vehicle motion in order to disengage the drive. Deadman controls shall automatically interrupt power to a drive when the operator's actuating force is removed, and may operate in any direction to disengage the drive.
7. When operating power walk-behind mowers, the following practices should be observed:
8. Do not tamper with the blade while the mower is running.
9. Remove the spark plug wire before checking, adjusting, or changing blades.
10. Fill the gasoline tank outdoors. Do not fill the gasoline tank while the engine is running or while it is still hot.
11. No smoking is permitted while the gasoline tank on the mower is being filled.
12. Do not stand in front of self-propelled mowers during and after starting.
13. Inspect the equipment for obvious defects before using. If a defect is found, report it to your supervisor or have it repaired before using the mower.
14. Clear the area to be mowed of all rocks and debris before starting to mow. Keep the area clear of people and keep the discharge chute directed toward a safe area.
15. Do not cross graveled areas while the blades are rotating.
16. Start hand-cranked mowers while standing to one side of the mower, and keep feet and hands away from the blade.
17. Walk-behind mowers should be run length wise along an incline instead of up and down.
18. Full cover goggles or safety glasses with side shields and proper ear protective equipment shall be worn while operating mowers.
19. Steel-toed safety boots shall be worn while mowing.
20. All mowers must have an automatic shutdown device.

Riding Mowers / Tractors

1. When operating riding mowers and tractors, the following rules apply:
2. Tractor and riding-type mowers shall not be used to mow horizontally on inclines greater than 3:1 (horizontal to vertical), unless they are specially designed for this purpose.
3. Slow down when making sharp turns. Most tractors will overturn sideways whenever a short turn is made at high speeds.
4. All tractors/mowers that are used on terrain where there is a possibility of rollover shall be equipped with a rollover protective structure and a seat belt.
5. When a tractor/mower is equipped with a seat belt and rollover protective structure, the belt must be used.
6. Shut off the engine before dismounting from a tractor and before making adjustments.
7. Avoid holes and obstacles such as stones, rocks, or stumps.
8. Slow down when vision or visibility is limited, or when operating on rough ground.
9. On highways, abide by the same rules as those for auto drivers.
10. Be sure that the tractor is equipped with a slow-moving vehicle emblem and proper lights before traveling on the highway.
11. Mower operators shall not permit any riders.
12. Disengage power to the sickle bars when they are raised for traveling.
13. Keep fuel in approved containers (safety cans).
14. Safety glasses with side shields shall be worn while operating power mowers.
15. Proper hearing protective equipment shall be worn while operating tractors/mowers.
16. Walk-behind mowers or specially designed slop-mowers shall be used for inclines greater than three to one (3:1).
17. Clear the area to be mowed of all rocks and debris before starting to mow. Keep the area clear of people. If others must be in the area, keep the discharge chute directed away from them.
18. An approved fire extinguisher shall be attached to tractor and riding mower in an accessible place.
19. Opening(s) shall be placed so that grass or debris will not discharge directly toward any part of an operator seated in a normal operator position.
20. There shall be one of the following at all openings in the blade enclosure intended for the discharge of grass:
21. A minimum unobstructed horizontal distance of 6 inches from the end of the discharge chute to the blade tip circle.
22. A rigid bar fastened across the discharge opening, secured to prevent removal without the use of tools. The bottom of the bar shall be no higher than the bottom edge of the blade enclosure.
23. Mowers shall be provided with stops to prevent jackknifing or locking of the steering mechanism.
24. Vehicle stopping means shall be provided.
25. Hand-operated wheel drive disengaging controls shall move opposite to the direction of vehicle motion in order to disengage the drive.
26. Foot-operated wheel drive disengaging controls shall be depressed to disengage the drive.
27. Deadman controls, both hand and foot operated, shall automatically interrupt power to a drive when the operator's actuating force is removed, and may operate in any direction to disengage the drive.

Operating the Tractor Mower

1. Be sure your hands and shoes are clean and dry before mounting the tractor to prevent slipping. Use the steps and handbars.
2. Do not allow any riders.
3. Adjust the seat, fasten the seat belt, set the parking brake, place shift lever in neutral or park, and disengage the pto before cranking the engine.
4. Raise the mower high and use low rpm before engaging power to the unit.
5. Use a ground speed based on length and density of material being cut -- normally between 2-5 mph.
6. Mow very tall grass twice at 90-degree angles if possible.
7. Mow up and down slopes with rear-mount, pull-type, and wing-type mowers.
8. Mow across slopes with side-mount, offset, and sicklebar mowers.
9. Look behind you before backing.
10. When finished or stopping, disengage the pto, place shift in neutral or park, set parking brake, turn engine off, and wait for all movement to stop before dismounting.
11. Remove the key if leaving the tractor for any length of time.
12. Always block the mower if working under it for any reason.

Power Mower Operation

1. Do not tamper with the blade while the mower is running.
2. Disable the mower engine before inspecting, adjusting, or changing attachments.
3. Fill the fuel tank outdoors or in well-ventilated areas.
4. Do not fill the fuel tank while the engine is running or while it is still hot.
5. No smoking is permitted while filling the fuel tank.
6. Use approved and properly labeled safety cans for fuel.
7. Fuel should not be transferred from one vessel to another in the vicinity of energized highvoltage equipment.
8. Gloves should be worn when handling mower blades.
9. When making carburetor adjustments, stand to one side and keep hands and feet in the clear.
10. Keep feet away from the blade when starting the mower.
11. On mowers so equipped, the blade should not be engaged until ready to begin mowing.
12. Always stop the engine when it is necessary to leave the mower.
13. Skid boards or a hydraulic lift tailgate should be used in loading and unloading the mower.
14. The operator should keep the area of mowing operation clear of unnecessary persons.
15. The mower discharge chute should be directed away from persons.
16. Sloping or uneven terrain should be mowed horizontally with walking-type mowers if practical.
17. Riding-type mowers should not be used on steep terrain.
18. Mowers should not be used without proper guarding and operating interlock devices in place.

Procedure 716 On-line Maintenance of High-Pressure Feedwater Heaters (Feedwater Side)

TVA Safety Manual

Procedure 717 Painting

TVA Safety Manual

717 Painting

Procedure Number 717

TVA Safety Procedure

Painting

Revision 1

March 30, 2011

Purpose

The purpose of this procedure is to establish requirements for painting operations.

General

1. Painting or mixing of paint shall be performed only in accordance with the restrictions contained in the MSDS applicable to the paint being used. When applying greater than one quart of high V.O.C. coatings in an enclosed/interior space, painters shall establish a ventilation plan that shall be approved by a Maintenance Manger, Maintenance Support Manager, or Buildings and Grounds Manager.
2. Smoking and flame-producing devices shall be prohibited in an area where any flammable or combustible paint is being applied.
3. Spray-painting equipment shall be properly selected so that hose and gun pressure ratings correspond to air pressure used.
4. Handle a spray gun cautiously. Never point the spray gun at yourself or anyone else or place the tip or nozzle in direct contact with any part of the body.
5. Always tighten threaded connections carefully and securely and handle the hose with care.
6. Where drop cloths are used, ensure that floor openings are not covered, creating a falling or tripping hazard.
7. Do not place drop cloths over heat-generating equipment, i.e., lights or heaters that may automatically operate.
8. Aerosol containers shall not be punctured or disposed of in a fire. Aerosol containers shall be stored out of the sun.
9. Materials such as rags and drop cloths that are saturated with oil-based paint shall be stored in properly labeled, non-combustible containers out of the sun.
10. Before eating, drinking, or smoking, employees who have been painting should wash/clean their hands and face to avoid any toxic effect of paint.
11. Do not go near open flames while wearing clothing contaminated with paint or thinner.
12. High-vapor and high-mist concentrations due to overspray should be reduced by decreasing air pressure in the spray gun.
13. An appropriate fire extinguisher should be available when using flammable paints.
    NOTE: Vapors associated with painting can pose a significant threat to off-gas treatment charcoal trays or any ventilation system with charcoal trays. Check with responsible operations personnel before beginning a job in which this condition could be created.

Personal Protective Equipment

1. The type of respiratory protective devices used in spray-painting operations are the supplied air respirator, the chemical cartridge respirator, and the disposable respirator, all of which must be approved for the specific hazard.
2. Supplied air respirators may be needed when working in confined spaces.
3. Chemical cartridge respirators are used only for exposure to specific chemicals which are indicated on the cartridge and for limited periods in an atmosphere that contains sufficient oxygen. The cartridge must be replaced when the user can smell vapors in the mask, when breathing becomes difficult, or when the respirator has been used for the specified lifetime of the cartridge. Prefilter pads should be changed when breathing becomes difficult.

Storage of Paint

1. Paint shall be stored away from direct sun heating.
2. Paint shall be kept away from heat and open flames.
3. Paint containers, when not in use, should be closed.
4. The maximum quantity of tower or substation paint that may be stored inside a building shall be 125 gallons in metal containers or 660 gallons in a portable tank. Any quantity can be stored in a building used solely for this purpose. Storage of epoxy, resin, or other type paints shall be in accordance with specifications on a MSDS for the specific paint or with standard 29 CFR 1910.106.

This paragraph applies to TPS operations

Tower and Substation Equipment

1. When painting at heights, employees shall use appropriate safety equipment for fall protection as specified in TVA Safety Procedure 305, “Fall Protection Systems”.
2. When painting is performed on transmission line towers or energized lines or substation structures near energized equipment, minimum clearance distances for energized work shall be maintained and proper clearance procedures shall be followed.
3. Care should be used when painting towers or substation structures to avoid danger of flashovers caused by drifting or dripping paint and insulator contamination.
4. When spray-painting, precautions should be taken to prevent direct spray or drift from depositing paint on bushings or other insulators.

This section applies to TPS operations

Procedure 718 Pneumatic Tools

TVA Safety Manual

718 Pneumatic Tools

Procedure Number 718

TVA Safety Procedure

Pneumatic Tools

Revision 1

November 24, 2009

Purpose

The purpose of this procedure is to ensure that pneumatic tools are used and maintained in a safe manner.

Roles and Responsibilities

All managers, supervisors, foremen and employees are responsible for complying with the requirements of this procedure.

Basic Requirements for Pneumatic Tools

1. Maximum operating speed (RPM) shall be clearly marked on tools designed for use with attachments having speed limitations.
2. Proper personal protective equipment (PPE) including protective eye wear, (safety glasses with side shields / goggles / face shields) , hard hats, and gloves shall be worn as necessary whenever pneumatic tools are used . Hearing protection shall be worn with all pneumatic tools, which exceed 85 dBA.
3. All employees who use pneumatic powered tools shall be trained. Supplemental training shall be conducted if inspections, observations, or accident studies indicate that these tools are not being properly used or maintained.
4. Never carry a tool by the hose. Keep hoses away from heat, oil, and sharp edges.
5. Disconnect tools when not in use, before servicing, and when changing accessories such as blades, bits and cutters and grinding wheels. Follow instructions in the user's manual for lubricating and changing accessories. Do not hold a finger on the switch while carrying a tool.
6. Be certain the tool is in good condition and that attachments are securely mounted in place.
7. Do not use tools without the standard guards installed.
8. Check the supply hoses for damaged areas or loose connections.
9. If a tool has a "lock on" button, disengage before starting. Do not start the tool at the work area until ready to begin.

Pneumatic Power Tool Operating Requirements

1. Pneumatic tools are powered by compressed air and include grinders, nailers, staplers, chippers, drills, hammers, sanders, etc.. There are several dangers encountered in the use of pneumatic tools. The main danger is getting hit by one of the tool's attachments or by some kind of fastener used with the tool.
2. Screens should be set up to protect nearby workers from being struck by flying fragments.
3. Do not lay hose over ladders, stairways, scaffolds, or walkways in such a manner as to create a tripping hazard.
4. Compressed air guns should never be pointed toward anyone. Users should never "deadend" it against themselves or anyone else.
5. Always follow correct procedures when disconnecting a tool or hose. Turn the air supply off or use quick disconnect fittings. After the air supply is cut off remember to depress the trigger on the tool to relieve the remaining air pressure.
6. Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming accidentally disconnected. Safety clips or retainers shall be securely installed and maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled. The hose and hose connections shall be designed for the pressure and service to which they are subjected. Hose connections that are of the "Chicago" type coupling shall have safety pins installed so that the coupling will not rotate and disengage.
7. Do not use manual sockets on a pneumatic wrench. Use the correct socket for the job and use retaining pins when applicable.
8. When using pneumatic drills, the drill guide plate is used when a drill hole is being started in granite, concrete, or other hard surfaces.
9. A broken air line under pressure is dangerous. Never try to grab a line that is whipping around. Relieve the air pressure first.
10. Some pneumatic power tools, like nail drivers and staple guns, are as powerful as small caliber firearms. Work with them cautiously and never point them at people or a part of your body.
11. Do not kink hoses to shut off the air supply.
12. Pneumatic tools used on energized electrical equipment or lines, or used where energized electrical parts may be contacted shall have protection against the accumulation of moisture in the air supply.
13. Air hoses for pneumatic tools exceeding ½-inch inside diameter require a safety device to reduce pressure in the event of hose failure. These devices are to be in-line and placed either at the source or as close as feasible to the air source such as at the air hose bib.

Inspection/Testing of Pneumatic Tools

1. Each pneumatic power tool shall be visually inspected by the user prior to use.
2. Defective tools shall be removed from service, tagged and repaired or disposed of as applicable.

Reference

29 Code of Federal Regulations 1910 Subpart P "Hand and Portable Powered Tools and Other Hand-Held Equipment"

29 Code of Federal Regulations 1926 Subpart I "Tools - Hand and Power"

29 Code of Federal Regulations 1910.269(I), "Electric Power Generation, Transmission, and Distribution, Hand and Portable Power Tools"

Procedure 719 Portable Heating Equipment

TVA Safety Manual

719 Portable Heating Equipment

Procedure Number 719

TVA Safety Procedure

Portable Heating Equipment

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish requirements for the safe use of portable heating equipment.

Requirements

1. Oil-fired or kerosene-fired space heaters shall not be transported, refueled, or lighted while hot.
2. Safety stands shall be used with oil-fired or kerosene-fired space heaters designed for safety stand use.
3. Oil-fired or kerosene-fired space heaters shall be used only in properly ventilated areas.
4. Oil-fired or kerosene-fired space heaters shall not be operated where flammable vapors or dust present an explosion hazard.
5. Fuel shall be stored in an approved, properly labeled, container.
6. Oil-fired or kerosene-fired space heaters should be properly maintained and inspected before use.
7. Oil-fired or kerosene-fired space heaters should not be operated close enough to combustible material or clothing to create a fire hazard.
8. Oil-fired or kerosene-fired space heaters should not be placed in high-traffic areas or where there is danger of tipping or upsetting during operation.
9. Oil-fired or kerosene-fired space heaters should not be left unattended while in operation.
10. Oil-fired or kerosene-fired space heaters should be refueled outdoors.

Procedure 720 Powder Actuated Tools

TVA Safety Manual

720 Powder Actuated Tools

Procedure Number 720

TVA Safety Procedure

Powder Actuated Tools

Revision 1

July 15, 2006

Purpose

The purpose of this procedure is to establish requirements for powder actuated tools and to ensure that powder actuated tools are used and maintained in a safe manner.

Types of Powder Actuated Tools

1. Powder actuated tools are identified by type and classes. There are two types, (directacting type and indirect-acting) and three classes of tool, (low, medium and high velocity) tools.
2. Direct-acting types operate by means of an expanding gas of a power load acting directly on the fastener to be driven into the work.
3. Indirect-acting types operate by means of an expanding gas of a power load acting on a captive piston, which in turn drives the fastener into the work.
4. The velocity class of a tool is determined by a ballistic test using the lightest fastener and the strongest power load. A low velocity tool is limited to a velocity of 300 feet per second. A medium velocity tool produces a test velocity between 300 and 500 feet per second. A high velocity tool produces a velocity greater than 500 feet per second.

Basic Requirements for Powder Actuated Tools

1. Powder-actuated tools operate like a loaded gun and should be treated with the same respect and precautions. In fact, they are so dangerous that they must be operated only by specially trained employees.
2. Powder-actuated tools shall not be used in an explosive or flammable atmosphere.
3. Before using powder-actuated tools, the worker should inspect it to determine that it is clean, that all moving parts operate freely, and that the barrel is free from obstructions.
4. Powder-actuated tools should never be pointed at anybody.
5. The tool should not be loaded unless it is to be used immediately. If the work is interrupted after loading , the tool shall be unloaded at once. A loaded tool should not be left unattended, especially where it would be available to unauthorized persons.
6. As a minimum, face shields with side shields, hard hats, and gloves shall be used whenever powder actuated tools are used. Hearing protection shall be used.
7. Only authorized, qualified employees shall operate powder actuated tools.
8. Keep observers at a safe distance from the work area.
9. Remove damaged powder actuated tools from service and tag “Do Not Use”.
10. Do not use tools without the standard guards installed.

Fasteners

1. The fasteners used in powder actuated tools are manufactured steel and heat treated to produce a very hard, yet ductile fastener. These properties are necessary to penetrate concrete or steel without breaking.
2. The fastener is equipped with a tip, washer, eyelet or other guide member to align the fastener in the tool as it is being driven and is used to retain the fastener in the tool.

Power Loads

1. The power load is a unique, portable, self-contained energy source. Power loads are available cased or caseless. The propellant in a cased power load is contained in a metal case.
2. Cased power loads are available in various sizes ranging from .22 caliber through .38 caliber.
3. The caseless power load does not have a case and the propellant is in a solid form.
4. Regardless of the type, caliber, size or shape, there is a standard number and color code used to identify the power level and strength of all power loads.
5. Cased power loads used in all types and classes of tools cover a range of 12 power loads levels, Numbers 1 through 12, with the lightest being Number 1 and the heaviest being the number 12 load.
6. A basic six-color code of gray, brown, green, yellow, red, and purple is used twice because there are not 12 different readily distinguishable colors.
7. Power loads Numbers 1 through 6 are in brass colored cases, and power loads Numbers 7 through 12 are in nickel-colored cases.
8. It is the combination of the case color and load color that defines the load level or strength. Each cased power load is clearly identified on one end by its powder level color.
9. Caseless loads are manufactured only in the Number 1 through 6 load levels.
10. In addition to the identification of the power load, each package is color coded and shows the load level.
11. In selecting the proper power load to use for any application, it is important to start with the lightest power level recommended for the tool being used. Using the lightest load, if the first test fastener does not penetrate to the desired depth, the next higher power load should be tried. If necessary, continue increasing power levels by single steps until proper penetration is obtained.

Limitations of Use

1. Fasteners shall not be driven into an existing hole unless a guide supplied by the manufacture is used to assure proper alignment.
2. Fasteners shall not be fired into very hard or brittle materials, some of which include cast iron, glazed tile, surface hardened steel, glass block, live rock, face brick, and hollow tile.
3. Fasteners shall not be driven into soft or thin materials which could be completely penetrated by the fastener unless there is a backing, which would prevent penetration through the other side.
4. Fasteners shall not be driven closer than ½ inch from the edge of steel or 3 inches from the edge of masonry materials, except for specific applications specified by the manufacturer.
5. Fasteners shall not be driven into concrete unless material thickness is at least 3 times the fastener shank penetration.

Inspection/Testing of Powder Actuated Tools

1. Each powder actuated tool shall be visually inspected by the user prior to use.
2. The tool shall be tested each day before loading to verify that safety devices are in proper working condition. The method of testing shall be in accordance with the instructions furnished with the tool.

Storage and Handling

1. Powder actuated tools and power loads shall be kept in a dry metal container and secured by lock and key. The container shall be painted red with white letters, and only authorized personnel shall be permitted access to it. The container shall have a label on the outside reading, "Powder Actuated Tool" and a label instructing "For Use by Authorized Personnel Only". A label on the inside of the container shall read, "Keep Locked When Not in Use".
2. Stored in the tool container shall be an operator's Instruction Manual, a power load chart, repair tools, cleaning tools, and a Tool Inspection Record.
3. Power loads of different power levels shall be stored separately.

Training

1. All operators of powder actuated tools shall receive training on the use of the tool provided by the manufacturer or by a qualified instructor using training materials provided by the manufacturer of the tool.
2. Authorized operators of powder actuated tools shall have in his / her possession a certification card as proof of training and qualifications.
3. TVA organization coordinating training shall ensure that successful completion of training is recorded in ATIS, "Powder Actuated Tools", ATIS Number 00059141. TVA Safety Procedure 442, Powder Actuated Tools Course Standard", establishes training requirements.
4. Supplemental training shall be conducted if inspections, observations, or accident investigations indicate that these tools are not being properly used or maintained.
5. TVA Safety Procedure 442, "Powder Actuated Tools Course Standard", establishes specific training requirements.

Definitions

Powder Actuated Tool is a tool that uses an explosive cartridge to drive fasteners into various materials; also known as a stud gun.

Reference

29 Code of Federal Regulations 1910 Subpart P "Hand and Portable Powered Tools and Other Hand-Held Equipment"

29 Code of Federal Regulations 1926 Subpart I "Tools - Hand and Power"

29 Code of Federal Regulations 1910.269(I), "Electric Power Generation, Transmission, and Distribution, Hand and Portable Power Tools"

Appendix A - Powder Actuated Tool Inspection Matrix

POWDER ACTUATED TOOL

INSPECTION MATRIX

ELEMENTS TO BE INSPECTED AND THE FREQUENCY

	Date	**General Condition**	**Mechanical Tolerance**					
*Powder Actuated *Stun Gun			***					

Frequency: *** = Annual

Procedure 721A Rigging (Non-Nuclear)

Procedure 721B Rigging (Nuclear Power Group)

Procedure 721C TVA Rigging Manual

TVA Safety Manual

Procedure 721D Rigging Equipment Standard Procurement Specifications

TVA Safety Manual

Procedure 722 Ship's Ladders

TVA Safety Manual

722 Ship's Ladders

Procedure Number 722

TVA Safety Procedure

Ship's Ladders

Revision 1

April 18, 2008

Purpose

1. The purpose of this procedure is to establish requirements and provide guidance for the design, construction, inspection and use of ship's ladders in buildings and structures.
2. Alternating tread ladders while similar in some ways, (i.e. angle of the ladder), are not covered by this procedure. Installation of an alternating tread ladder must include a review and approval by TVA Safety prior to purchase and installation.

What is a Ship's Ladder?

1. A ship's ladder is a permanently installed steep pitched stair-like structure with an angle between 50 degrees and 70 degrees with the horizontal, having rigid treads supported by rigid side rails, with handrails on each side. It does not include a ladder configuration made of treads or rungs supported by "side rails" made of fiber or wire rope.

Where are Ship's Ladders Appropriate?

1. Existing ship's ladders will be evaluated against the criteria in section 4 of this procedure. Existing ship's ladders are not required to be changed unless the evaluation reveals the following: If falls over handrails would result in a fall distance greater than 12 feet, onto moving equipment or other exposed hazardous condition (e.g., conveyors), other engineered fall prevention controls shall be installed; or if existing ship's ladders are used more than once per day, additional engineered fall prevention controls will be installed. These engineered controls may include additional railings above the handrail or ladder type cages or wells. These installations will prevent a worker from falling over handrails.
   Note: Handrails with a minimum height of 36 inches above the tread nosing is an adequate engineered control for daily use ship's ladders.
2. When major structural modifications are made to existing ship's ladders they shall be replaced with standard industrial stairs unless space / configuration of the area will not permit.
3. For new installations a ship's ladder shall only be considered for construction where a conventional stairway cannot be installed due to limited space / configuration of the area and limited to locations where only occasional use (typical frequency of less than daily) is required, such as for servicing machinery or equipment, access to tanks and similar structures or at conveyor belt crossovers. If a new ship's ladder installation is necessary and will result in hazards specified in item #1 above, then the same additional fall prevention controls are required.
4. The present OSHA 29 CFR 1910, Subpart D - Walking-Working Surfaces standard does not address ship's ladders. A 1990 Proposed Rule for Subpart D, Walking and Working Surfaces, addresses the issue at proposed

§1910.25, Stairs, paragraph (e)(1), which states, "Ship's stairs shall be installed at a slope between 50 degrees and 70 degrees from the horizontal." Where an employer is in compliance with the provisions of a proposed standard, OSHA's general policy is to treat the violation of an existing requirement as a de minimis violation. Therefore, in areas where conventional industrial stairs cannot be installed due to limited space/configuration of area and do not adversely affect the safety of employees, their use may be considered a de minimis violation. A de minimis violation carries no penalty and does not require abatement.

Design and Construction Requirements of Ship's Ladders

1. In the absence of an OSHA standard, TVA has established the following requirements for the design and construction of ship's ladders.
2. Design drawings and specifications shall show all information necessary for the fabrication and installation of the ship's ladder, including details on how it is to be secured in place.
3. Whenever ship's ladders must be constructed outside the construction specifications listed below and / or any applicable regulations at the time of the design, then a qualified engineer must design the ship's ladder and the ship's ladder must be constructed according to the design specifications. A copy of the design shall be maintained by the facility / organization. Any deviations to the construction specifications will be listed as well as the reason behind the deviations.
4. The completed installation shall be certified by a qualified engineer as being fabricated and installed in accordance with good engineering practices.
5. The minimum design of the tread for any ship's ladder shall be for a concentrated live load of 250 pounds with a safety factor of four.
6. Ship's ladders have a uniform combination of rise and run that will result in a ladder at an angle to the horizontal of between 50 degrees to 70 degrees. The preferred angle is in the range of 60 degrees to 68 degrees.
7. Stair treads shall be not less than 5 inches in width and be spaced not more then 12 inches apart.
8. Stair width shall be a minimum width of 22 inches.
9. Ship's ladders shall have flat horizontal treads (as opposed to round rungs).
10. The optimum height between treads is 8½ to 9 inches. Treads shall be open and provided with non-skid surfacing. No risers will be installed. The depth of the tread depends upon the angle of the ladder. As a rule, the rear of each tread should overlap the front of the tread immediately above. Although portions of the shoe may extend beyond this point, this design will be in contact with the weight-bearing portion of the shoe sole.
11. Rise height and tread width shall be uniform throughout.
12. A standard handrail designed to provide an adequate hand hold to avoid falling must be provided on both sides of a ship's ladder. The height of the handrail is approximately 36 inches above the tread nosing. Handrails will be capable of supporting a force of at least 200 pounds applied at any point along the top edge of the handrail. The handrail clearance from an adjacent wall or other surface will be a minimum of 3 inches.
13. New construction of ship's ladders shall have a landing platform provided for each 12 feet of vertical height.
14. If materials must be transported between levels served by a ships ladder, material handling devices (lanyards, cranes, etc.) must be installed.
15. Vertical clearance above any stair tread to an overhead obstruction shall be at least seven feet.
16. Ship's ladders will be painted or otherwise treated to resist corrosion and rusting where location demands.

Signs

1. Signs will be placed at entrances to ship's ladders containing the following instructions for use:
   - Face the ship's ladder when ascending or descending.
   - Keep both hands on the handrails.
   - Do not carry tools or equipment in your hands
   - Only one person on ship's ladder at a time

Sample Sign

Requirements for Use of Ship's Ladders

1. Always face the ladder and maintain "three points of contact" when using the ladder by keeping both hands on the handrail.
2. If work is required to be performed from a ship's ladder and work location is above 4 feet, then the fall protection requirements from TVA Safety Procedure 305 "Fall Protection" will be followed.
3. Never carry tools, equipment, or materials in your hands while ascending or descending a ship's ladder, instead use a tool belt, pouch, holster, or other lifting device (e.g. lanyards located at ladders to facilitate material handling).
4. Never allow more than one person on a ship's ladder at a time.
5. Always observe a ship's ladder for obstructions prior to ascending or descending.
6. Never place objects in the travel path on ship's ladders.
7. Always wear footwear that meets TVA Safety Procedure 307, "Foot Protection". Employees should ensure that their footwear does not have mud, oil, etc. on the soles that could contribute to a foot slipping while ascending or descending a ship's ladder.

Requirements for Inspection Ship's Ladders

1. Ship's ladders will be inspected annually by the organization that is responsible for the facility where the ships ladder is installed and deficiencies corrected. A record of the inspection, findings, and corrective action taken will be made and maintained for a period of three years. Critical deficiencies shall be corrected immediately.
2. The inspection shall include, but not be limited to:
   - Excessive rust, corrosion, deterioration
   - Loose or broken anchorage
   - Damaged steps or railings that no longer support requirements of design
   - Worn nose, treads
   - Contaminants on ladder or approach
   - Adequacy of signage

- Functional fall protection devices
- Any change to the frequency of use that may demand additional requirements
- Any change to the material handling that may demand additional requirements
- Functional material and tool handling devices
- Any change to the fall potential

Chapter 2 Section 8 Special Work Requirements

Procedure 801 Confined Space Entry

TVA Safety Manual

801 Confined Space Entry

Procedure Number 801

TVA Safety Procedure

Confined Space Entry

Revision 5

February 2, 2009

Purpose

This procedure establishes requirements for designation, evaluation, and the establishment of safe work practices in confined spaces.

Confined Space

1. A confined space is a space that is large enough and so configured that an employee can bodily enter and perform assigned work; and has limited or restricted means for entry or exit; and is not designed for continuous employee occupancy.
2. Confined spaces shall be classified prior to entry as permit required or non-permit required by use of an approved confined space entry permit as illustrated by Appendix A of this procedure. The confined space entry permit form shall be modified by the entry supervisor as required to provide for documented consideration of each hazard that may be associated with a particular space.
3. Permit-required Confined Space (permit space) is a confined space that has one or more of the following unmitigated characteristics: contains or has a potential to contain a hazardous atmosphere; contains a material that has the potential for engulfing an entrant; has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or contains any other recognized serious safety or health hazard.
4. Non-permit confined space is a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

Hazards of Confined Spaces

1. Hazards commonly associated with confined or enclosed space entry include asphyxiating gases or vapors; toxic gases, vapors, fumes, or dusts; flammable vapors and gases; temperature extremes; pressure changes; oxygen deficiency or enrichment; noise, mechanical and electrical hazards; and flooding of spaces with solids or liquids.
2. Gases or vapors can cause an oxygen-deficient atmosphere by the displacement of oxygen or loss of oxygen through chemical reaction or human breathing.
3. Toxic gases, vapors, fumes, dusts, mists, or flammable/combustible gases frequently exist in hazardous concentrations within confined spaces where chemicals or flammable substances have been used or stored.
4. Hazardous concentrations within a confined space may also result from activities such as descaling, washing, welding, cutting, painting, or by feed back from other associated systems through conduits, pipe and pipe sleeves, or through faulty valves.
5. Injury within confined spaces is most likely to occur from the following:
   - Direct contact with corrosive or sensitizing chemicals such as acids, caustics, or oxidizing agents.
   - Inadvertently opening piping systems containing steam, acids, gases, or other materials that have not been isolated or disconnected.
   - Fire or explosion resulting from the presence of flammables and an ignition source. Enriched oxygen levels increase this hazard immensely.
   - Oxygen deficiency from the release of gases or the presence of oxygen consuming substances combined with a lack of proper ventilation or as a result of purging.
   - Inadvertently activated mechanical equipment.
   - Electrical shock from portable lights, tools, or other electrical equipment.
   - Physical hazards (such as slipping on wet, oily, or dirty work surfaces or tripping over hoses, pipes, tools, or equipment).
   - Falls through or from tank tops, scaffolds, stairs, or ladders.
   - Objects (tools, materials) dropped from overhead.
   - Contact with toxic substances from inhalation or direct contact.
   - Heat stress.

General Requirements for Confined Spaces

1. Confined spaces shall be evaluated to determine if the hazards associated with entry and work within the space require the implementation of the permit requirements specified by this procedure. All spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate the space can be reclassified as a non-permit confined space. See Paragraph "Reclassification of Confined Spaces (Permit-Required and Non-Permit Required)" for requirements to reclassify a permit-required confined space to a non-permit confined space. All confined spaces, permit-required and non-permit required, shall be monitored prior to entry. Assessment of confined space hazards and monitoring performed shall be documented on the form TVA 17237 - Confined Space Entry Permit [1], Appendix A. See How To, TVA Safety Procedure 2017, “Conduct Assessment of Confined Spaces” for guidelines for assessment of confined space hazards.
2. Hazard control measures start with the identification of existing or potential hazards associated with entry or within the permit space. Measures are then applied to eliminate or control the identified hazards.
3. Entry into permit required confined spaces shall be carefully planned prior to entry to establish adequate methods for system isolation, support equipment requirements, ventilation, entry and work techniques, emergency and rescue procedures, and availability of required personal protective equipment.
4. The scope of the work to be performed, as well as the protective measures that must be implemented to provide a safe work environment, are identified and documented on the Confined Space Entry Permit, Appendix A, by the responsible supervisor.

5. All permit required confined spaces shall be identified and exposed employees shall be informed by posting danger signs or by publishing a log of confined spaces showing the existence and location of and the danger posed by the permit spaces. Note: A sign reading "DANGER-PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" or other similar language shall be used. If it is determined that these are non-permit confined space(s), plant/site management shall maintain signed documentation concerning the rationale for this decision, and review whenever conditions change.
6. The log of confined spaces shall be updated once a year. The revised list shall be the basis for an annual review of the signs at each confined space.
7. The following requirements apply to entry into permit confined spaces:
   - Any conditions making it unsafe to remove an entrance cover shall be eliminated before the cover is removed;
   - When entrance covers on confined spaces are removed, the opening shall be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space;
   - Before an employee enters the space, the internal atmosphere shall be tested, with a calibrated direct-reading instrument, for the following conditions in the order given:

     Oxygen content,

     Flammable gases and vapors,

     and Potential toxic air contaminants
8. The use of continuous forced air ventilation to maintain safe conditions in a confined space shall comply with the following:
   - An employee may not enter the space until the forced air ventilation has eliminated any hazardous atmosphere;
   - The forced air ventilation shall be so directed as to ventilate the immediate areas where an employee is or will be present within the space and shall continue until all employees have left the space;
   - The air supply for the forced air ventilation shall be from a clean source and shall not increase the hazards in the space.
9. The atmosphere within the space shall be periodically tested as necessary to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere.
10. If a hazardous atmosphere is detected during entry:
    - Each employee shall leave the space immediately; the space shall be evaluated to determine how the hazardous atmosphere developed; and
    - Measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place. Measures taken must be documented on TVA 17237 - Confined Space Entry Permit [1]
11. When arrangements are made to have employees of another employer (contractor) perform work that involves permit confined space entry:
    - Inform the contractor that the workplace contains permit spaces and that permit space entry is allowed only through compliance with a permit space program meeting the requirements 29 CFR 1910.146, “Confined Space Entry”.
    - Apprise the contractor of the hazards identified and the plant experience with the space, that make the space in question a permit space;
    - Apprise the contractor of any precautions or procedures that the plant has implemented for the protection of employees in or near permit spaces where contractor personnel will be working;
    - Coordinate entry operations with the contractor, when both plant personnel and contractor personnel will be working in or near permit spaces; and debrief the contractor at the conclusion of the entry operations regarding the permit space program followed and regarding any hazards confronted or created in permit spaces during entry operations.

12. In addition to complying with the permit space requirements that apply to all employers, each contractor who is retained to perform permit space entry operations shall:
    - Obtain any available information regarding permit space hazards and entry operations from the plant;
    - coordinate entry operations with the plant, when both plant personnel and contractor personnel will be working in or near permit spaces;
    - Inform the plant of the permit space program that the contractor will follow and of any hazards confronted or created in permit spaces, either through a debriefing or during the entry operation.

Specific Requirements of Working in Confined Spaces

1. Mobile tank vehicles and tank cars shall be grounded prior to personnel entry if the vehicle or car has contained flammables or combustibles.
2. Toxic materials or coatings on surfaces to be heated shall be removed prior to applying heat. If removal of toxic material or coatings is infeasible, appropriate respiratory protection shall be used.
3. No one shall change the configuration of any control, equipment, device, etc., which is identified by a hold order or other clearance tag except as authorized by the holder of the clearance.
4. Piping (steam, water, inert gases, chemicals, etc.) to the confined space shall be physically disconnected or blanked off to prevent the entrance of harmful materials into the space or other equivalent means of protection is employed. Clearance procedures shall be utilized to ensure that this is accomplished.
5. Drains or overflow lines shall be disconnected or isolated from a sewer, header, or any other system from which harmful materials could be transmitted back into the confined space.
6. Mainline disconnects to operational controls for any apparatus, such as mixers or conveyors, and exposed energized electrical circuits and equipment that could endanger personnel in the confined space shall be controlled in accordance with the clearance procedure.
7. Warning signs or devices shall be posted as needed near the entrance to confined spaces where work is being performed to keep unauthorized personnel out and to ensure that potentially hazardous independent operations are not started nearby. Additional signs and/or barricades shall be used to prevent persons from inadvertently entering confined areas which could contain hazardous conditions.
8. Lighting shall be provided to enable entrants to see well enough to work and enter/exit quickly and safety. Should the permit space be an enclosed vessel or in wet areas, the lighting shall be of the low-voltage type (12 volts) or be connected through a ground fault circuit interrupter (GFCI). If the permit space contains or has the potential to contain combustible/flammable gases, vapors, or dusts, then Class I or Class II approved lighting fixtures/circuits must be used. The plant / facility manager or their designee, e.g. TVA Safety Consultant, must make the determination whether the confined space has the potential to contain combustible/flammable gases, vapors or dusts and approve the use of Class I or Class II approved lighting fixtures or circuits?
9. Catalytic heaters or other fuel-burning heating equipment shall not be used in confined spaces.
10. Internal combustion engines shall not be taken into confined spaces. If it is absolutely necessary to do so, the off-gases produced by the engine(s) must be vented to a safe point outside the confined space and the atmosphere constantly monitored for oxygen level and flammable gases.

Measurements, Evaluations and Controls in Confined Spaces

1. Appropriate control measures, such as but not limited to, Self Contained Breathing Apparatus (SCBA) or air-line respirators, elimination of source of ignition, ventilation, and administrative controls shall be taken when the evaluation indicates that the atmosphere in the confined space to be entered contains any of the following:
   - A concentration of oxygen less than 19.5 percent or greater than 23.5 percent.
   - Measurable concentration of flammable vapor or gas in excess of 10 percent of the Lower Explosive Limit (LEL).
   - A concentration of toxic contaminants greater than 50 percent of the threshold limit values,
   - Hazardous physical agents, i.e., heat, noise,
   - Concentrations of combustible dust.
2. Continuous and/or frequent testing or monitoring of the confined space atmosphere shall be carried out no longer than 30 minutes prior to entry.
3. Test results shall be noted on the Confined Space Entry Permit. The determination of whether the monitoring is continuous or frequent is made by the qualified person and specified on the permit.
4. If oxygen deficiency is a potential hazard, the space shall be constantly monitored for oxygen deficiency unless a positive pressure breathing apparatus (SCBA) is utilized.

Procedures for Atmospheric Testing

1. Atmospheric testing is required for two distinct purposes: evaluation of the hazards of the permit space and verification that acceptable entry conditions for entry into that space exist.
2. The atmosphere of a confined space shall be analyzed using equipment of sufficient sensitivity and specificity to identify and evaluate any hazardous atmospheres that may exist or arise, so that appropriate permit entry procedures can be developed and acceptable entry conditions stipulated for that space. Ensure that the monitoring equipment used has sufficient capability to evaluate the atmosphere.
3. Results of testing (i.e., actual concentration, etc.) shall be recorded on the permit.
4. When monitoring for entries involving a descent into atmospheres that may be stratified, the atmospheric envelope should be tested a distance of approximately 4 feet (1.22 m) in the direction of travel and to each side. If a sampling probe is used, the entrant's rate of progress should be slowed to accommodate the sampling speed and detector response.
5. A test for oxygen is performed first because most combustible gas meters are oxygen dependent and will not provide reliable readings in an oxygen deficient atmosphere. Combustible gases are tested for next because the threat of fire or explosion is both more immediate and more life threatening, in most cases, than exposure to toxic gases and vapors. If tests for toxic gases and vapors are necessary, they are performed last.
6. Training is required for users on the operation of the air monitoring equipment before it an be used.

Permit-required Confined Space

1. Implement measures necessary to prevent unauthorized entry.
2. Identify and evaluate the hazards of permit spaces before employees enter them.
3. Develop and implement the means, procedures, and practices necessary for safe permit space entry operations, including, but not limited to, the following:
   - Specifying acceptable entry conditions;
   - Isolating the permit space;
   - Purging, inerting, flushing, or ventilating the permit space as necessary to eliminate or control atmospheric hazards;
   - Providing pedestrian, vehicle, or other barriers as necessary to protect entrants from

   external hazards; and

- Verifying that conditions in the permit space are acceptable for entry throughout the duration of an authorized entry.

4. Provide equipment at no cost to employees, maintain that equipment properly, and ensure that employees use the equipment properly: this includes testing and monitoring equipment; ventilating equipment needed to obtain acceptable entry conditions; communications equipment; personal protective equipment; lighting equipment needed to enable employees to see well enough to work safely and to exit the space quickly in an emergency; barriers and shields; equipment, such as ladders, needed for safe ingress and egress by authorized entrants; rescue and emergency equipment; and any other equipment necessary for safe entry into and rescue from permit spaces.
5. Provide at least one attendant outside the permit confined space into which entry is authorized for the duration of entry operations; (attendants may be assigned to monitor more than one permit space provided the duties can be effectively performed for each permit space that is monitored). Likewise, attendants may be stationed at any location outside the permit space to be monitored as long as the duties can be effectively performed for each permit space that is monitored.
6. The entrants and attendant(s) must be briefed by the entry supervisor prior to allowing entry. The briefing must describe the identified hazards, tests conducted, results of the tests, and all actions taken to address the identified hazards. The briefing must allow employees to review the permit.
7. If multiple spaces are to be monitored by a single attendant, include in the permit the means and procedures to enable the attendant to respond to an emergency affecting one or more of the permit spaces being monitored without distraction from the attendant's responsibilities.
8. Designate the persons who are to have active roles (for example, authorized entrants, attendants, entry supervisors, or persons who test or monitor the atmosphere in a permit space) in entry operations, identify the duties of each such employee, and provide each such employee with the training required.
9. Develop and implement procedures for summoning rescue and emergency services, for rescuing entrants from permit spaces, for providing necessary emergency services to rescued employees, and for preventing unauthorized personnel from attempting a rescue;
10. Develop and implement a system for the preparation, issuance, use, and cancellation of entry permits.
11. Develop and implement procedures to coordinate entry operations when employees of more than one employer are working simultaneously as authorized entrants in a permit space, so that employees of one employer do not endanger the employees of any other employer.
12. Review entry operations when there are reasons to believe that the measures taken under the permit space program may not protect employees and revise the program to correct deficiencies found to exist before subsequent entries are authorized.
13. Review the permit space program using the canceled permits retained within 1 year after entry, revise the program as necessary to ensure that employees participating in entry operations are protected from permit space hazards. Note: organizations may perform a single annual review covering all entries performed during a 12-month period. If no entry is performed during a 12-month period, no review is necessary.

Confined Space Entry Permit

1. Before entry is authorized, a confined space entry permit, (TVA 17237 - Confined Space Entry Permit [1]) (Appendix A), which may be modified to address specific hazards, shall be used to guide consideration of potential hazards and as the authorizing document for entry.
2. Before entry begins, the entry supervisor identified on the permit shall sign the entry permit to authorize entry.
3. Entrants shall be logged in and out of a permit required confined space. This is normally the duty of the attendant.
4. The completed permit shall be made available at the time of entry to all authorized entrants, by posting it at the entry portal or by any other equally effective means, so the entrants can confirm that pre-entry preparations have been completed.

5. The entry supervisor shall terminate entry and cancel the entry permit when: The entry operations covered by the entry permit have been completed; or a condition that is not allowed under the entry permit arises in or near the permit space.
6. Canceled entry permit forms shall be retained for at least 1 year to facilitate the review of the confined space program.
7. Any problems encountered during an entry operation shall be noted on the permit so that appropriate revisions to the permit space program can be made.
8. The entry permit that documents compliance with this procedure and authorizes entry to a permit space shall identify:
    - The permit space to be entered;
    - The purpose of the entry;
    - The date and the authorized duration of the entry permit, (the duration of the permit may not exceed the time required to complete the assigned task or job identified on the permit, up to a maximum of 16 hours);
    - The authorized entrants within the permit space, by name or by such other means (for example, through the use of rosters or tracking systems) as will enable the attendant to determine quickly and accurately, for the duration of the permit, which authorized entrants are inside the permit space;
    - The personnel, by name, currently serving as attendants;
    - The individual, by name, currently serving as entry supervisor, with a space for the signature or initials of the entry supervisor who originally authorized entry;
    - The hazards of the permit space to be entered;
    - The measures used to isolate the permit space and to eliminate or control permit space hazards before entry; Note: Those measures can include the lockout or tagging of equipment and procedures for purging, inerting, ventilating, and flushing permit spaces.
    - The acceptable entry conditions;
    - The results of initial and periodic tests, accompanied by the names or initials of the testers and by an indication of when the tests were performed;
    - The rescue and emergency services that can be summoned and the means (such as the equipment to use and the numbers to call) for summoning those services;
    - The communication procedures used by authorized entrants and attendants to maintain contact during the entry;
    - Equipment, such as personal protective equipment, testing equipment, communications equipment, alarm systems, and rescue equipment, to be provided for compliance with this section;
    - Any additional permits, such as for scaffolding or hot work, that have been issued to authorize work in the permit space.

Duties of Authorized Entrants

1. Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure.
2. Communicate with the attendant to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space.
3. Alert the attendant whenever: The entrant recognizes any warning sign or symptom of exposure to a dangerous situation, or the entrant detects a prohibited condition.
4. Exit from the permit space as quickly as possible whenever: An order to evacuate is given by the attendant or the entry supervisor; the entrant recognizes any warning sign or symptom of exposure to a dangerous situation; the entrant detects a prohibited condition; or an evacuation alarm is activated.

Duties of Attendants

1. Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure.
2. Be aware of possible behavioral effects of hazard exposure in authorized entrants.
3. Continuously maintain an accurate record and count of authorized entrants in the permit space and ensures that the means used to identify authorized entrants identifies who is in the permit space.
4. Remain outside the permit space during entry operations until relieved by another attendant;(attendants may enter a permit space to attempt a rescue if they have been trained and equipped for rescue operations and have been properly relieved.
5. Communicate with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space.
6. Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space and order the authorized entrants to evacuate the permit space immediately under any of the following conditions; if the attendant detects a prohibited condition; if the attendant detects the behavioral effects of hazard exposure in an authorized entrant; if the attendant detects a situation outside the space that could endanger the authorized entrants; or if the attendant cannot effectively and safely perform all the duties required.
7. Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards.
8. Take the following actions when unauthorized persons approach or enter a permit space while entry is underway: Warn the unauthorized persons that they must stay away from the permit space; advise the unauthorized persons that they must exit immediately if they have entered the permit space; and inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space.
9. Perform no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

Duties of Entry Supervisors

1. Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure.
2. Verify, by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin.
3. Terminate the entry and cancel the permit.
4. Verify that rescue services are available and that the means for summoning them are operable.
5. Remove unauthorized individuals who enter or who attempt to enter the permit space during entry operations.
6. Determine, whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

Rescue and Emergency Services

1. Each plant/site shall train a sufficient number of rescue personnel that will ensure the availability for rescue from confined spaces during each shift.
2. Based on the hazards identified in the confined space inventory, each plant/site shall purchase equipment necessary to rescue personnel from each confined space.
3. Plants and facilities shall ensure that each member of the rescue team is provided with, and is trained to use properly, the personal protective equipment and rescue equipment necessary for making rescues from permit spaces.
4. Each member of the rescue team shall be trained to perform the assigned rescue duties. Each member of the rescue team shall also receive the training required of authorized entrants.
5. Each member of the rescue team shall practice making permit space rescues at least once every 12 months, by means of simulated rescue operations.
6. Each member of the rescue team shall be currently trained in basic first-aid and in cardiopulmonary resuscitation (CPR).
7. Whenever a plant arranges to have persons other than the plant employees perform permit space rescue, they shall inform the rescue service of the hazards they may confront when called on to perform rescue, and provide the rescue service with access to all permit spaces from which rescue may be necessary so that the rescue service can develop appropriate rescue plans and practice rescue operations.
8. To facilitate non-entry rescue, retrieval systems or methods shall be used whenever an authorized entrant enters a permit space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. Retrieval systems shall meet the following requirements.
    - Each authorized entrant shall use a chest or full body harness, with a retrieval line attached at the center of the entrant's back near shoulder level, or above the entrant's head. Wristlets may be used in lieu of the chest or full body harness.
    - The other end of the retrieval line shall be attached to a mechanical device or fixed point outside the permit space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary. A mechanical device shall be available to retrieve personnel from vertical type permit spaces more than 5 feet deep.
    - A full body harness shall be used with a retrieval line attached at the center of the entrant's back near shoulder level or above the entrants head. (Wristlets may be used instead if the chest harness is infeasible or creates a greater hazard.)
9. If an injured entrant is exposed to a substance for which a Material Safety Data Sheet (MSDS) or other similar written information is required to be kept at the worksite, that MSDS or written information shall be made available to the medical facility treating the exposed entrant.
10. The entry supervisor shall notify the rescue personnel at the time the permit is issued and work begins so that they will know the location and be prepared to respond. Their telephone numbers will be noted on the permit for use by the attendant should the need arise. SCBAs may be necessary for entry rescue. The rescue services shall, on notification of permit space work, check the functioning of the SCBAs and if necessary position the SCBAs near the permit space entry.
11. Permit-required confined spaces may be entered under emergency conditions without a permit or atmospheric monitoring. In emergency situations where an employee must enter a confined space before its environment has been tested and verified, safe equipment approved for the potential hazards of the confined space is used.
12. Caution: If the level of the contaminant or oxygen level is unknown or a deficiency exists, respiratory protection is limited to positive pressure self-contained breathing apparatus (SCBA).
13. The entry supervisor shall establish a system of communication between the authorized entrants and the attendant as well as a way to notify rescue services.

Personal Protective Equipment (PPE)

1. Respiratory protection - SCBAs will be required for entry of permit spaces with oxygen deficiencies and where forced air ventilation cannot alleviate the hazard. SCBAs may also be required for those toxic environments that cannot be eliminated or controlled or where air purifying respirators are ineffective.
2. Air purifying respirators may be required for work in permit spaces containing airborne dusts, vapors, and mists, but only in areas with 19.5% - 23.5% oxygen. Respirators may also be required for the actual work within the permit space, i.e., welding/cutting/grinding operations. The entry supervisor shall ensure that the authorized entrants have received respiratory training, respirator fit test, and are medically fit to wear a respirator.
3. Other PPE - that may be required include head protection, eye protection, welding/cutting goggles and face shields, hearing protection, gloves and coveralls.
4. The entry supervisor shall arrange for ladders and appropriate fall protection devices to provide easy access/exit from the confined space and for the work to be accomplished should the need be identified from the job planning process.

Tools and Equipment

1. Electrically operated tools, equipment, radiation and atmospheric monitors used in environments where the possibility exists of flammable vapors, gases, or dusts, shall be of explosion-proof construction and listed or approved by a recognized testing laboratory such as Underwriters' Laboratories or Factory Mutual for use in the environment considered. Non-sparking hand tools shall be used in these environments. Pneumatically operated tools shall be used whenever possible in lieu of those that are electrically operated.
2. Portable electrical tools, equipment, and lighting used in wet and/or conductive confined spaces are either supplied through an isolating transformer with an ungrounded secondary of not more than 50 volts, supplied through a ground fault circuit interrupter, or battery operated with dc voltage not more than 50 volts. See TVA Safety Procedure 1008, “Ground Fault Circuit Interrupters”.
3. Electric powered tools shall be of the double insulated type or protected by a GFCI. Electric powered tools shall not be used in an atmosphere containing combustible/flammable gasses, vapors, or dusts unless they are approved for Class I and/or Class II atmospheres as appropriate.
4. Welding and cutting torches shall not be taken into a confined space until ready for use and until it has been determined by tests that flammable vapors, liquids, gases, or dusts are not present or that the concentration of these is no greater than 10 percent of their lower explosive limit. Torches shall be removed immediately after use, during lunch breaks, and at the end of a shift. Compressed gas cylinders other than SCBA cylinders, shall not be taken into confined spaces. See requirements in TVA Safety Procedure 815, “Welding and Cutting”.
5. All combustibles in the vicinity of welding or cutting are removed or covered with ireretardant blankets. A fire watch with fire extinguishers shall be established and remain in the vicinity of all welding or cutting operations, and for thirty minutes after such work is completed.

Non - Permit Confined Spaces

1. Non-permit confined space is a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazards capable of causing death or serious physical harm.
2. All spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. See Paragraph "Reclassification of Confined Spaces (Permit-Required and Non-Permit Required)" for the procedure to reclassify a permit-required confined space to a non-permit required. Any employee required or permitted to monitor or enter a confined space shall have successfully completed, as a minimum, the training as required by this procedure.
3. All pumps and lines which may reasonably cause contaminants to flow into the space shall be disconnected, blinded or locked out, or effectively isolated by clearance procedure to prevent development of dangerous air

contamination or engulfment. When a clearance is required to eliminate the hazard of high energy systems (operating with temperature greater than 200 degrees F or pressure greater than 500 psig) or a lethal chemical entering a confined space the requirements of TVA Safety Procedure 613, "Clearance Procedure to Safely Control Hazardous Energy Using Group Tagout." must be followed which require as a minimum isolation with two (2) closed valves in series with an open vent between the valves. If blocking, isolation or clearance activity requires entry into the space, the provisions for entry into a permit-required confined space must be implemented.

4. If there are no serious non-atmospheric hazards present and if the pre-entry tests show there is no dangerous air contamination and/or oxygen deficiency within the space and there is no reason to believe that any is likely to develop, entry into and work within may proceed. Continuous testing of the atmosphere in the immediate vicinity of the workers within the space shall be accomplished when knowledge or the possibility of serious atmospheric contamination exists. The workers will immediately leave the permit space when any of the gas monitor alarms are reached. Workers will not return to the area until it is safe.

Reclassification of Confined Spaces (Permit-Required and Non-Permit Required)

1. A space classified as a permit-required confined space may be reclassified as a non-permit confined space under the following conditions:
   - If the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space, the permit space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated;
   - If it is necessary to enter the permit space to eliminate hazards, and if testing and inspection during that entry demonstrate that the hazards within the permit space have been eliminated, the permit space may be reclassified as a non-permit confined space for as long as the hazards remain eliminated.
2. Since all confined spaces are initially considered to be permit-required confined spaces TVA 17237 - Confined Space Entry Permit [1] (Appendix A) must be completed to reclassify any confined space to a nonpermit confined space. The title "Checklist of Potential Confined Space Hazards," on the first page of TVA 17237 - Confined Space Entry Permit [1] must be completed. The checklist must be completed after performing an assessment of all existing and potential hazards (internal or external to the space) that could affect personnel working within the confined space. All line items must be answered "NO" in order for a confined space to be classified an non-permit required. After the assessment mark the correct classification on page one of TVA 17237 - Confined Space Entry Permit [1], i.e. permit - required or non-permit required. TVA 17237 - Confined Space Entry Permit [1] must be signed by the qualified person authorizing entry.
   NOTE: Control of atmospheric hazards through forced air ventilation alone does not constitute elimination of hazards. Paragraph General Requirements for Confined Spaces, items 10 and 11 covers permit space entry where it has been demonstrated that forced air ventilation alone will control all hazards in the space.
3. The completed TVA 17237 - Confined Space Entry Permit [1] must be maintained for at least one (1) year as documented of the confined space classification for the work to be performed. It is recommended that the completed TVA 17237 - Confined Space Entry Permit [1] be filed with the work package after the job is completed.
4. Initial and continued monitoring to document that atmospheric hazards continue to be eliminated must also be documented on TVA 17237 - Confined Space Entry Permit [1]. As a minimum monitoring of the space for atmospheric hazards must occur for each shift and work location. If there is any possibility of re-accumulation of a hazardous atmospheric under any conditions then continuous monitoring in the immediate vicinity of the workers must be performed in a manner to give workers adequate warning to exit the confined space.
5. If hazards arise within a permit space that has been declassified to a non-permit space, each employee in the space shall exit the space. The space will then be re-evaluated to determine whether it must be reclassified as a permit space. The re-evaluation must be documented on a new Form TVA 17237 [1]. The new form will be maintained as part of the documentation. If the re-evaluation determines that the space will be reclassified as a

permit-required confined space the new form will be used for the permit.

Entry Into Areas Immediately Dangerous to Life or Health (IDLH)

NOTE: A TVA safety professional or safety consultant shall approve any entry into IDLH atmospheres except for emergency rescue operations (life saving) by qualified rescue teams.

1. Entry into confined spaces which are immediately dangerous to life and health are not routine operations, are not permitted if the confined space can be put into a safer condition, and when permitted are subject to rigid control.
2. There are always at least two standby personnel, one designated the safety observer, the other designated as the rescue person present at an IDLH confined space. The rescue person shall be provided with SCBA and harness with lifeline. Where this is not practical, a safety professional must approve all alternatives. The safety observer and rescue person are assigned no duties or responsibilities which might divert their attention or interfere in any way with their primary function to assure the safety and wellbeing of the person or persons entering or working in the confined space by being vigilant and ever watchful for any signs of danger or distress to those in the confined space. It is the rescue person's job in the event of an emergency, to effect rescue of those in the IDLH confined space while the safety observer summons assistance.
3. The following precautions are always taken when entering an area which is IDLH:
   - SCBA or supplied air respirator is used by each employee entering the confined space.
   - Each employee entering the confined space wears a body harness and secured lifeline.
   - The safety attendants ensure that the lifelines do not become tangled.
   - Industrial Safety assists the responsible supervisor in preparing the emergency plan, and approves or disapproves any proposed deviation from this procedure.
   - Constant communication is maintained, by radio, by sight, or other positive means.
   - Where it is not possible to retrieve someone by use of the lifeline and body harness, an alternative emergency plan is developed and requires approval by the entry supervisor.
4. The attendant and/or rescue person are assigned no duties or responsibilities which might divert their attention or interfere in any way with their primary function of assuring the safety and wellbeing of the person or persons entering or working in the confined space.
5. All cutting, welding, grinding, open flame, and spark producing work activities shall be conducted following the permit and requirements established to control these activities. The "hot work" permit is referenced on the confined space permit.

Emergency Procedures

1. A person showing symptoms of exposure to a hazardous environment (i.e., mental confusion, euphoria, dizziness, ringing sensation in ears, nausea, headache, labored breathing, fullness in head, apparent suffocation, loss of consciousness, etc.) is immediately removed from the confined space, provided prompt first aid by a trained person, and provided medical assistance as soon as possible. All other persons working in the confined space are withdrawn and access to the involved confined space physically or administratively secured. No further entry is permitted until the space is monitored again and determined safe to enter.
2. If a person is incapacitated as a result of exposure to a hazardous environment, rescue operations are started immediately. Rescuers entering a suspected hazardous atmosphere to remove a victim wear positive pressure respiratory protection equipment (supplied air or SCBA). An entrance watch is in place before rescue operations begin. Radio contact or other means of direct communication are utilized between the rescue crew and the entrance watch.

Training

1. Plant / facilities shall provide training so that all employees whose work is regulated by this procedure acquire the understanding, knowledge, and skills necessary for the safe performance of the duties. See TVA Safety Procedure 410, “Confined Space Entry Course Standard”.
2. Training shall be provided to each affected employee: before the employee is first assigned duties; before there is a change in assigned duties; whenever there is a change in permit space operations that presents a hazard about which an employee has not previously been trained; whenever a plant has reason to believe either that there are deviations from the permit space entry procedures or that there are inadequacies in the plant's knowledge or use of these procedures.
3. Refresher training is required every five years.
4. The training shall establish employee proficiency in their duties and shall introduce new or revised procedures, as necessary.
5. Training shall be documented in the ATIS system and shall contain each employee's name, social security number, the names of the trainers, and the dates of training. The training roster shall be considered and handled as sensitive information.
6. All employees who enter, serve as attendants, perform atmospheric testing or those who supervise entry into confined spaces shall receive ATIS training course 00059109, "Confined Space Entry". Refresher training is required every five years.
7. All employees who conduct atmospheric testing of confined spaces using gas testing instruments shall receive ATIS training course 00059159, “Confined Space Test Instruments”. This training is required every 5 years or if the type of instrument used is changed.
8. All employees involved in confined space rescue shall receive ATIS training course 00059109, "Confined Space Entry"; ATIS course 00059159 “Confined Space Test Instruments” and ATIS course 00010251, “Confined Space Rescue".
9. Each member of the confined space rescue team must participate annually in simulated rescue from an actual permit required confined space or a space that is representative of a permitted space. A representative space is a mockup of the space with reference to it’s portal size, shape, obstructions and etc. This practice uses plant equipment to perform the simulated rescue. This course is ATIS 00010252, “Confined Space Rescue - Drill”

Definitions

1. **Acceptable Entry Conditions** means the conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter into and work within the space.
2. **Attendant** means an individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the plant / facility permit confined space entry program.
3. **Authorized entrant** means an employee who is authorized to enter a permit confined space.
4. **Blanking or Blinding** means the absolute closure of a pipe, line, or duct by the fastening of a solid plate that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.
5. **Double Block and Bleed** means the closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.
6. **Emergency** means any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.
7. **Engulfment** means the surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

8. **Entry** means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.
9. **Entry Permit (permit)** means the written or printed document that is provided to allow and control entry into a permit space and that contains the information specified Appendix A.
10. **Entry Supervisor** means the person (such as the Supervisor, Shift Supervisor, or foreman) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this procedure.
    Note: An entry supervisor also may serve as an attendant or as an authorized entrant, as long as that person is trained and equipped for each role he or she fills. Also, the duties of entry supervisor may be passed from one individual to another during the course of an entry operation.
11. **Hazardous Atmosphere** means an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue, injury, or acute illness from one or more of the following causes: flammable gas, vapor, or mist in excess of 10 percent of its lower explosive limit (LEL); airborne combustible dust at a concentration that meets or exceeds its LEL; any other atmospheric condition that is immediately dangerous to life or health.
12. Hot Work Permit means the written authorization to perform operations (for example, welding, cutting, burning, and heating) capable of providing a source of ignition.
13. Immediately Dangerous to Life or Health (IDLH) means any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.
14. Oxygen Deficient Atmosphere means an atmosphere containing less than 19.5 percent oxygen by volume.
15. Oxygen Enriched Atmosphere means an atmosphere containing more than 23.5 percent oxygen by volume.
16. Prohibited Condition means any condition in a permit space that is not allowed by the permit during the period when entry is authorized.
17. Rescue Team means the personnel designated to rescue employees from permit spaces.
18. Retrieval System means the equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit spaces.
19. Serious safety or health hazard means a condition where there is a substantial probability that death or serious physical harm could result.
20. Testing means the process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.
    Note: Testing enables plants to devise and implement adequate control measures for the protection of authorized entrants and to determine if acceptable entry conditions are present immediately prior to, and during, entry.

Reference

1. 29 Code of Federal Regulations 1910.146 Permit Required Confined Spaces
2. 29 Code of Federal Regulations 1910.269, "Electric Power Generation, Transmission, and Distribution"
3. TVA Safety Procedure 410, “Confined Space Entry Course Standard”
4. How To, TVA Safety Procedure 2017, “Conduct Assessment of Confined Spaces”

Appendix A - Confined Space Entry Permit - TVA Form 17237

TVA 17237 - Confined Space Entry Permit [1]

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=060870060

Procedure 802 Requirements for the Safe Operation of Cranes

TVA Safety Manual

802 Requirements for the Safe Operation of Cranes

Procedure Number 802

TVA Safety Procedure

Requirements for the Safe Operation of Cranes

Revision 8

February 14, 2012

Purpose

This procedure establishes the requirements for safe operation and maintenance of TVA cranes and cranes used on TVA work sites in accordance with TVA criteria “Requirements for the Safe Operation of Cranes”.

General Program Requirements

1. Performance Evaluations--Implementation of the requirements contained in this procedure will be periodically evaluated by the user organization(s) and by Corporate Safety. Corporate-level performance reports will be distributed to the Senior Vice President, the Designated Agency Safety and Health Official (DASHO), and other appropriate organization/plant managers.
2. Interpretation of Standards and Criteria--Standards, criteria, or other technical issues related to cranes that cannot be resolved at the plant, project, or higher organizational level must be forwarded to Corporate Safety for agency interpretation. The affected organizations will be promptly notified concerning final interpretation and resolution.
3. Designation of Crane Coordinators--User organizations will designate a qualified person as a crane coordinator for each plant, project, and/or major construction site. TVA contractor partners will also establish a designated crane coordinator who will also oversee crane operations conducted by their subcontractors. For operations with locations in several areas, a crane coordinator may be designated at an upper organizational level. The crane coordinator may serve in a collateral-duty role; however, the person selected must be provided the time and resources necessary to perform the responsibilities assigned in this procedure. As a minimum personnel selected to serve as crane coordinators will have documented experience with the cranes being operated at the site they are responsible for; have documented formal training in crane operations and rigging; and have completed training in this procedure to include crane coordinator responsibilities. The following training courses are required for formal training:
    1. Overhead Cranes – Overhead Crane Operators Certification course ATIS number 00059111 and Overhead Crane Coordinator course ATIS number 00061328. Exception: TVAN requires MTS 037 modules.
    2. Mobile Cranes – Mobile Crane Training course ATIS number 00059110 and Mobile Crane Field Coordinator course 00059183 provided by Heavy Equipment Division.
    3. Rigging and Signals– An approved Rigging and Hand Signals Safety course listed in Appendix C.

    Course standards can be viewed on the Technical Training SharePoint Site [1].
4. Training, Qualification, and Certification--Organizations will establish a training, qualification, and certification program consistent with this procedure to ensure that all personnel who inspect, operate, maintain, or work with cranes are consistently and properly trained for their jobs.

5. Crane Inspection, Testing, and Maintenance--Organizations will establish an inspection, testing, and maintenance program to schedule and perform the annual inspections and ensure that the maintenance requirements are carried out.
6. Crane Engineering and Analysis--Organizations will establish a crane engineering and analysis program to serve as a focal point for all crane related matters and problems.
7. Contractor Operations--Contractors performing crane operations for TVA will comply with the requirements specified in their contract. Contracts must be written to require meeting the requirements of this procedure as a minimum.

Responsibility of the Crane Coordinator

1. Provide oversight of the crane safety program for the plant, site, or locations assigned to ensure that all cranes, hoists, and rigging equipment are operated, inspected, tested, and maintained in accordance with the requirements of this procedure.
2. Ensure that all personnel with responsibilities related to the operation of cranes and hoists are certified or qualified as required and such certification/qualification is maintained.
3. Lead lift plan efforts by participating in lift planning when required. Participate in and approve all high hazard lift plans and maintain a copy of all high hazard lift plans for a minimum of three years. The crane coordinator may delegate approval of high hazard lift plans to another person who meets the experience and training requirements of the crane coordinator. However, the crane coordinator is responsible to oversee the work of any person(s) to which this responsibility is delegated.
4. Coordinate inspections, maintenance activities, and retrofit operations.
5. Track corrective action to closure for all discrepancies identified on crane inspections.
6. Resolve questions on crane operations, standards, codes, criteria, and procedures as specified in this procedure.
7. Review purchase specifications on rigging hardware.
8. Stop crane activities when requirements are not met.
9. Ensure that crane PM programs are being performed.
10. Establish an emergency plan for providing off site crane operators if needed on short notice. This may involve but is not limited to TVA certification of vendor crane operators to ensure availability when needed.

Responsibility of Crane Operators

1. Maintain current certification on crane(s) being operated and S-8 medical examination.
2. Understand the operating functions and limitations of the crane being operated.
3. Perform a pre-operational inspection to determine the operating condition of the crane. Do not make a lift until all safety related deficiencies identified on the pre-operational inspection have been corrected.
4. Participate in the planning of the lift.
5. Stop or do not make a lift when there is a concern relative to the safety of the lift. The responsible supervisor will be notified and if the concern cannot be resolved the crane coordinator will be consulted.
6. Ensure basic rigging procedures are followed in accordance with TVA Safety Procedure 721, “Rigging”.
7. Ensure that the load to be lifted is within the rated capacity of the crane.
8. Maintain communication with the signal person. Ensure standard hand signals are used unless voice communication equipment is used. Signals will be visible or audible to the operator at all times.
9. Verify that monthly and annual inspections are current prior to operating a given crane.
10. Crane operators (TVA and contractor) are required to report to their supervisor and to the TVA medical examiner or nurse any prescribed medication or over the counter medication, especially those known to cause drowsiness, which may impair their ability to operate TVA cranes.

Note: Medications that a physician determines could impair the capacity for endurance, agility, dexterity, coordination, speed of reaction, consciousness, alertness, judgment, or emotional stability may be sufficient

cause for disqualification. The examiner will review these cases on an individual basis considering the dosage, reason for prescription, and tolerance for the medication to determine if the individual can safely operate cranes.

Responsibility of Riggers

1. Participate in lift planning during pre-job briefings.
2. Use only approved and inspected rigging.
3. Use only established and approved rigging practices in accordance with TSP 721.
4. Ensure that rigging is selected based on the load to be lifted and configuration of the rigging. Use rigging charts to assist in performing this responsibility.
5. Inspect all rigging to be used. Do not use defective rigging when making a lift.

Responsibility of Signal Person

1. Participate in lift planning during pre-job briefings.
2. Use only standard hand signals or approved voice communication devices.
3. Maintain communication with the crane operator at all times.
4. Ensure that only one person is providing signals to the crane operator.
5. Stop the crane operation if any unsafe condition is observed.

Responsibility of the Supervisor of Crane Operations

1. Ensure that only certified crane operators and qualified riggers and signal persons are assigned to make lifts.
2. Ensure that all lifts are planned in accordance with the requirements of this procedure.
3. Ensure that cranes are not used if safety discrepancies exist or if inspections are not current.
4. Consult with the crane coordinator on questions regarding implementation of the crane safety program.
5. When notified by a crane operator that prescribed medication or over the counter medication is being taken, consult with the TVA medical vendor or site health station to determine fitness for duty. In addition, provide the TVA medical examiner information on the types of cranes being operated.

General Responsibilities

1. Only crane operators who are certified under the requirements listed in sections 16 of this procedure will be allowed to participate in a lift. Apprentices or other personnel undergoing on-the-job training may participate in a lift operation provided they are supervised by fully certified operators. Operators for cab-equipped cranes that are also equipped to be operated by pendant and/or remote control must be certified. Operators for radio-operated overhead cranes must be certified.
2. The crane operator will have responsibility for the safe lift of a load and will be the final authority on decisions related to making a lift unless relieved of this responsibility by a qualified person. The signal person is responsible for all communication with the operator except in an emergency stop situation.

Planning / Handling the Load

1. Prior to each initial lift, the crane operator, rigger(s), and signal person will review and discuss the planned lift. This review, as a minimum, will include setup, proper determination that the load to be lifted is within the capacity of the crane, analysis of the load chart, and the safe load path. These reviews are not necessary for repetitive lifts, such as concrete pouring operations.
2. Planning normal and high hazard lifts must be conducted as designated in this procedure. For high-hazard lifts, the lift plan will be documented and include an appropriate evaluation (i.e., loads, stresses, support structures, lift and swing paths) by a qualified person. Form TVA 17671, Appendix A will be used to document each high hazard lift plan. High-hazard lift planning must consider all elements of the lift necessary to assure a safe lift. Form TVA 17671 is designed to provide minimal information and must be supplemented with any additional information required to conduct a safe lift. Additional information may include load chart calculations, results of structural analyses, drawings of crane set-up, rigging diagram, soil conditions, etc. As a minimum the crane coordinator, crane operator and the responsible supervisor will sign the highhazard lift plan indicating approval. High hazard lift plans will be maintained by the field crane coordinator for a minimum of 3 years.

Mobile Crane Setup and Operating Radius

1. Setup of mobile cranes at the lift site will be performed in accordance with OSHA, ASME, and TVA standards and appropriate manufacturers' requirements. As a minimum, they will include the following.
    1. Preparation of operating location and access roads.
       Note – TVAN Requirement: Mobile cranes will not be set up to make a lift or driven off any roadway in the protected area of the plant unless site engineering has given approval or the responsible engineer/foreman has reviewed applicable drawings for buried piping systems and conduits that could be impacted by the weight of the crane and associated load lifts.
    2. When traveling a truck crane from one location to another a qualified person with a Commercial Drivers License (CDL) will operate the truck with a certified crane operator at the crane controls. All other cranes require a certified crane operator to move the crane.
    3. If the crane is to be set up on a structure, assurance that allowable structural loads are not exceeded.
    4. Preparation of footing.
    5. Verification that crane is level (4-foot carpenter's level, crane leveling bubbles, transit). Requires second party verification.
    6. Determination of total load weight by OEM load chart requirements. The actual weight of the load to be lifted will be determined by engineering calculation, by vendor-supplied information, weighing (using a calibrated load cell), or conservatively estimated by a qualified person, e.g. site crane coordinator.
    7. Determination of the load radius by physical measurement or documented engineering calculation.
    8. Proper placement and use of outriggers.
    9. Assurance of adequate swinging clearance of two feet or more between the counterweight and any obstacles.
    10. Assurance that operating locations are far enough away from shoring, excavations, trenches, buried utilities, foundations, etc., to eliminate risk of collapse.
    11. Assurance that minimum clearance from power lines is maintained. If minimum clearance is not possible, the lines must be either de-energized and grounded or temporarily relocated.
        (Note: This does not apply to approved hot-line work.)
    12. Proper positioning- of barricades, where appropriate, to prohibit entry into the tail swing area of the crane.
    13. Proper boom assembly / disassembly in accordance with manufacturer's specifications.
2. Crane set up for high hazard lifts requires documentation of second party verification by signature on TVA form 17671, High Hazard Lift Plan.

Rigging

Rigging for all loads will be done in accordance TSP 721.

Signaling and Emergency Shutdown

1. A signal person will be used for the duration of all lifts. Throughout the entire lift, the crane operator will accept communications only from the designated signal person, except in emergency situations.
2. The operator will accept an emergency stop signal from anyone. Conditions for emergency shutdown include but are not limited to the following:
    1. Severe weather (high wind or lightning) – Booms will be lowered and/or anchored in accordance with manufacturer's recommendations during a severe weather warning. This also includes the maintenance of clear areas for lowering booms on proper cribbing without delay and, in the case of booms which cannot be lowered because of size, the requirements for attaching the load line to suitable anchors.
    Note: Additional TVAN requirements for severe weather – In performing lifts with a mobile crane during inclement weather conditions, the following situations will be considered:
        - Operating wind velocity.
        - Derating procedures to be instituted in winds of sufficient force to affect the crane loading.
        - A wind velocity action level for termination of lifting activities.
        - A derating procedure for the buildup of ice on crane booms in locations where ice buildup is possible.
        - A warning to all operators and mechanics that shock loading or impact in temperatures below freezing may result in brittle fractures of the steel.
    2. Improperly rigged load
    3. Mechanical defects or failure
    4. Operations too near power lines
    5. When the crane gets in a tipping or overload condition
    6. Any hazard from the lift to personnel in the work area
    7. Improper crane setup
    8. Loss of communication (between operator and signal person)
    9. Equipment or material being moved and not in the clear
    10. People walking under load

General Safety Requirements

1. Crane cabs must be kept clean and free from litter. Extraneous items such as magazines and personal radios are not allowed in the cab. Areas around the load pickup and set down points will be kept free of loose objects, material, etc.
2. Unauthorized equipment will not be used in or on the crane.
3. Cranes will be operated according to operating practices contained in ASME B30.2 (overhead cranes) and ASME B30.5 (mobile cranes) including operator conduct, load handling, and signals.
4. Cranes will not be loaded beyond its rated capacity except for rated-load test or for planned engineered lifts (see Appendix J).
5. Cranes will not be derated due to deficiencies affecting safe operation by anyone except the crane manufacturer.
6. Lifting personnel with cranes is inherently dangerous and will always be regarded as high hazard. Where there is no practical alternative, lifting personnel using platforms attached to load lines may be done but must be in strict compliance with TSP 708, "Crane Suspended Work Platforms", to include careful attention relative to inspection, maintenance, and operating conditions.
7. As a general rule, lifting loads over personnel is prohibited. However, in situations where it is impossible to perform the lift without lifting over personnel, such lifts will be deemed high hazard, thus requiring formal

planning. Such planning situations may include rearranging of the job site or rescheduling so as to make the lift without endangering personnel. Special attention will be given to personnel who may be under the floor or surface where the load is to be set or where the load could fall through the floor or roof. The structural capacity of the surface where the load is to be placed will be determined if the failure could endanger personnel or equipment located under the load-bearing surface.

8. Ensure that no personnel are below the crane hoist when testing, troubleshooting, performing routine maintenance, or making repairs (except necessary maintenance personnel). The responsible person will ensure that the area below the crane hoist is free of personnel by using rope, plastic caution tape, or barricades, (where practical) to secure the area, or by posting a watchman (with no other duties) where the use of rope, plastic tape, or barricades is not practical. The responsible person will also ensure that the crane hoist is not positioned over tool trailers, office structures that may contain personnel.
9. A load will not be lifted until all employees are clear. Clear means adequate distance in case the load drops, shifts, or swings. Loose material or items such as pipe, poles, or stacks from which a load is made will be secured from shifting by chocks, cribbing, stanchions, etc.
10. Tag lines will be used where needed to control the load.
11. Nighttime operations will be conducted with adequate illumination of the pickup area, set down area, the signal person, the boom tip, and the load path (if the load path is not previously determined to be clear). Nighttime crane operations where contact with energized electrical lines is possible will not be made unless such lines can be adequately illuminated.
12. Structures supporting hoists will be designed by a qualified engineer to support the load imposed by the weight of the hoist and the maximum load the hoist can lift. Structures, i.e. monorail beams, supporting hoists will be labeled as to their capacity in a manner that is clearly visible from the floor.
13. Requirements for arc flash protection found in TSP 1022, “Arc Flash Hazard Calculation and Required Protection,” must be followed where calculations have determined the need for such protection when operating or maintaining overhead cranes. This includes completion of required arc flash training and the use of required FR clothing.

Training

The formal Crane Training course requirements are available on the Technical Training SharePoint Site [1].

1. Employees required to be qualified or certified to meet requirements of this procedure will be trained as necessary to meet qualification or certification requirements.
2. Training curriculum and written examinations will be developed for mobile and overhead cranes by the following organizations. Only training and examinations developed and administered by these organizations will be accepted unless the Crane Review and Advisory Committee recommends a change to the following list and it is approved by Corporate Safety.
    1. Mobile Cranes – Training will be developed and delivered by the Heavy Equipment Division. Written examinations will be developed and administered by the Heavy Equipment Division for all organization. Copies of the test will be strictly controlled.
    2. Overhead Crane – Training will be developed and delivered by the Power Service Shop or TVAN training centers. Written examinations will be developed and administered by the Power Service Shop or TVAN training centers. The Power Service Shop and TVAN will coordinate the development of the core examination. TVAN will add additional questions specific to nuclear operations. Copies of the test will be strictly controlled.
3. Training required will include, as a minimum, the following:
    1. Training that leads to employee qualification and/or certification in each appropriate function.

2. Training modules that are designed to include knowledge in related functions. It is vitally important that signal persons, for instance, understand the limitations of the specific crane as well as rigging limitations.
3. Training modules and on-the-job practical training that lead to technical knowledge, qualification, and/or certification in the specific crane (make and model) to be operated.

4. The following training modules will be developed and used for training appropriate employees in safe mobile and overhead crane operations. Key topics of each training module are listed in Appendix B. Appendix C contains a list of approved training courses to meet the requirements of this procedure.
Note: TVAN Requirement: See Appendix L for TVAN training modules and matrixes for required training by position.

Mobile Cranes	Overhead Cranes
Crane Setup	Overhead Crane Operating
Load Charts	Practices and Functional
Operating Principles and Procedures	Characteristics
Rigging and Flagging	Inspection and Maintenance Requirement
Rigging and Flagging	Inspection and Maintenance Requirements

Qualification Process

1. Managers will document in writing that the following personnel have been examined and meet the definition of a "qualified person" lead maintenance personnel, riggers, signal persons, supervisors, trainers, and pendant crane operators.
2. Operating organizations will define the level of knowledge, training and experience for each category of personnel to provide for specific criteria to determine qualification. As a minimum qualification requirements will include a documented training course and experience with the crane(s) and rigging being used. Approved training courses are contained in Appendix C.

Crane Operator Certification Process

1. Each organization will ensure crane operators, annual crane inspectors, and persons who administer skills tests are certified according to the following criteria in order to ensure consistency across the agency.
    1. Applicants for certification as mobile crane operators must show at least one year (2000 hours) of documented experience on the type of crane to be operated. Management has the option of requiring additional experience on specific cranes.
    Exception: The following requirements apply to applicants for certification as an operator on a National Crane:
    - Successfully complete the HED Mobile Crane Course, ATIS number 00059110.
    - Show at least 520 hours experience operating a National Crane under the supervision of a

    certified operator performing the type of tasks required of a National Crane Operator.
    - Show 30 additional hours performing required National Crane PMs.
    - Present a signed statement from the employee's supervisor stating (1) required number of hours has been obtained and (2) supervisor's concurrence that the employee is ready for certification.
    - Complete the remaining certification requirements in items 1.2 through 1.8 of this paragraph.
    2. Only journeymen or Level 2 technicians will be considered as applicants for certification as a crane operator.
    3. Certified TVA personnel will be designated to administer the certification. TVA personnel will administer the certification. Certification will be obtained from the Heavy Equipment Division for mobile cranes and the Power Service Shop for overhead cranes. The only exception is that NPG conducts certifications for overhead cranes for NPG personnel.

4. A written examination, a skills test, and a medical examination, (operators, annual inspectors, and persons who administer skills tests). Tests may be administered verbally, so long as the applicant is given the same test, i.e., verbal answers recorded and all required reading and interpretation of the load chart information is satisfactorily demonstrated. The approved testing organization will develop and administer the test in accordance with requirements of this procedure. If an applicant fails a certification examination three (3) consecutive times at a minimum of thirty (30) day intervals the individual can not be tested again for a period of one (1) year.
5. A passing grade of 80 percent for the written examination, and 100 percent for the hand signal portion of the test.
6. A skills test with actual operation of the equipment under the direction/observation of a certified operator. The test must include the requirements necessary for a safe lift specified in OSHA and ASME standards and must include all aspects of making a lift. Competence will, of necessity, be a matter of judgment on the part of the certifier, but failure to conduct a pre-operational inspection or errors/incompetence in any aspects that could cause the load to be dropped, tipping of the crane, or overload of the crane will be cause for failure. A checklist will be used to conduct the skills test to ensure key elements of crane operation are covered. The checklist will be maintained with certification documentation.
7. Certification for each class of crane, according to size, type, and capacity.
8. Maintain a current medical examination.

Annual Crane Inspector Certification Process

1. In addition to certification as a crane operator, annual inspectors must be certified to perform the required inspections on specified cranes.
2. HED will administer a written annual crane inspector certification process for mobile cranes and Power Service Shops will do the same for overhead cranes.
3. The annual crane inspector certification process will as a minimum require initial and refresher training on regulatory requirements and operational characteristics of the specific cranes to be inspected. In addition, the process will require written and practical exams to demonstrate knowledge of regulatory requirements and specific crane characteristics.
4. The annual crane inspector certification process must also establish a minimum level of experience performing maintenance on cranes to be inspected. This process will be subject to evaluation in accordance requirements of this procedure.

Medical Examination

Note: Alcohol and drug tests required by paragraphs 18.1 through 18.4 will be effective for any S08 medical approval due on or after June 25, 2004.

1. TVA employees who operate cranes and/or perform annual crane inspections will pass a medical examination at least every two years, or more frequently as determined by the TVA physician. TVAs medical examination procedures for the “Special Medical Approval for Crane Operator Duty” (S08) meets OSHA, ASME, and TVA specific requirements, which include passing alcohol and drug tests at the direction of and pursuant to criteria established by TVA. Medical examinations are not required for employees who operate or perform annual inspections on pendant operated overhead cranes.
2. If the alcohol and/or drug test is positive on an employment crane operator examination, the offer of employment to the employee will be withdrawn. If the alcohol and/or drug test is positive for current employees obtaining initial crane operator clearance, during their periodic crane operator examination, or during a random alcohol and drug test the requirements of the applicable alcohol and drug testing program apply.
3. Records must be available to demonstrate that S08 special medical approval is current. Certification for TVA crane operators and annual crane inspectors is not valid if the S08 medical approval is not current.

4. Non-employees who operate cranes for TVA or its contractors are required to meet the same medical qualifications as TVA employees who perform the same duty. Contractors must provide to management a completed form TVA 17632, “Contractor Crane Operator Medical Certification,” for each individual who will operate cranes for TVA or its contractors documenting that the individual meets TVA medical qualifications for crane operators. Certification for non-employee crane operators is not valid if the information documented on the form TVA 17632 is not current. A copy of the form TVA 17632 can be found at Attachment D. As part of the medical examination non-employees must also successfully pass alcohol and drug tests at the direction of and pursuant to criteria established by TVA and this standard. If a non-employee tests positive for alcohol or drugs, they will be denied access to TVA property.

Certification Period

1. The certification period will be as shown below unless cause is shown to suspend or revoke the certification. This period will be shown on the certification card.
    1. Mobile crane operators - 3 years
    2. Overhead crane operators - 5 years
    3. Crane inspectors (mobile) - 3 years
2. Crane inspectors (overhead) - 5 years

Recertification

1. When the initial and subsequent certification periods expire crane operators and annual inspectors must be recertified to continue crane operation. Recertification requires meeting all of the original conditions for certification.
2. Crane operators must be recertified if documentation does not exist that they have operated the crane(s) for which they are certified at least once a year. Performing an operation in a simulator is equivalent to actual crane operation to meet this requirement.
3. Individuals transferring from one organization to another may be required to be recertified if their certification is still valid. Those who leave TVA, and return within the certification period may be required to be recertified.

Revocation of Certification

1. The operator’s/inspector’s certification will be revoked by the responsible supervisor when an accident occurs due to operator or inspector error.
2. A certification may be revoked by, the responsible supervisor for reasons such as:
    - Operating under the influence of drugs or alcohol.
    - Falsifying certification records.
    - Inability to pass the physical examination.
    - Violating safety rules involving the operation of the crane.
3. The reason for revocation of a certification must be noted on certification form TVA 18121. Written justification supporting this action will be made part of the record (including the PHR).
4. After the revocation period has expired, the individual must satisfy all necessary requirements to be reinstated.

Suspension of Certification

1. An operator's or an annual inspector's certification will be automatically suspended by the responsible supervisor for any of the following reasons. The reason(s) for suspension will be noted on the certification form TVA 18121 and made part of the record (including the PHR).
    1. When the operator's or annual inspector's physical examination becomes delinquent or if there is a physical change that keeps the operator or annual inspector from meeting the physical requirements. When the physical examination has been passed, the certification may be reinstated.
    2. When an operator or annual inspector has been involved in an accident for which, an accident investigation team has been convened. Following a crane accident the operator will be sent to the appropriate TVA medical examiner for a drug and alcohol test. After a thorough investigation of the accident, the certification may be revoked or reinstated based on the findings.

Inspection

1. The inspection program will consist of three (3) parts.
    1. A daily inspection performed by the crane operator prior to use. A checklist (See Appendixes E & F) will be used by the crane operator to help ensure a thorough inspection. Documentation of preoperational inspections is not required for pendant operated overhead cranes. Completed checklists will be maintained for a period of at least 30 days and include action taken on discrepancies found. A log book may be placed in the cab and used with the checklist to document inspection dates, turnover information, etc.
    2. Monthly inspections by user organization for crane hoist running wire rope and critical safety items such as brakes, hooks, etc. A checklist (see Appendix G and H) will be used to perform and document this inspection. Inspection documentation will be maintained for at least a period of one year and include action taken on discrepancies found.
    Note: TVAN Exception – TVAN overhead cranes are exempt from monthly inspections per OSHA variance.
    3. Annual (periodic) inspection by certified inspectors independent of the local plant/site. Inspection documentation will be maintained for a period of at least five years and include action taken on discrepancies found.
    Note: TVAN Requirement – A crane, which has been subjected to severe weather conditions, will receive a periodic inspection prior to use.
    4. Operators and inspectors are responsible for reporting crane discrepancies, and local plant/site management will be responsible for correcting identified discrepancies. The local plant/site may use the services of a certified inspector in correcting discrepancies. Crane equipment with critical safety item discrepancies must be removed from service using proper "tagout" procedures.
    5. Inspections will, as a minimum, cover the requirements of the appropriate OSHA, ASME, and TVA standards and the manufacturer's recommendations. Organizations may require more stringent inspection requirements, but must ensure uniformity within their own organization. Inspection findings will be tracked until corrective action has been completed. Documentation of corrective action taken will be maintained with the inspection report.
    6. Cranes (overhead and mobile) that have been idle for a period of one month or more, but less than six months, will receive a monthly inspection prior to use. Cranes (overhead and mobile) that have been idle for more than six months will receive an annual inspection before use.
    7. Specific control circuit or limit switch set points will follow those recommended by the manufacturers and not be altered unless approved by a qualified engineer after coordinating the alterations with the manufacturer as appropriate. Inspectors and qualified mechanics/maintenance personnel are the only personnel authorized to change a specified set point.

8. All crane equipment failing the required inspection will be removed from service using the appropriate "tagout" procedure and the affected function not used until the identified discrepancy is corrected. Electrically powered cranes will be cleared for inspection under approved tagout procedures.
   Note: TVAN Requirement - Non-destructive examination (NDE) of hooks, when performed, will be performed by individuals certified to SNT-TC-1A out of N-MT-5, Magnetic Particle Examination of Crane Hooks.

Testing

1. Cranes that undergo major repair or modification will be tested in accordance with OSHA and applicable ASME standards.
2. New cranes will also be tested for compliance with purchase and/or design requirements. Discrepancies identified will be corrected prior to acceptance or release. A certified inspector will participate in the tests.
3. Rated load test will be performed on mobile cranes when boom is disassembled or configuration is changed.

Records

Inspection records required will be kept locally and/or at a central location. These records will be analyzed periodically for generic problems or other trends so that timely and appropriate actions can be taken.

Maintenance

1. Organizations will develop a crane and rigging maintenance program based on the philosophy of preventive maintenance. This program will include designation of responsibilities for the required maintenance, the necessary documentation and procedures, and a record keeping system. Maintenance personnel will be qualified for the equipment assigned.
2. The Preventive Maintenance (PM) program will include, as a minimum, the following elements.
   - Management emphasis and support
   - Work order system
   - Equipment records
   - Lubrication program
   - Rigging, to include lubrication of wire rope slings and chokers
3. Organizations will ensure that a process is established for ensuring replacement of critical parts and components for older cranes no longer manufactured or where replacement parts cannot be purchased. This process will include an appropriate engineering review to ensure that such parts or components are designed and fabricated to function safely.
4. Before initiating maintenance activities, the following precautions will be followed:
   1. The crane to be repaired will be moved to a location where it will cause the least interference with other cranes and operations in the area.
   2. Barricades and/or flagging will be provided to keep personnel clear of the maintenance area beneath the crane.
   3. All controllers will be placed in the off position unless they are required for maintenance.
   4. The main power source must be disconnected and tagged in accordance with site clearance procedures unless main power is required for performance of maintenance.

Safety Devices

1. Organizations will maintain safety devices required by the appropriate OSHA and ASME standards. The central crane coordinator will provide for review of new technology, manufacturer's options, operational problems, and accidents to determine the need for additional safety devices or safety design features.
2. Shaded Area for TVAN Only. Anti-Two Block devices are required to be installed and in working condition on all mobile cranes operating on TVAN property.

Crane Engineering and Analysis

1. All data and records collected concerning crane operations, i.e., inspections, maintenance, accidents, and training/certification, will be made available to the crane coordinator. All data will be analyzed periodically for (1) tracking the operational readiness of crane equipment; (2) generic and agency-wide problem trends; (3) the need for retrofit, major modifications, or replacement; (4) frequency of lubrication, adjustments, tests, etc ; (5) any need to change purchase and/or design specifications; and (6) injury and property damage accident cause trends.
2. Responsibility will be established for coordinating, designing, and approving all the following activities related to crane operations.
   - Retrofit/modifications
   - Rigging hardware specifications development
   - Purchase review, bid review, engineering and operations review
   - Specifications review
   - Recommendations for standardizing equipment
   - Adding/removing safety devices
   - Acceptance control
   - Technical guidance
   - Solving problems and sharing information

Interpretation and Resolution of Criteria / Standards Issues

1. The standards required or referenced by this procedure are subject to different and sometimes conflicting interpretations. Additionally, gaps in coverage may exist between standards, e.g., ASME and the National Electric Code. When such issues develop interpretations and/or clarification will be resolved at the lowest possible level, i.e.:
   - Plant/site crane coordinator
   - Central crane coordinator.
2. Corporate Safety will make all official interpretations of this procedure, OSHA standards, and/or national consensus standards. Corporate Safety will when necessary request interpretations from regulatory agencies.
3. Organizations will comply with the latest edition of the appropriate OSHA, ASME, or TVA standard. Where a new standard may require a major retrofit/modification and does not provide a "grandfather" clause, the central crane coordinator, in consultation with Corporate Safety, will decide on the appropriate course of action.
4. The central or plant/site crane coordinator will ensure line organization distribution of all new/updated ASME standards and applicable manufacturers' bulletins to all users. Corporate Safety will continue to ensure availability of updates and/or new OSHA standards.

Accident Reporting and Investigation

1. All accidents involving cranes will be investigated and reported to the plant/site and central crane coordinator for analysis. This includes all property damage accidents and near- miss incidents involving crane operations. Reference TVA Safety Procedure 113, "Safety Procedure 13, Report and Investigate Injuries and Illnesses". The site crane coordinator or their designee will be involved in the investigation of these accidents.
2. Accidents meeting the definition of a "serious accident" in TSP 111, "Safety Procedure 11, Conduct Serious Accident Investigation", must be reported and investigated in accordance with that procedure.
3. Accident information will be shared on a timely basis with all plants/sites and between line organizations. The central crane coordinator will have responsibility for distribution of such information.

Crane Review and Advisory Committee

1. A standing committee will be established as an advisory group to review TVA's crane operations periodically and update this criteria procedure.
2. This committee will be represented by all organizations utilizing or supplying cranes and will be composed of persons with extensive experience in the inspection, operation, and maintenance of cranes.

Definitions

1. **Certified Person**--An individual who has sufficient physical and mental qualifications, knowledge, dexterity, and demonstrated he/she can safely perform the function required to be certified.
2. **Crane Coordinator**--The designated person at the plant, site or upper organizational level responsible to answer questions on crane operations; resolve crane operation conflicts; interpret issues on standards, codes, criteria, and procedures; lead lift planning efforts; review purchase specifications of rigging hardware; coordinate inspections, maintenance activities, and retrofit actions; and serve as general technical crane resource. This person will be uniquely qualified by experience and training in all equipment being used at the site, in crane operations, and in rigging and flagging.
3. **Central Crane Coordinator –** Same definition as crane coordinator (see above) except the central crane coordinator is responsible for crane operations of an entire organization with other crane coordinators assigned to sub elements of that organization.
4. **Cranes**--A crane is defined by the appropriate ASME standards as follows. This practice applies to all cranes as defined in the following ASME standards.
    1. B30.2 - "Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)"
    2. B30.3 - "Hammerhead Tower Cranes"
    3. B30.4 - "Portal, Tower, and Pillar Cranes"
    4. B30.5 - "Mobile and Locomotive Cranes" (includes old ANSI B30.15, "Mobile Hydraulic Cranes")
    5. B30.6 - "Derricks"
    6. B30.8 - "Floating Cranes and Floating Derricks"
    7. B30.11 - "Monorails and Underhung Cranes"
    8. B30.16 - "Overhead Hoists (Underhung)"
    9. B30.17 - "Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)"

    Note: TVAN Requirement – Tuggers, base-mounted drum hoists are covered by this document for TVAN.
5. NOTE: The following equipment is not covered by this procedure.
    1. Machines designed specifically for backhoe, dragline, or shovel operations.
    2. Tuggers, base-mounted drum hoists, and skip hoists.

3. Conveyors, elevators, and "sky-climbers."

   Note: TVAN Requirement - Nuclear fuel handling equipment that is, refueling platform, manipulator crane, and spent fuel pit bridge crane is not covered by this document.

6. **Contractor**--Any individual or organization that provides services, materials, or products under an agreement with TVA.
7. **Critical Safety Items**--Any hardware or activity where failure or error may result in a serious accident involving a crane and causing personal injury or damage to the crane or other property. Critical safety items or components include, but are not limited to, those that would cause the following conditions.
   - Dropping the load
   - "Two-blocking"
   - Tipping of the crane
   - Electrical shock
   - Uncontrolled swinging of the load
   - "Over-speed" or "over running" conditions
   - Personnel pinch points
8. **Designated Person**--A person selected or assigned who is qualified to perform specific duties.
9. **Emergency Shutdown**--The immediate stopping of all crane operations.
10. **Inspections**--The formal, documented activities associated with the examination and testing of cranes and associated rigging hardware to determine if they meet the requirements of OSHA, ASME, and TVA standards and the stated manufacturer's performance capabilities.
11. **High-Hazard Lifts**
    1. For nuclear operations any lift in a "critical lift zone (CLZ)" will be performed in accordance with the requirements of Appendix I.
    2. Any lift which could cause significant damage to equipment or injury to personnel due to any combination of the following conditions or other unspecified hazards:
    3. When the lift is 90% of net capacity (Net Capacity is the load chart capacity of a mobile crane for a given configuration minus capacity deductions i.e. everything mounted or stowed on the boom as well as everything hanging from the boom tip; examples of typical capacity deductions are weight of main hook block, weight of slings and rigging, weight of auxiliary hook, weight of wire rope from boom tip sheave to auxiliary hook, etc.) or greater for mobile cranes and 100% of capacity for overhead cranes.
    4. Planned engineered lifts when the capacity of an overhead crane is to be exceeded. See Appendix J.
    5. When rigging, attachments, or methods are employed that are not covered in OSHA, ASME, or Rigging Handbook requirements.
    6. When operating on an inherently hazardous location or under severe weather or emergency conditions.
    7. When operating with specific operational limits due to abnormal conditions existing with equipment, load, rigging, or facilities.
    8. Any lift whose failure could damage a high-value, long-procurement item(s) or significantly impact plant operations, shutdown, or equipment availability as determined by site management/superintendent, plant manager, or equivalent level of management.
    9. Any lift, in which the crane working clearances to adjacent equipment or electrical power lines are within plus 10 percent of minimum clearances specified in the ASME standard for the respective crane, excluding approved hot-line work. (See Appendix K)
    10. Any lift utilizing more than one crane or more than one hook.
    11. Any lift of humans with platforms attached to a load line.
    12. Any lift of material/equipment over humans (under special/unique conditions requiring such lifts).
12. **Normal Lifts**--Any lifts that cannot be classified as high hazard.

13. **Planned Engineered Lifts (Overhead Crane) –** High hazard lifts that are in excess of the rated capacity of the overhead crane. Each instance is a specific problem, which must be formally addressed. See Appendix J.
14. **Preventive Maintenance**--Preplanned, periodic inspections and necessary repairs.
15. **Qualified Person**--An individual who possesses a recognized degree, certificate of professional standing, or record of extensive knowledge, training, and experience that successfully demonstrates his/her ability to solve problems related to the subject matter and/or work. Qualifications are prerequisites for certification.
16. **Responsibility Levels**--Designated persons accountable for each activity associated with operating, inspecting, or maintaining a TVA crane, including the following.
    - Supervisors - first level through plant managers/site directors
    - Operators
    - Riggers
    - Signal persons
    - Crane coordinators
    - Inspectors
    - Mechanics (or persons performing any maintenance on a crane)
    - Engineers
17. **Purchase Specifications**--The documented technical requirements and descriptions necessary to control in part the purchase of cranes, spare parts, retrofits, and associated rigging hardware or to design a part for fabrication.

Reference

1. Occupational Safety and Health Administrative (OSHA) standards that cover cranes, rigging, and associated operations (these are mandatory requirements for all TVA cranes and crane operations).
2. American Society of Mechanical Engineers (ASME) standards for cranes, rigging and associated hardware (these are mandatory requirements for TVA cranes and crane operations.
3. Crane and rigging manufacturer's specifications (Manufacturer's specifications will not be violated or altered unless exempted by a designated, qualified engineer.).

Appendices

1. Appendix A High Hazard Lift Plan
2. Appendix B Key Topics Training Modules
3. Appendix C Approved Training Courses
4. Appendix D Contractor Crane Operator Medical Certification
5. Appendix E Operator's Mobile Crane Preoperational Inspection
6. Appendix F Operator's Overhead Crane Preoperational Inspection
7. Appendix G Monthly Overhead Crane Inspection
8. Appendix H Monthly Mobile Crane Inspection
9. Appendix I TVAN Requirements for Control of Heavy Loads (NUREG-0612)
10. Appendix J Planned Engineered Lift Requirements
11. Appendix K Operations Near Electrical Power Lines
12. Appendix L TVAN Training Modules and Matrices

Appendix A High Hazard Lift Plan

Click for TVA Form 17671 - High Hazard Lift Plan [1]

Appendix B Key Topics Training Modules

Key Topics - Training Modules

MOBILE CRANES

Crane Setup

*Bearing surface/surface preparation	*Environment
*Leveling	*Machine configuration
*Cribbing/mats/floats	*Use of outriggers
*Operating radius/clearance/power lines/reeving	*Impact load
*Planning	*Work on strong side of rig
*Responsibility	*Rapid swing rate
*Determine safe load path	*Access lines

Load Charts

*Responsibilities - qualification of operator	*Load radius
*Configuration of crane base	*Load radius between load chart listings
*Configuration of crane and boom	*Capacity limited by strength or stability
*Quadrants of operation	*Main boom load charts
*Boom length	*Integrated jib load charts
*Boom length between load chart listings	*Two separate load charts for jibs
*Boom angles	*Gross capacity versus net capacity
*Boom angles between load chart listings	*Range diagrams

Operating Principles and Procedures

*Review crane accident trends and causes of upper	*Changes in crane leverage and capacity during rotation
*Principles of leverage	*works
*Center of gravity - define	*Effect of location of tipping axis on stability and capacity
*Crane's center of gravity - apply to principles of leverage	*Backwards stability factors
*Changes in location of center of gravity during Rotation of upper works	*Structural failures
*Leverage and stability	*Wire rope safety factors
*Stability versus instability	*Effects of overloads

Factors That Reduce Rated Capacity

*Poor machine condition	*Side loading
*Machine configuration not to specification	*Increase of load radius
*Eccentric reeving	*Rapid swing rates
*Improper use of outriggers	*Impact loading and rapid acceleration/deceleration
*Soft footing	*Duty cycle operation
*Crane not level	*High wind speeds

Operating Procedures

*Responsibilities (understanding operations and technical manuals)	*Working near power lines
*Signs of tipping	*Planning the lift
*Crane setup -Weight of load -Load radius -Capacity of crane for maximum radius required -Height of lift - Ground conditions - Power lines fundamentals - Underground utilities, pipe excavations, trenches - Outriggers use - Cribbing/mats - Crane level - Load path (lifting over/near Personnel - Swinging clearance	*Slack rope on drums and uneven spooling
	*Effects of hitting boom
	*Two blocking
	*On - rubber lifting
	*Pick-and-carry operations
	*Multiple crane lifts
	*Barge mounted operation
	*Environmental conditions (night operations)
	*Flagging
*Rigging	*Shutdown procedures
*Tagout procedures	*General housekeeping
*Lifting personnel	*Pre-operation inspections (safety Devices)

Rigging and Flagging

*Responsibility	*Tag lines
*Planning	*Factors of safety
*Types/construction of wire ropes	*Rope bending radius
*Hardware - fittings/type/plate clamp	*Installation of wire rope clips
*Flagging - Use of hand signals - Use of radio-telephone - Knowledge of cranes/hoisting equipment - Responsibilities - Two-crane operation - Blind spots - Special conditions - Environment - High visibility clothing/gloves	*Cranes (General)
	*Types of hitches - handling of load
	*Load weight determination and center of gravity
	*Special lifting devices equipment
	*Slings - construction, type, angles, material type, wire rope, nylon, Chains
	*Inspection and maintenance care of Ropes and attachments
	*Personnel safety

Inspection and Maintenance

*Manufacturer's service manual/Specifications	*Lubrications
*Oil samples	*ASME/OSHA standards and other governing documents
*Load/operations tests	*Housekeeping
*Wire ropes/blocks/hooks	*Testing operating control mechanisms
*Nondestructive test requirements	*Crucial points/parts (what to look for)
*Tagouts/hold orders	*Responsibilities
*Records/forms	*Planning and scheduling

Overhead Crane Operating Practices and Functional Characteristics

*Applicable standards	*Responsibilities
*Planning (safe load path) --Lifting over or near personnel --Load weight determination --Handling of load --Emergency procedures -- Emergency egress -- Emergency load landing location -- Emergency stop switch --Communications and flagging	*Housekeeping --Magazines/papers --Radios --Nonstandard chairs --Rags --Oil --Food/drink containers
*Types of controllers --Radio --Pendant --Cab	*Rigging (from operator's perspective)
*Moving the load --Two-hoist operation --Safe load path	*Limits of travel --Bridge --Trolley --Hoists
*Pre-operational checks and inspections --Walk-down inspections --Control functional checks --Safety devices	*Safety devices --Overload/overheat devices --Hoist limit switches --Horns/warning devices --Bridge/trolley rails limit switches
*Shutdown and securing --Load and set down --Controls off --Power shut off --Earthquake restraints (where applicable)	*Special controls --Jogging --Inching --Plugging
*Manufacturer's operational manual --Walk down inspection requirements --Maintenance requirements	*Maintenance location --Hold orders --Floor barriers (maintenance) --Floor barriers (NDT/X-rays)

Rigging and Flagging

*Responsibility	*Factors of safety
*Planning	*Rope bending radius
*Types/construction of wire ropes	*Installation of wire rope clips
*Hardware - fittings/type/plate clamp	*Flagging - Use of hand signals - Use of radio-telephone - Knowledge of cranes/hoisting equipment - Responsibilities (related to rigging) - Two-crane operations - Special conditions - Blind spots - Environment
*Load weight determination and Center of gravity	
*Cranes (General)	
*Types of hitches - handling of load equipment	
*Special lifting devices	
*Slings - construction, type, angles, Material type, wire rope, nylon, Chains	
*Inspection and maintenance care of Ropes and attachments	
*Personnel safety - High visibility clothing/gloves	*Tag lines

Inspection, Maintenance (Pertaining to Inspections) and Functional Makeup of Cranes

*Manufacturer's service manuals	Testing operating control mechanisms
*Manufacturer's specifications/Drawings	*Load/operating tests
*Wire rope, blocks, hooks	*Records/forms
*Crucial points/parts -What to investigate -Where to investigate -When to investigate	*Lubrication

Appendix C Approved Training Courses

Approved Training Courses

Overhead Cranes

TVA Except TVAN

- ATIS Number 00059111, Overhead Crane Operators Certification, provided by Power Service Shops
- ATIS Number 00061328, Overhead Crane Coordinator

TVAN

- MTS 037.001, Operating Practices and Functional Characteristics
- MTS 037.002, Rigging Fundamentals
- MTS 037.003, Electrical Maintenance
- MTS 037.006, Certification Skills for Overhead Cab-Operated Cranes

Mobile Cranes

- ATIS Number 00059110, Mobile Crane Training, provided by Heavy Equipment Division.

Mobile Crane Certifications – ATIS Numbers

*0-20 Ton Hydraulic Telescoping Boom Crane	00059167
*21-90 Ton Hydraulic Telescoping Boom Crane	00059168
*91 Ton & Larger Hydraulic Telescoping Boom Crane	00059169
*Crawler Mounted Hydraulic Crane	00059170
*Commercial Truck Mounted Hydraulic Crane	00059171
*Articulating Boom Hydraulic Crane	00059172
*Fixed Boom Truck Mounted Friction Crane	00059173
*Fixed Boom Truck Mounted Friction Crane with Tower Attachment	00059174
*Fixed Boom Crawler Mounted Friction Crane	00059175
*Fixed Boom Crawler Mounted Hydraulic Crane	00059176
*Fixed Boom Crawler Mounted Friction Crane with Tower Attachment	00059177
*Fixed Boom Crawler Mounted Hydraulic Crane with Tower Attachment	00059178
*Fixed Boom Crawler Mounted Friction Crane with Ringer Attachment	00059179
*Fixed Boom Crawler Mounted Hydraulic Crane with Ringer Attachment	00059180
*Fixed Boom Crawler Mounted Friction Crane with Luffer Attachment	00059181
*Fixed Boom Crawler Mounted Hydraulic Crane with Luffer Attachment	00059182
*Mobile Crane Field Coordinator	00059183
*Mobile Crane Skills Evaluator	00059184
*Mobile Crane Annual Inspector	00059185

Pendant Cranes

TVA Except TVAN

- ATIS Number 00059112, Pendant Crane Operator Training, provided by Power Service Shops

TVAN

- MTS 037.005, Pendant Crane Operator Qualification

Radio-Operated Cranes

TVAN

- MTS 037.007, Radio-Operated Cranes Certification

Rigging and Signals

TVA except TVAN

- ATIS Number 00059147, Rigging and Hand Signals, provided by Heavy Equipment Division
- ATIS Number 00010263, Rigging and Hand Signals, provided by Power Service Shops

TVAN

- MTS 037.002, Rigging Fundamentals
- MTS 037.002R, Rigging Fundamentals, Retraining (3 year frequency)
- MTS 037.009, Rigging Fundamentals (for inspection only)

Appendix D Contractor Crane Operator Medical Certification

Click for TVA Form 17632 - Contractor Crane Operator Medical Certification [2]

Appendix E Operator's Mobile Crane Preoperational Inspection

Click for TVA Form 40345 - Operator's Mobile Crane Preoperational Inspection [3]

Appendix F Operator's Overhead Crane Preoperational Inspection

Click for TVA Form 17672 - Operator's Overhead Crane Preoperational Inspection [4]

Appendix G Monthly Overhead Crane Inspection

Click for TVA Form 17775 - Overhead Crane Monthly Inspection [5]

Appendix H Monthly Mobile Crane Inspection

Click for TVA Form 17774 - Operator's Monthly Mobile Crane Safety Inspection [6]

Appendix I TVAN Requirements - Control of Heavy Loads (NUREG-0612)

TVAN Requirements - Control of Heavy Loads (NUREG-0612)

1. TVAN has overhead handling systems that are used to handle heavy loads in the area of the reactor vessel, near spent fuel in the spent fuel pool (SFP), or in other areas where an accidental drop may damage safe shutdown systems. Accordingly, TVAN has addressed NRC concerns at each site on NUREG-0612 through implementation of guidelines contained in this section.
2. Administrative controls have been established to control heavy loads in accordance with the following:
    1. Safe load paths have been established for the movement of heavy loads by:
        a. Clearly defining safe load paths in plant procedures and/or equipment layout drawings.
        b. Discussing safe load paths in detail with the crane operator and rigging/flagging personnel before each heavy load lift.
        c. Clearly marking the path on the floor where practical.
        d. Obtaining Plant Operation Review Committee approved deviations from defined safe load paths.
3. Load handling procedures have been developed for heavy loads to include:
    a. Assignment of a Person-in-Charge (PIC) of the lift.
    b. Identification of required equipment.
    c. Inspections and acceptance criteria required before movement of the load.
    d. Steps and proper sequence to be followed in handling the load including weights, sling locations, balance points, methods of attachment, and other pertinent features to be considered as necessary.
    e. Special handling precautions due to the weight, size, susceptibility to shock damage, high nil ductility transition temperatures, or any conditions that warrant special consideration.
    f. Limiting miscellaneous lifts in critical lifting zones to 50% of the crane/hoist rated capacity, and ensuring rigging equipment is rated at twice the weight of the load.
    g. Safe load path.
4. Crane operators are verified to be certified or qualified in accordance with this SDP.
5. NUREG-0612 Special Lifting Devices will satisfy the guidelines of ANSI N14.6 including a minimum factor of safety of 5 to 1.
6. Ensure lifting devices that are not specially designed are maintained and used in accordance with the guidelines of ASME B30.9 including a minimum factor of safety of 5 to 1.
7. A crane or hoist used for heavy load lifts will be verified to comply with the inspection requirements before each identified lift.

8. Heavy load handling cranes or hoists must meet the applicable criteria and guidelines of the applicable ASME standard for which the hoist was designed as determined by Site Engineering.

Definitions for Heavy Lifts

Critical Lift Zone (CLZ) - Areas, whether permanent or temporary, in designated strategic regions of the plant where a load-drop impact could potentially release radioactive material into the environment or prevent equipment from functioning that may be required to achieve and maintain safe shutdown.

Heavy Load Lift (NUREG-0612) - Any load carried in a CLZ after a plant becomes operational that weighs more than the combined weight of a single-spent fuel assembly and its associated load-handling tool for the specific plant.

Miscellaneous Lift (In CLZ) - A NUREG-0612 lift not previously defined which is limited to 50% of the crane/hoist rated capacity and is made using rigging equipment rated for twice the load weight.

Safe Load Path (NUREG-0612) - A path defined for transport of a heavy load that will minimize adverse effects in terms of releases of radioactive material and damage to safety systems if the load is dropped. This path is administratively controlled by procedures and/or clearly outlined by markings on the floor where the load is to be handled. It may also be enforced by mechanical stops and/or electrical interlocks.

Appendix J Planned Engineered Lift Requirements

Planned Engineered Lift Requirements

Before making lifts in excess of the rated load, except rated load test, the following requirements as specified in ASME B30.2 must be met:

A. Site Engineering must determine the accurate weight of the load (including weight of lifting hardware) to be lifted by use of approved drawings or calculations.
B. The maintenance history of the crane will be reviewed, including reports of any prior special overrated load lifts.
C. Structural, mechanical, and electrical components of the crane design will be checked by Site Engineering.
D. The crane-supporting structural design will be checked by Site Engineering for conformance to AISC or other applicable design standards.
E. A complete periodic inspection of the crane will be made just before making the lift. The crane support will be inspected and any deterioration or damage will be taken into consideration in Site Engineering calculations.
F. The lift checklist will be approved with signatures by the Plant Manager/Site Engineer or their designees.
G. The lift will be made as a high-hazard lift under the direction of a PIC designated by the responsible supervisor.
H. The operator will test the crane during the special overrated load lift by lifting the load a short distance and allowing the brakes to set to assure they will hold the load.
I. During performance of this lift, only one crane function at a time will be performed, that is, only the bridge or the trolley or one hoist may be operated at any given time.
J. Completed High Hazard Checklist will be maintained with the Work Order or Work plan Package.
K. After the planned engineered lift is concluded, a complete periodic inspection of the crane will be made before the crane is used for any other lifts.
L. Frequency of Planned Engineered Lifts will be limited to two such lifts during a continuous 12 month period and a maximum load of 125 percent of the rated capacity unless approved by the crane manufacturer.

Appendix K Operations Near Electrical Power Lines

Operations Near Electrical Power Lines

OPERATIONS NEAR ELECTRIC POWER LINES OUTSIDE SWITCHYARDS

A. Know where the overhead power lines are located in the work area.

B. Treat all wires and electrical equipment as energized until confirmed with hold order. Preplan the work activity to identify and maintain clearance during the operation.

C. When equipment is set up to operate within boom's length of the minimum clearance distance to power lines, develop a high hazard lift plan. The high hazard lift plan will cover all specific job activities and will be discussed with all persons involved in the operation.

D. Whenever possible, operate cranes near power lines only when they have been deenergized and visibly grounded at both sides of the point of work.

E. If necessary to work near energized lines, erect insulating barriers where possible to prevent physical contact with the lines. The barriers cannot be a part of or an attachment to the equipment or machine.

F. If necessary to work near energized lines without insulating barriers, observe the following restrictions:

1. Maintain minimum clearances given in Table 1 of this appendix.
2. Designate a person to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. Specifically, the qualified signal person is assigned to observe the clearance when the crane moves within a boom's length of the minimum clearance distance.
3. When cage-type boom guards, insulating links, or proximity warning devices are used on cranes, ensure such devices do not alter the requirements of any other regulation of this part, even if such devices are required by law or regulation.
4. Any overhead wire is considered to be an energized line unless and until the appropriate TVA systems dispatcher notifies that it is not an energized line and it has been visibly grounded.
5. Before working near transmitter towers where an electrical charge can be induced in the equipment or materials being handled, the transmitter is deenergized, or tests are made to determine if an electrical charge is induced on the crane. The following precautions will be taken when necessary to dissipate induced voltages:
   a. Provide the equipment with an electrical ground directly to the upper rotating structure supporting the boom.
   b. Attach grounded jumper cables to material being handled by boom equipment when electrical charge is induced while working near energized transmitters. Provide crews with nonconductive poles having large alligator clips or other similar protection to attach the ground cable to the load.
   c. Remove combustible and flammable materials from the immediate areas prior to operation.

G. If after reviewing this procedure, any questions arise regarding crane operations near power lines contact the responsible supervisor or the crane coordinator for assistance.

Table 1

REQUIRED CLEARANCE FOR OPERATIONS NEAR HIGH-VOLTAGE POWER LINES AND FOR OPERATIONS IN TRANSIT WITH NO LOAD AND ROOM FOR MAST LOWERED	
Normal Voltage, kV (Phase-t o-Phase)	Minimum Required Clearance, ft
Operation Near High-Voltage Power Lines	
0 to 50	10
Over 50 to 200	15
Over 200 to 350	20
Over 350 to 500	25
Over 500 to 750	35
Over 750 to 1000	45
Operation in Transit With No load and Boom or Mast Lowered	
0 to 0.75	4
Over 0.75 to 50	6
Over 50 to 343	10
Over 345 to 750	16
Over 750 to 1000	20

Appendix L TVAN Training Modules and Matrices

TVAN Training Modules and Matrices

Overhead Crane - Qualification Training Module Description

MODULE 1 (MTS 037.001) - Operating Practices and Functional Characteristics

Teaches the safety aspects to consider when operating cranes. Uses lecture with overhead transparencies and covers the following subjects:

A. Applicable Standards.
B. Responsibilities.
C. Planning.
D. Rigging for Operators.
E. Moving the Load.
F. Preoperational Checks and Inspections.
G. Shutdown and Securing.
H. Maintenance Location.
I. Housekeeping.
J. Manufacturer's Operator Manual.
K. Types of Controllers.
L. Safety Devices.
M. Limits of Travel.
N. Special Controls.
O. NUREG 0612.

MODULE 2 (MTS 037.002) - Rigging Fundamentals

(MTS 037.009) - Rigging Fundamentals (for inspection only)

(MTS 037.002R) – Rigging Fundamentals Retraining

Teaches fundamental techniques for inspecting and using rigging equipment. Includes special hoisting techniques, as well as techniques for moving a load with jacks, rollers, and skids. Emphasizes study of ASME Standard crane signals.

MODULE 3 (MTS 037.003) - Electrical Maintenance

Teaches specific maintenance and repair of hoist drive systems and components (including all aspects of hoist travel limiting devices)on overhead cranes.

MODULE 4 (MTS 037.005) - Pendant Crane Operator Qualification

Qualifies personnel to operate light-duty pendant controlled hoist and cranes including a skills test in which they will attain a score of 100%:

MODULE 5 (MTS 037.006) - Certification Skills for O/H cab-operated cranes

Verifies and documents that a candidate can successfully inspect, test, and operate overhead cab operating cranes.

MODULE 6 (MTS 037.007) - Certification Skills for Radio-Operated Crane

Verifies and documents that a candidate can successfully inspect, test, and operate a radio- controlled overhead crane.

Mobile Crane - Qualification Training Module Description

MODULE 1 - Operating Principles and Procedures

Teaches the basic principles of mobile crane functional characteristics. Reviews operating procedures including responsibility, crane selection, and key considerations for planning the lift.

MODULE 2 - Crane Setup

Teaches the key elements to evaluate and practice when setting up a mobile crane to make a lift. Controlling factors determining crane setup include knowing the weight of the load, the maximum radius, and the height of the load is to be lifted.

MODULE 3 - Load Charts

Reviews how load charts are developed and the key considerations given to the development. Emphasizes that understanding and correctly using the load charts are critical to the safe operation of the mobile crane. Illustrates and teaches how to use the load charts in various configurations.

MODULE 4 - Rigging and Flagging

Teaches fundamental rigging practices. Includes methods for inspecting, handling, and using rigging for crane operations. Covers standard-based signals for mobile cranes.

MODULE 5 - Inspection and Maintenance (Preoperational & Monthly)

Reviews inspection and maintenance requirements for preoperational and monthly inspection activities. Emphasizes the preventive-maintenance requirements as part of the inspection.

MODULE 6 -- Skills Test

Mobile crane operators must be certified on each type of mobile crane they operate.

Overhead Crane Qualification - Training Matrix Qualifying Position

Qualification Training Modules	Crane Coordinators	Crane Inspectors Monthly	Instructors	Lead Crane Maintenance Personnel	Pendant Crane Operator	Rigging Personnel	Crane Operators	Certifiers	Supervisors
Module 1 - Operating Practices and Functional Characteristics	1		2	1			1	1	1
Module 2 - Rigging Fundamentals	1	1	2	1	1	1,4	1	1	1
Module 3 - Electrical Maintenance	1		2	3					1
Module 4 - Pendant Cranes	1	1	2		1,4			1	1
Module 5 - Skills Test for Cab Operated	1	1	2				1	1	
Module 6 - Skills Test for Radio Controlled							1	1	

1. Required for position qualification.
2. Instructor qualification requirements. Instructors must be qualified only on modules to which they have been assigned responsibility for conducting.
3. Selective position qualification requirements. In lieu of module 3 each site may provide equivalent training module(s) tailored to site specific needs.
4. Includes performance evaluation for position qualification.

- Supervisors are required to be qualified only for modules applicable to tasks performed by their discipline.

Mobile Crane Qualification - Training Matrix Qualifying / Certifying Positions

Qualification Training Modules	Certifiers	Crane Operators	Crane Coordinators	Crane Inspectors	Instructors	Rigging Personnel	Supervisors
Module 1 - Operating Practices and Functional Characteristics	1	1	1	1	2		1
Module 2 - Crane Setup	1	1	1	1	2		1
Module 3 - Load Charts	1	1	1	1	2		1
Module 4 - (MTS 37.002 & 37.002R) Rigging and Flagging	1	1	1	1	2	1,3	1
Module 5 - Inspection and Maintenance (Preoperation & Monthly)	1	1	1	1	2		1
Module 6 - Skills test of each type crane	1	1					

1. Required for position qualification.
2. Instructor qualification requirements. Instructors must be qualified only on modules to which they have been assigned responsibility for conducting.

3. Includes performance evaluation for position qualification.

References

[1] http://sharepoint.tva.gov/sites/osfg/4/Health%20and%20Safety%20Training/Forms/AllItems.aspx
[2] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072560900
[3] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072561829
[4] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072560942
[5] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072561092
[6] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072561090

Procedure 803 Drilling or Chipping in Concrete

TVA Safety Manual

803 Drilling or Chipping in Concrete

Procedure Number 803

TVA Safety Procedure

Drilling or Chipping in Concrete

Revision 3

April 18, 2008

Purpose

The purpose of this procedure is to establish the method of review and approval prior to the performance of drilling, chipping, or altering permanent concrete, masonry, and concrete structural members.

Roles and Responsibilities

1. All managers, supervisors, system engineers, foremen, and employees shall be responsible for ensuring compliance with the requirements of this procedure. They are also responsible for properly evaluating locations where drilling and chipping operations will be performed.
2. The “Drilling and Chipping in Concrete Permit” is normally prepared by the supervisor responsible for the work. **Note: For hydro facilities, this is the organization which initiates the work. For example, Design Engineering will prepare the permit for engineered plant changes. The plant will prepare the permit for maintenance activities. Also, the implementor shall review the permit for completeness and accuracy and resolve any discrepancies with the initiator before starting work. Partners and contractors shall be informed of the requirements of this procedure and are responsible for implementing the requirements including proper use of the “Drilling and Chipping in Concrete Permit”.**

Requirements for Drilling or Chipping in Concrete

1. Prior to drilling or chipping into permanent plant concrete, (floors, walls, ceilings, and structural supports), locations for such work shall be reviewed to ensure that embedded electrical conduit, piping, cable troughs, reinforcing steel, duct work, tunnels, and other plant equipment are not jeopardized. Planned work shall be reviewed by the responsible engineer before a drilling and chipping permit is issued.
2. The responsible supervisor shall identify any hidden hazards and obtain the necessary hold orders before work is initiated.
3. Prior to the start of drilling or chipping in concrete, ensure that adjacent or nearby sensitive equipment is identified and properly protected from dust.
4. Ensure that the person performing the drilling or chipping is properly protected from exposure to silica dust by using approved respiratory protection. Respiratory protection may not be required when dust is controlled by wet core drilling. See TVA Safety Procedure 312, “Respiratory Protection”.
5. Ensure the person performing the drilling or chipping is wearing proper personal protective equipment; this includes eye protection (goggles), hard hat, hearing protection and suitable work gloves.
6. Make an actual layout of the area to be drilled, chipped, or altered before the performance of the work. Ensure that all parties that review and approve the work know the exact area affected and eliminate potential for error.

7. Include all information required to locate the exact spot for drilling, or chipping by relating to elevations, distance from column lines, and other location references used on plant drawings. Include a brief description of the work or job to be performed indicating the extent and depth of drilling or chipping required.
8. Use a drill stop device to interrupt power to the tool upon contact with an embedded object, when analysis indicates a probability of such contact.
9. Immediately notify the unit operator of any incident resulting from the permitted work.

Use of a Drilling or Chipping in Concrete Permit

1. Prior to beginning drilling or chipping in concrete a properly completed "Drilling or Chipping in Concrete Permit," Appendix A shall be prepared.
   Exception: A "Drilling or Chipping in Concrete Permit" is not required by River Operations for drilling to install concrete anchors if the embedment depth is less than 5 inches and a concrete bit is used.
   Exception: A "Drilling or Chipping in Concrete Permit" is not required by Nuclear Power Group when installing concrete anchors if using a concrete bit with a device such as a drill stop and it has been determined that the drill depth will not contact energized circuits or piping.
2. Whenever drilling or chipping in concrete does not require the use of a permit as allowed by item #1 above or when the result of all efforts to identify embedded objects are inconclusive, employees shall be insulated and / or isolated from contact with an energized energy source and ground potential through the use of suitable tools, equipment, and / or personal protective equipment (PPE). Examples of equipment and PPE that may be required are: double-insulated electrical tools with insulated handles; drill-stop equipment; ground fault circuit interrupters; rubber mats; eye protection; electrically-rated protective gloves and footwear; etc.
3. The permit shall include the following information:
   - A complete description of the work to be performed
   - The location of the work
   - Reference drawings reviewed
   - Hold Order
   - Protection required for nearby equipment
   - Special Precautions, including personal protective equipment and tools, dust containment
   - Special equipment required, i.e. a drill stop device
   - Authorization / approval for work to be performed by the responsible manager / supervisor or engineer
   - A copy of the permit shall be provided to the unit operator of the affected unit
4. Upon completion of the work, the permit shall be closed and retained with the work package.

Definitions

Drill Stop Device is a device that is intended primarily to sense the presence of grounded metal in concrete and to prevent accidental cutting of reinforcing bar and conduit by turning off the power to the drilling unit when grounded metal is encountered. The job of detecting concealed rebar and conduit necessitates electrical isolation of the drilling unit from its conventional grounding connection.

Appendix A Drilling or Chipping in Concrete Permit

Click for TVA Form 17717 - TVA Drilling or Chipping in Concrete Permit [1]

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072561002

Procedure 804 Excavations and Trenching

TVA Safety Manual

804 Excavations and Trenching

Procedure Number 804

TVA Safety Procedure

Excavations and Trenching

Revision 4

April 18, 2008

Purpose

The purpose of this procedure is to establish requirements for excavation and trenching operations.

Roles and Responsibilities

1. The responsible manager, supervisor or foreman is responsible for complying with this procedure and initiating the Excavation Permit.
2. The designated Competent Person is responsible for evaluating a proposed excavation site to determine:
   - What, if any surface encumbrances need to be removed or supported.
   - What protective measures are most appropriate to the site, i.e., sloping or shoring/shielding to most effectively protect employees and property.
   - The soil classification to ensure the adequacy of sloping or shoring/shielding.
   - Whether the excavation and / or the protective systems will require approval or design by a registered professional engineer.
   - Whether the excavation will require testing/monitoring for oxygen deficiency or flammable/toxic atmospheres.
3. A registered professional engineer must evaluate the excavation and/or design/approve any protective system under any of the conditions listed below. The engineer must also sign the permit under any of these conditions.
   - When the excavation will exceed 20 feet in depth,
   - When using a sloping protective measure or shoring/shielding protective measures NOT specified by 29 Code of Federal Regulations 1926, Subpart P, “Excavations",
   - Any excavation adjacent to or beneath any structure or foundation such that the stability of the structure could be affected.
4. At least one copy of the design shall be maintained at the job site during the construction of the excavation protective system. The design(s) will remain with the excavation permit and shall identify the registered professional engineer.

Basic Requirements for Excavations

1. Prior to beginning any excavation, an Excavation Permit (Appendix A) shall be initiated by the responsible foreman / supervisor. The permit shall include the following information:
   - A plant specific administrative cover page with Part A & B. Part A includes a plant specific sequential number (Plant/EXC/yr/number; e.g. ALF-EXC-0501) and the appropriate reviews for permit approval. Approvals are based on the subject matter expert's safety assessment within their area of expertise of the proposed excavation. Part B includes approvals for completion and final closure of the permit.
   - A description of the work to be performed.
   - Exact location of the excavation and the embedded systems such as piping, electrical conduit, etc., that are to be located and marked.
   - The hold order numbers on systems that have to be de-energized because they are located in or near the excavation.
   - Any drawings or sketches needed to locate these embedded systems.
2. A competent person shall be designated and trained to evaluate and monitor all excavation work.
3. Before beginning the actual excavation, the foreman/supervisor shall ensure the following actions have been taken:
   - The excavation area has been checked for embedded pipes and other utilities and their locations identified and marked.
   - Pipes/utilities (including overhead power lines which could be contacted by excavation equipment) are de-energized/blanked off and necessary hold orders are in effect.
   - Protective measures are taken when power excavating machines, e.g., backhoes, can contact an energized electric circuit, exposed or concealed, as follows:
   - Ground the excavating machine with a temporary protective ground installed in accordance with Safety Procedure 1109; "Protective Grounding," paragraphs 3 (equipment grounds), 6.14 (ground rod size), and 6.15 (number of ground rods). The temporary protective ground is selected and tested prior to use in accordance with Safety Procedure 1008, "Temporary Protective Grounding for Generating Stations and Other Non-Transmission Facilities."

   Warning: Do not drive ground rods where underground energized circuits may be present or inside a switchyard due to the presence of underground facilities. Grounding in a switchyard/substation must be in accordance Safety Procedure 1109, paragraph 4, the preferred grounding point is structural steel that is tied to the substation ground mat.

   - Use a portable ground mat that is bonded to the machine for the operator to stand on, if the operator must stand on the ground while operating the machine. The bonded mat protects the operator from differences of potential if the machine contacts an energized circuit.
   - Use barricades to guard against hazardous differences in potential that would develop at the machine or a driven ground rod if the machine contacts an energized circuit. Examples of barricades are orange barrier tape and danger cones placed at least 3 m (10 ft) from the ground rod and the machine.

   Note: Where energized circuits are positively identified and the excavating machine will not be operated close enough to contact the circuit, temporary protective grounding is not required.

   - Employees have been briefed on the permit, work procedures, special hazards, and required personal protective equipment (PPE). When an excavating machine is operating and grounded, employees (not including the operator) are instructed to remain outside barricades (3 m (10 ft) from a grounded machine, a driven ground rod(s), or other grounding connection point).
4. After the above actions have been taken, the foreman/supervisor shall complete and sign the permit and post the permit at the excavation site. Excavation can then begin.

5. Before employees are allowed to enter an excavation over four (4) feet deep, the competent person shall ensure and annotate on the permit that the following conditions have been addressed:
   - The shoring/shielding or sloping systems meet requirements.
   - Evaluation of the excavation for potential oxygen deficiency or hazardous atmospheres see TVA Safety Procedure 801, “Confined Space Entry”, • Adequate means of egress is provided at least every 25 feet within the excavation, i.e., ladders, steps or ramps.
   - Adequate warnings, barricades or stop-logs provided if mobile equipment is to be operated adjacent to the excavation.
   - Excavated material and equipment positioned at least two (2) feet from the edge of the excavation and/or otherwise restrained from falling into the excavation.
   - Adequate barricades and warning signs provided in proximity to pedestrians or vehicle traffic.
   - Standard guardrails provided when employees have to cross the excavation by bridge or ramp or when they must work near the edge of the excavation.
   - Adequate precautions are being taken to control water accumulation.

Evaluation Of the Excavation Site

1. The competent person shall evaluate the proposed excavation site and complete/sign the excavation permit. The competent person is responsible for making the key decisions on whether protective systems are needed and if so, what method of protection is needed.
2. The competent person must make a number of decisions which shall be documented on the excavation permit. These include:
3. Will the excavation undercut a structure/sidewalk, etc., or be close to the foundation of a structure? If so, a registered professional engineer shall design/approve shoring or stability of the structure in question.
4. Will conditions permit sloping the excavation sides to one and one half horizontal to one vertical (34 degrees)? If not, other sloping or shoring protective systems options require that the soil type be evaluated and classified according to type soil. This may require actual excavation to allow the competent person to determine the soil structure. However, no employees may enter the excavation until protective systems are in place.
5. If sloping is selected as the protective system, option one under paragraph 29CFR1926.652(b) does not require soil classification since a 34 degree slope is considered to be the maximum allowable slope for the most unstable of soils. If option two, three or four is selected, the competent person must classify the soil as type A, B or C using the specified testing methods outlined in the above standard. Option four requires design/approval by a registered professional engineer.
6. If shoring or shielding is selected as the protective system the soil type must be tested and classified as type A, B or C and one of the four options in 29CFR1926.652(c) specified. Option three or four require design/approval by a registered professional engineer.

Protection from Hazards Associated with Water Accumulation

1. Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed.
2. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.
3. If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by the competent person to ensure proper operation.
4. Trenches shall be carefully inspected by the competent person after each rain and before employees are permitted to re-enter the trench.

Inspections of Excavations

1. Daily inspections of excavations, the adjacent areas, and protective systems shall be made by the competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. The competent person shall be authorized to shut down operations and evacuate employees from the excavation if a hazardous condition which could be unsanitary, hazardous or dangerous to employees is detected.
2. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence, when there is a change in the size, location, or placement of the spoil pile, or when there is any indication of change or movement in adjacent structures. These inspections are only required when employee exposure can be reasonably anticipated.
3. The competent person shall sign and date the inspection log portion of the permit after each inspection.
4. Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

Determination of Soil Type

1. Soil and rock is classified into one of four types. These types are (1) Stable Rock, (2) Type A Soil, (3) Type B Soil, and (4) Type C Soil. This classification is based on visual and manual tests of both the physical characteristics of the soil itself and structural defects such as fissures and stratified layers or previously disturbed soil observed within the excavation.
2. Stable rock is natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed. It is usually identified by a rock name such as granite or sandstone. Determining whether a deposit is of this type may be difficult unless it is known whether cracks exist and whether or not the cracks run into or away from the excavation.
3. Type A soils are cohesive soils with an unconfined compressive strength of 1.5 tons per square foot (tsf) or greater. Examples of Type A cohesive soils are often: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. (No soil is Type A if it is fissured, is subject to vibration of any type, has previously been disturbed, is part of a sloped, layered system where the layers dip into the excavation on a slope of 4 horizontal to 1 vertical (4H:1V) or greater, or has seeping water).
4. Type B soils are cohesive soils with an unconfined compressive strength greater than 0.5 tsf but less than 1.5 tsf. Examples of Type B soils are: angular gravel; silt; silt loam; previously disturbed soils unless otherwise classified as Type C; soils that meet the unconfined compressive strength or cementation requirements of Type A soils but are fissured or subject to vibration; dry unstable rock; layered systems sloping into the trench at a slope less than 4H:1V (only if the material would be classified as a Type B soil).
5. Type C soils are cohesive soils with an unconfined compressive strength of 0.5 tsf or less. Type C soils include granular soils such as gravel, sand and loamy sand, submerged soil, soil from which water is freely seeping, and submerged rock that is not stable. Also included is material in a sloped, layered system where the layers dip into the excavation or have a slope of four horizontal to one vertical (4H:1V) or greater.
6. Where soils are configured in layers, i.e., where a layered geologic structure exists, the soil must be classified on the basis of the soil classification of the weakest soil layer. Each layer may be classified individually if a more stable layer lies below a less stable layer, i.e., where a Type C soil rests on top of stable rock.

Test Equipment and Methods for Evaluating Soil Type

1. Pocket Penetrometers are direct-reading, spring-operated instruments used to determine the unconfined compressive strength of saturated cohesive soils. Once pushed into the soil, an indicator sleeve displays the reading.
2. SHEARVANE (TORVANE) To determine the unconfined compressive strength of the soil with a shearvane, the blades of the vane are pressed into a level section of undisturbed soil, and the torsional knob is slowly turned until soil failure occurs.
3. Thumb Penetration Test involves an attempt to press the thumb firmly into the soil in question. If the thumb makes an indentation in the soil only with great difficulty, the soil is probably Type A. If the thumb penetrates no further than the length of the thumb nail, it is probably Type B soil, and if the thumb penetrates the full length of the thumb, it is Type C soil. The thumb test is subjective and is therefore the least accurate of the three methods.
4. Dry Strength Test Dry soil that crumbles freely or with moderate pressure into individual grains is granular. Dry soil that falls into clumps that subsequently break into smaller clumps (and the smaller clumps can be broken only with difficulty) is probably clay in combination with gravel, sand, or silt. If the soil breaks into clumps that do not break into smaller clumps (and the soil can be broken only with difficulty), the soil is considered unfissured unless there is visual indication of fissuring.
5. Plasticity or Wet Thread Test is conducted by molding a moist sample of the soil into a ball and attempting to roll it into a thin thread approximately 1/8 inch (3 mm) in diameter (thick) by two inches (50 mm) in length. The soil sample is held by one end. If the sample does not break or tear, the soil is considered cohesive.
6. >Visual Test is a qualitative evaluation of conditions around the site. In a visual test, the entire excavation site is observed, including the soil adjacent to the site and the soil being excavated. If the soil remains in clumps, it is cohesive; if it appears to be coarse-grained sand or gravel, it is considered granular. The evaluator also checks for any signs of vibration.
7. During a visual test, the evaluator should check for crack-line openings along the failure zone that would indicate tension cracks, look for existing utilities that indicate that the soil has previously been disturbed, and observe the open side of the excavation for indications of layered geologic structuring.
8. The evaluator should also look for signs of bulging, boiling, or sluffing, as well as for signs of surface water seeping from the sides of the excavation or from the water table. If there is standing water in the cut, the evaluator should check for "quick" conditions.
9. The area adjacent to the excavation should be checked for signs of foundations or other intrusions into the failure zone, and the evaluator should check for surcharging and the spoil distance from the edge of the excavation.

Shoring Types

1. Shoring is the provision of a support system for trench faces used to prevent movement of soil, underground utilities, roadways, and foundations. Shoring or shielding is used when the location or depth of the cut makes sloping back to the maximum allowable slope impractical. There are two basic types of shoring, timber and aluminum hydraulic.
2. Shoring systems consist of posts, wales, struts, and sheeting. The trend is toward the use of hydraulic shoring, a prefabricated strut and/or wale system manufactured of aluminum or steel.
3. Hydraulic shoring provides a critical safety advantage over timber shoring because workers do not have to enter the trench to install or remove hydraulic shoring. Other advantages of most hydraulic systems are that they:
    - are light enough to be installed by one worker;
    - are gauge-regulated to ensure even distribution of pressure along the trench line;
    - can have their trench faces "preloaded," to use the soil's natural cohesion to prevent movement; and
    - be adapted easily to various trench depths and widths.

4. All shoring should be installed from the top down and removed from the bottom up. Hydraulic shoring should be checked at least once per shift for leaking hoses and/or cylinders, broken connections, cracked nipples, bent bases, and any other damaged or defective parts.
5. Pneumatic shoring works in a manner similar to hydraulic shoring. The primary difference is that pneumatic shoring uses air pressure in place of hydraulic pressure. A disadvantage to the use of pneumatic shoring is that an air compressor must be on site.
6. Screw jack systems differ from hydraulic and pneumatic systems in that the struts of a screw jack system must be adjusted manually. This creates a hazard because the worker is required to be in the trench in order to adjust the strut. In addition, uniform "preloading" cannot be achieved with screw jacks, and their weight creates handling difficulties.
7. Single-Cylinder Hydraulic Shores are generally used in a waler system, as an assist to timber shoring systems, and in shallow trenches where face stability is required.
8. Underpinning involves stabilizing adjacent structures, foundations, and other intrusions that may have an impact on the excavation. As the term indicates, underpinning is a procedure in which the foundation is physically reinforced. Underpinning should be conducted only under the direction and with the approval of a registered professional engineer.

Shielding Types

1. Trench boxes are different from shoring because, instead of shoring up or otherwise supporting the trench face, they are intended primarily to protect workers from cave-ins and similar incidents.
2. The excavated area between the outside of the trench box and the face of the trench should be as small as possible. The space between the trench boxes and the excavation side are backfilled to prevent lateral movement of the box. Shields may not be subjected to loads exceeding those which the system was designed to withstand.
3. Trench boxes are generally used in open areas, but they also may be used in combination with sloping and benching. The box should extend at least 18 inches (0.45 m) above the surrounding area if there is sloping toward excavation. This can be accomplished by providing a benched area adjacent to the box.
4. Earth excavation to a depth of 2 feet (0.61 m) below the shield is permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench and there are no indications while the trench is open of possible loss of soil from behind or below the bottom of the support system.
5. Conditions of this type require observation on the effects of bulging, heaving, and boiling as well as surcharging, vibration, adjacent structures, etc., on excavating below the bottom of a shield. Careful visual inspection of the conditions mentioned above is the primary and most prudent approach to hazard identification and control.

Sloping Excavated Soil

Maximum allowable slopes for excavations less than 20 feet (6.09 m) based on soil type and angle to the horizontal are as follows:

Soil type	Height/depth ratio	Slope angle
Stable Rock	Vertical	90 degrees
Type A	3/4:1	53 degrees
Type B	1:1	45 degrees
Type C	1 1/2:1	34 degrees
Type A (short-term)	1/2:1	63 degrees

(For a maximum excavation depth of 12 feet)

Benching

1. There are two basic types of benching, simple and multiple. The type of soil determines the horizontal to vertical ratio of the benched side.
2. As a general rule, the bottom vertical height of the trench must not exceed 4 feet (1.2 m) for the first bench.
3. Subsequent benches may be up to a maximum of 5 feet (1.5 m) vertical in Type A soil and 4 ft (1.2 m) in Type B soil to a total trench depth of 20 feet (6.0 m).
4. All subsequent benches must be below the maximum allowable slope for that soil type. For Type B soil the trench excavation is permitted in cohesive soil only.

Spoil (Temporary and Permanent)

1. Temporary spoil must be placed no closer than 2 feet (0.61 m) from the surface edge of the excavation, measured from the nearest base of the spoil to the cut. This distance should not be measured from the crown of the spoil deposit. This distance requirement ensures that loose rock or soil from the temporary spoil will not fall on employees in the trench.
2. Spoil should be placed so that it channels rainwater and other run-off water away from the excavation. Spoil should be placed so that it cannot accidentally run, slide, or fall back into the excavation.
3. Permanent spoil should be placed some distance from the excavation. Permanent spoil is often created where underpasses are built or utilities are buried.
4. The improper placement of permanent spoil, i.e., insufficient distance from the working excavation, can cause an excavation to be out of compliance with the horizontal to vertical ratio requirement for a particular excavation. This can usually be determined through visual observation. Permanent spoil can change undisturbed soil to disturbed soil and dramatically alter slope requirements.

Training and Qualifications

1. All employees who are responsible for supervising or entering excavations and trenches shall complete the training course “Excavating and Trenching - (Affected Person)”. ATIS Number 00059118. This is initial training only, no refresher training is required.
2. The designated competent person shall complete the training course “Excavating and Trenching - (Competent Person)” ATIS Number 00059119, This is initial training only, no refresher training is required. The competent person must be able to demonstrate the following:
   - Training, experience, and knowledge of: soil analysis, use of protective systems, and requirements of 29 CFR Part 1926 Subpart P.
   - Ability to detect: conditions that could result in cave-ins, failures in protective systems, hazardous atmospheres, and other hazards including those associated with confined spaces.
   - Authority to take prompt corrective measures to eliminate existing and predictable hazards and to stop work when required.

Surface Crossing of Trenches

1. Surface crossing of trenches should be discouraged; however, if trenches must be crossed, such crossings are permitted only under the following conditions:
2. Vehicle crossings must be designed by and installed under the supervision of a registered professional engineer.
3. Walkways or bridges must be provided for foot traffic. These structures shall: - have a safety factor of 4, - have a minimum clear width of 20 inches (0.51 m), - be fitted with standard rails, and - extend a minimum of 24 inches (.61 m) past the surface edge of the trench.

Ingress and Egress from Excavations

Access to and exit from the trench require:

- Trenches 4 feet or more in depth should be provided with a fixed means of egress.
- Spacing between ladders or other means of egress must be such that a worker will not have to travel more than 25 feet laterally to the nearest means of egress.
- Ladders must be secured and extend a minimum of 36 inches (0.9 m) above the landing.

Exposure to Vehicles

Procedures to protect employees from being injured or killed by vehicle traffic include:

- providing employees with and requiring them to wear warning vests or other suitable garments marked with or made of reflectorized or high-visibility materials; and
- requiring a designated, trained flagperson along with signs, signals, and barricades when necessary.

Exposure to Falling Loads

Employees must be protected from loads or objects falling from lifting or digging equipment. Procedures designed to ensure their protection include:

- Employees are not permitted to work under raised loads.
- Employees are required to stand away from equipment that is being loaded or unloaded.
- Equipment operators or truck drivers may stay in their equipment during loading and unloading if the equipment is properly equipped with a cab shield or adequate canopy.

Warning Systems for Mobile Equipment

The following steps should be taken to prevent vehicles from accidentally falling into the trench:

- Barricades must be installed where necessary.
- Hand or mechanical signals must be used as required.
- Stop logs must be installed if there is a danger of vehicles falling into the trench.
- Soil should be graded away from the excavation; this will assist in vehicle control and channeling of run-off water.

Hazardous Atmospheres and Confined Spaces

Employees shall not be permitted to work in hazardous and/or toxic atmospheres. Such atmospheres include those with:

- less than 19.5% or more than 23.5% oxygen,
- a combustible gas concentration greater than 10% of the lower flammable limit, and
- concentrations of hazardous substances that exceed those specified in the Threshold Limit Values for airborne contaminants established by the ACGIH (American Conference of Governmental Industrial Hygienists).

Testing for Atmospheric Contaminants

Testing should be conducted before employees enter a trench and should be done regularly to ensure that the trench remains safe. The frequency of testing should be increased if equipment is operating in the trench or if welding, cutting, or burning is done.

Fall Protection

Walkways shall be provided where employees or equipment are required or permitted to cross over excavations. Standard guardrails shall be provided where walkways are 6 feet (1.8 m) or more above lower levels.

Job Completion and Documentation

1. After the job is completed, the foreman/supervisor shall ensure that:
   - Changes or additions to existing embedded pipes, utilities, etc. have been surveyed and documented on plant/site drawings.
   - Protective shoring if used, is removed starting at the bottom of the excavation in accordance with the manufacturer's instructions, registered engineer's design and competent person's recommendations.
   - The excavation is immediately backfilled.
2. The foreman/supervisor shall complete and sign the permit and send the permit along with any corrected drawings to the responsible manager. The completed permit shall be kept on file for a minimum of six months after completion of the work. The corrected drawings should then be sent to plant/site engineering.

Definitions

Barricade - A substantial (wind resistant) structure which conforms to ANSI D6.1 "Manual On Uniform Traffic Control Devices For Streets and Highways," or a standard railing as specified in 29CFR1926.500(f), "Guardrails, Handrails and Covers."

Benching - Means a method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with a vertical or near-vertical surfaces between levels.

Competent Person is a trained individual (see paragraph 14) who is capable of identifying existing and predictable hazards or working conditions that are unsanitary, hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate or control these hazards and conditions.

Distress means that the soil is in a condition where a cave-in is imminent or is likely to occur. Distress is evidenced by such phenomena as the development of fissures in the face of or adjacent to an open excavation; the subsidence of the edge of an excavation; the slumping of material from the face or the bulging or heaving of material from the bottom of an excavation; the spalling of material from the face of an excavation; and ravelling, i.e., small amounts of material such as pebbles or little clumps of material suddenly separating from the face of an excavation and trickling or rolling down into the excavation. suddenly separating from the face of an excavation and trickling or rolling down into the excavation.

Excavation is any man-made cut, cavity, trench, or depression in an earth surface that is formed by earth removal. A

Trench is a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth of a trench is greater than its width, and the width (measured at the bottom) is not greater than 15 ft (4.6 m). If a form or other structure installed or constructed in an excavation reduces the distance between the form and the side of the excavation to 15 ft (4.6 m) or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.

Maximum Allowable Slope means the steepest incline of an excavation face that is acceptable for the most favorable site conditions as protection against cave-ins, and is expressed as the ratio of horizontal distance to vertical rise (H:V).

Protective System refers to a method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, and from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Registered Professional Engineer A person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a "registered professional engineer," when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

Shielding A structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent or portable and designed to be moved along as work progresses. Shields used in trenches are usually referred to as "trench boxes."

Shoring A structure such as a metal hydraulic, mechanical or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Sloping A method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins.

Subsurface Encumbrances include underground utilities, (sewer, telephone, fuel, electric, water, and other product lines), tunnels, shafts, vaults, foundations, and other underground fixtures or equipment that may be encountered during excavation or trenching work.

Surface Encumbrances Potential surface hazards such as trees or boulders which could become unstable and roll/fall into an excavation or impede traffic flow on an excavation site.

Support System refers to structures such as underpinning, bracing, and shoring that provide support to an adjacent structure or underground installation or to the sides of an excavation or trench.

Reference

29 Code of Federal Regulations 1926, Subpart P Excavations

Appendix A Excavation Permit form TVA 29205

Click for TVA Form 29205 - Excavation Permit Form [1]

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072561711

Procedure 805 Forklift Operations

TVA Safety Manual

805 Forklift Operations

Procedure Number 805

TVA Safety Procedure

Forklift Operations

Revision 4

October 01, 2007

Purpose

This procedure establishes requirements to ensure that forklifts are properly inspected, operated, and maintained, and that employees are properly trained.

Basic Requirements for Forklifts

1. All forklifts purchased, leased, rented and used by TVA plants / facilities shall meet the design and construction requirements of ANSI B56.1, "Safety Standard for Low Lift and High Lift Trucks," and be labeled with manufacturers name, type, model, serial number, capacity, operation, and maintenance instruction plates, tags, or decals approved by a nationally recognized testing laboratory.
2. Forklifts should be selected for use based on NFPA designations.
3. There are 11 different designations in 4 categories:
   - gasoline powered (G), (GS),
   - diesel powered (D), (DS), (DY)
   - liquefied petroleum gas powered (LP), (LPS)
   - electric powered (E), (ES), (EE), EX)
4. In non-hazardous areas, any of the following 11 designations can be used: D, DS, DY, G, GS, LP, LPS, E, ES, EE, and EX.
5. Only forklifts containing the EX designation may be used in coal handling areas. (Such areas would meet the hazardous classification of Class II, Division 2.)
6. In areas containing the possibility of volatile flammable liquids or flammable gases, only forklifts containing the DY, EE, or EX designations may be used. (Such areas would meet the hazardous classification of Class I, Division 2.)
7. In areas where concentrations of carbon monoxide are likely to exceed permissible exposure levels, only electric powered forklifts with E, ES, EE, or EX shall be used.
8. Forklifts shall not be used if the "truck data and capacity plate" is missing or illegible.
9. Forklifts shall be fitted with an overhead guard.
   Note: In a work area that has a low clearance, the overhead guard may be removed however overhead lifts are not allowed in this case.
10. Where lighting is less than two foot-candles, trucks will be equipped with lights.
11. Warning lights shall be provided in areas where noise would interfere with horns or other sound-producing warning devices.

12. Modifications/attachments which affect capacity and safe operation shall not be made without the manufacturer's written approval. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.
    liRemovable attachments (other than fork extensions) shall have a nameplate with the information indicating that "the forklift/attachment combination may be less than the capacity shown on the attachment - consult truck nameplate."

Lift Truck Operations

1. Only trained and certified employees will operate lift trucks. The operator is responsible for the safety of the lift and has the authority to stop work if necessary to correct safety issues prior to continuing a lift.
2. Check the lift truck before placing it in service. If a defect is found or develops during operation, report these conditions immediately to supervision.
3. Do not overload the forklift.
4. Never drive or transport loads with a lift truck while the forks are higher than necessary to clear the road surface.
5. Observe regular traffic rules such as: keep to the right; do not tailgate; keep the truck under control; avoid sharp turns, etc.
6. Persons other than the operator are not permitted to ride on lift trucks.
7. Do not operate lift trucks near the edge of unprotected loading docks, ramps, and platforms.
8. Keep all extremities (head, arms, feet, legs) inside the cab area of the lift truck.
9. Do not allow anyone under or close enough to the forks or load of a lift truck that would allow them to be struck if the load fell.
10. A lift truck used as a work platform shall have a properly designed safety platform securely attached to the forks.
11. Do not move the lift truck forward or reverse while people are on the platform.
12. Bridge plates are to be properly placed and secured if traveling onto trucks or rail cars from a loading dock or platform. Ensure that the truck or car wheels are chocked.
13. Always back down a ramp or incline with a load. Never turn sideways on an incline.
14. Always tilt the load against the backrest before moving the lift truck.
15. Do not handle double-tiered loads unless they are secured together.
16. When making overhead lifts, use a lift truck that has a manufacturer designed overhead guard installed.
17. When a lift truck is left unattended, load engaging means (forks) shall be fully lowered, controls neutralized, power shut off, and the brakes set. Block the wheels if the truck is parked on an incline. . If the operator is more than 25 feet away or forklift is not in sight, the power shall also be shut off.
18. Do not operate a lift truck on any grating floor unless the floor area is known to be structurally adequate to support the lift truck and load.
19. Using a forklift for a below-the-tine lift can only be performed using manufacturer approved lifting attachments. “Free rigging” is prohibited, i.e. the direct placement of rigging equipment (slings, shackles, rings, etc.) onto the tines of a forklift for a below-the-tines lift.
20. A qualified rigger must be used to rig any load to an approved forklift attachment. See TSP 721, “Rigging” for requirements for a qualified rigger.

Forklift Operating Areas

1. Plants/sites shall determine where forklifts shall be permitted to operate, and establish appropriate battery charging, refueling, and loading dock facilities. Mark areas for battery charging or refueling with caution signs to prohibit no open flames, etc.
2. Areas which are classified as hazardous due to the presence of flammable gases, vapors, combustible dust, or easily ignitable fibers shall be identified to determine what type designation of forklift may be used.
3. Aisles or areas for forklift operation shall be designated and clearly marked. These areas/aisles shall be established based on an evaluation of the following factors.
   - Maximum allowable floor loading (assuming a four-to-one safety factor for the heaviest load the forklift can carry).
   - Adequate overhead and side clearances to avoid such problems as hitting beams/pipes, tearing off insulation, or knocking off or making unstable the forklift load. (Clearance limit signs shall be provided when necessary.)

   Note: Congested / high traffic areas identified may require the use of a spotter/signal person for operation in these areas.
4. Pneumatic forklift tires shall not be removed until completely deflated. Following assembly of tires, and rims, a safety cage or restraining device shall be used during tire inflation.

Pre-operational Inspection of Forklift

1. At the beginning of each shift and before operating a forklift, the operator shall complete an inspection report Appendix B “Operators Daily Report Engine-Powered Lift Trucks” or Appendix C “Operator’s Daily Report Battery-Powered Lift Trucks”. If the forklift is found to be in need of repair or unsafe in any way, the matter shall be reported to maintenance and the forklift shall not be operated until repaired. A defective equipment tag shall be placed on the ignition until repaired.
2. The operator’s daily inspection report shall be given to the responsible foreman or supervisor and maintained on file for thirty (30) days.
3. If the forklift passes the preoperational inspection or after the forklift has been repaired, the operator may proceed with normal forklift operations.

Safe Forklift Operating Requirements

1. Tipping over is the leading cause of forklift injuries. Seat belts shall be provided and used.
2. Tip-over can be avoided by slowing down before turning, never turning on a slope, driving with forks or attachments fully lowered and tilted back, avoiding sharp turns (even when unloaded), moving slowly with raised loads, not backing into low overheads with a raised load, not tilting heavy loads to far forward, avoiding hard braking or sudden acceleration, and not exceeding forklift rated lifting capacity.
3. On outside operations stay on the road to avoid soft shoulders, avoid/repair potholes, cross railroad tracks diagonally, and use pneumatic tires (properly inflated) on unpaved roads.
4. Rules to prevent losing loads include:
   - Do not handle double-tiered loads unless secured together.
   - When traveling up or down ramps or inclines, keep the load upgrade. Unloaded trucks should travel with the forks downgrade.
   - Properly support the load, i.e., adjusting fork spread to fully support load, ensuring that the fork length supports at least two-thirds of the load length, centering the load, tilting the load against the backrest.
   - When traveling, keep the load as low as possible to the ground to just maintain ground clearance.
5. Other operating rules to avoid injury include:
   - Keep legs and arms inside the forklift structure.
   - Do not allow passengers on the forklift or forks.

- Do not allow people to pass under or be close enough to raised forks or load to be struck should a load fall.
- Keep hands, feet, and legs out of the upright.
- Do not use the upright for a ladder.
- Watch for pedestrians.
- Sound horn at all intersections.
- If the load obstructs forward view, travel with the load trailing.
- Always look in the direction of travel.

6. Know the rated capacity of elevators and floors/gratings and do not proceed into these areas if the loaded forklift will exceed these ratings. Enter elevator squarely, neutralize the controls, shut off power, and set the brakes.
7. Watch overhead clearances, especially when raising and moving loads, and side clearances when moving wide loads. Keep forks as low as possible at all times to provide maximum overhead clearance and to enhance stability.

Training and Certification of Forklift Operators

1. Only trained and certified employees shall be permitted to operate forklifts. This training shall include both classroom and a skill demonstration exercise. Training course, ATIS Number 00059122, “Forklift Operations, is a 4-hour course required every three years.
2. A current TVA Certification Card, form TVA 18121 shall be issued upon completion of the course and carried at all times by forklift operators, or proof of Certification will be documented in the Training Database of Record.

Preventive Maintenance on Forklifts

1. Preventive/other maintenance, battery charging/changing, and inspections shall be performed only by authorized employees.
2. Preventive maintenance/inspections shall be performed on a regularly scheduled basis in accordance with manufacturer's recommendations. Forklift maintenance manuals shall be obtained from the manufacturer if not presently available at the site.
3. Maintenance/inspection records shall be kept for each forklift.
4. No repairs shall be made in Class I, II, or III locations. Repairs to the fuel and ignition systems which involve fire hazards shall be conducted only in locations designated for such repairs.
5. Forklifts in need of repair to the electrical system shall have the battery disconnected prior to such repairs.
6. The main hazard in the use of LP gas is fire due to leaks. Fittings shall be listed by a recognized testing agency, correctly installed, connections properly tightened before refueling, and checked after refueling to ensure gas is not released into the air.
7. Before disconnecting any part of the engine fuel system of LP gas-powered forklifts, close the tank valve and run the engine until the fuel in the system is depleted and the engine stops. If the engine will not run, close the tank valve and vent the fuel slowly in a well ventilated nonhazardous area.
8. Before disconnecting any part of the engine fuel system of gasoline powered forklifts with gravity feed fuel systems, take precaution to eliminate any possibility of unintentional fuel escape.
9. Forks in use shall be inspected at intervals of not more than 12 months or when any defect or permanent deformation is detected. The forks shall be removed from service if defects (e.g. holes in forks) which might impair safe use are found. Only the manufacturer of the fork shall repair and re-certify forks found to be defective. The inspection date should be marked on the forks with a permanent marker. Detailed fork inspection criteria is found in Appendix A , Fork Inspection Criteria.
10. Replacement parts shall be of equivalent safety to the original design and not degrade the hazard class designation of the forklift.
11. Forklifts shall not be altered from the original design of the manufacturer by the addition or removal of any parts. Additional counter weighting of forklift trucks shall not be done unless approved in writing by the truck manufacturer.

12. Forklifts shall be kept clean and free of excess coal dust, oil, and grease. Only noncombustible or high flash point agents (at or above 100°F) should be used for cleaning trucks. Appropriate precautions shall be taken regarding toxicity, ventilation, and fire hazards.
13. Do not use forklifts in areas where hydrogen may be leaking until the source of the leak has been found, corrected, and the area confirmed free of residual hydrogen gas.

Refueling Operations

1. Refuel only in designated areas.
2. Shut off the engine and maintain a 50-foot distance from sources of ignition when refueling. Clean up spilled fuel immediately.
3. During refueling, stop the engine, have a fire extinguisher available, and make sure the operator is off the forklift.
4. Handle LP gas tanks with care. Physical damage such as dents, scrapes, or gouges may dangerously weaken the tank and make it unsafe for use.

Battery Charging / Changing

1. Battery charging shall be conducted only in designated and clearly marked areas.
2. Means for flushing and neutralizing spilled electrolyte, fire protection, protecting charging apparatus from damage by forklift trucks, and for adequate ventilation and diffusion of gases from the battery(s) to prevent the accumulation of an explosive mixture.
3. A conveyor, overhead hoist, or equivalent material handling equipment shall be provided for handling batteries.
4. Eye wash / emergency shower facilities shall be provided within 25 feet of a battery changing area or where battery charging is performed that includes removing or refilling batteries.
5. Only trained and authorized personnel shall perform battery changing and charging operations.
6. Trucks shall be properly positioned and brake applied before attempting to change or charge batteries.
7. Ensure that the forklift is properly secured to prevent tipping due to overbalancing. Reinstalled batteries shall be properly positioned and secured in the forklift.
8. A carboy tilter or siphon shall be used for handling electrolyte and protective chemical goggles or face shield, rubber gloves, and aprons shall be worn. Acid shall always be poured into water, never the reverse. If acid or electrolyte is spilled on the skin, it should be washed off immediately with plenty of water.
9. When charging batteries, the vent caps shall be kept in place to avoid electrolyte spray. Care shall be taken to ensure that vent caps are functioning. The battery (or compartment) cover shall be open to dissipate heat.
10. NO SMOKING signs shall be posted in the charging area and precautions shall be taken to prevent open flames, sparks, or electric arcs in battery charging areas.
11. Tools and other metallic objects shall be kept away from the top of uncovered batteries.

Jump-starting Conventional 12-Volt Batteries

1. Before attempting to jump-start a battery, don protective goggles or faceshield, remove battery vent caps, and cover caps with a cloth to reduce the potential for spraying electrolyte should an explosion occur.
2. Jump-starting a combustion engine forklift 12-volt battery shall be performed in the following sequence.
   - Vehicles shall not be touching.
   - Keep engine of charging vehicle running.
   - Attach positive lead to positive terminal of discharged battery, then to positive terminal of the good battery.
   - Attach negative lead to the negative terminal of the good battery, then to a metal part of the disabled forklift at a point away from the battery to avoid sparking near hydrogen gas.
   - Remove the leads in reverse sequence.

3. If the battery is to be removed from the forklift, use extreme care not to spill or come in contact with the electrolyte or acid deposits on the battery. Wear protective chemical goggles or faceshield, rubber gloves, and apron while removing or installing the battery.

Personnel Platforms

1. Under normal circumstances, scaffolds or equipment specifically designed to lift personnel shall be used to reach elevated work locations. Forklifts may only be used to lift personnel if the following requirements are met:
   - Work platforms shall be provided and secured to the forklift and meet construction design requirements outlined in ANSI B56.1-1993, which includes:
   - A slip-resistant floor surface.
   - A minimum of 18 inches by 18 inches for each platform occupant.
   - Protection for personnel in their normal working position on the platform from moving parts of the truck that present a hazard.
   - A guardrail not less than 36 inches or more than 42 inches around its upper periphery and include a midrail (access opening shall use a hinged section or chain). The guardrail and access opening guards shall be capable of withstanding a concentrated horizontal force of 200 pounds applied at the point of least resistance without permanent deformation.
   - A 4-inch minimum height toe plate.
   - The floor of the platform shall not be located more than 8 inches above the upper face of the supporting truck fork blade.
   - Means shall be provided to securely attach the platform to the lifting carriage or forks and to prevent the lifting carriage or forks from pivoting upward.
   - The combined weight of the platform, load, and personnel shall not exceed one-half of the capacity as indicated on the nameplate of the forklift on which the platform is used.
2. The following information shall be prominently indicated on the platform:
   - Maximum load (including personnel and equipment),
   - Weight of empty platform, and the minimum capacity of the forklift on which the platform can be used.
3. Prior to beginning personnel lifting operations:
   - The platform shall be securely attached to the lifting carriage or forks.
   - The lifting mechanism shall be operated through its entire lift height to ensure smooth operation.
   - The mast shall be vertical and not operating on a side slope.
   - The platform shall be horizontal and centered and not tilted forward or rearward.
   - The forklift shall be on firm and level footing.
   - The parking brake shall be applied and only released for minor maneuvering as requested by the elevated personnel.
   - The area shall be marked with barrier tape to warn of work by elevated personnel.
4. During personnel lifting operations:
   - The forklift operator shall lift and lower personnel with caution and only at their request (a signal person shall be used where the operator's vision is obstructed).
   - Overhead obstructions and electrical wires shall be avoided. The forklift operator shall keep hands and feet clear of controls other than those in use.
   - Personnel are to remain on the platform floor.
   - Personnel shall not attempt to enter or exit the platform until it has been lowered to the floor or attempt to enter or exit the platform by climbing on any part of the forklift.

Loading Dock Operations

1. Operators shall be aware of and avoid edges of loading docks, move slowly, and avoid slippery spots.
2. Before loading/unloading highway trucks or trailers, brakes on the trucks/trailers shall be applied and wheel chocks or other positive mechanical means used to prevent unintentional movement of the trucks/trailers.
3. Whenever forklifts are driven onto semi-trailers not coupled to a tractor, supports shall be provided to prevent upending or corner dipping.
4. Dockboards / bridgeplates shall be designed and maintained so that one end will have substantial contact with the dock or loading platform and the other end with the transport vehicle to prevent the dockboard from rocking or sliding. They shall also have a high friction surface designed to reduce the possibility of employees or forklifts slipping.
5. Dockboards / bridgeplates shall be marked conspicuously with their rated carrying capacity, and that capacity shall not be exceeded.
6. Portable dockboards / bridgeplates shall be secured in position either by being anchored or by being equipped with devices that will prevent their slipping. To facilitate safe handling, portable dockboards / bridgeplates shall have built-in handholds or fork loops/lugs.

General Storage

1. Storage of material shall not create a hazard. Bags, containers, bundles, etc., stored in tiers shall be stacked, blocked, interlocked, and limited in height so that they are stable and secure against sliding or collapse.
2. Prevent the accumulation of materials that constitute hazards from tripping, fire, explosion, or pests.
3. Maximum safe load limits of floors in pounds per square foot shall be conspicuously posted in all storage areas, except for floor or slab on grade. Maximum safe loads shall not be exceeded.

Reference

29 Code of Federal Regulations 1910.178, "Powered Industrial Trucks" 29 Code of Federal Regulations 1910.176, "Handling Materials, General" 29 Code of Federal Regulations 1926.250, "General Requirements for Storage" 29 Code of Federal Regulations 1926. 602(c), "Lifting and Hauling Equipment" ANSI B56.1 - 1993, "Safety Standard for Low Lift and High Lift Trucks" NFPA 505, "Powered Industrial Trucks"

Appendix A Fork Inspection Criteria

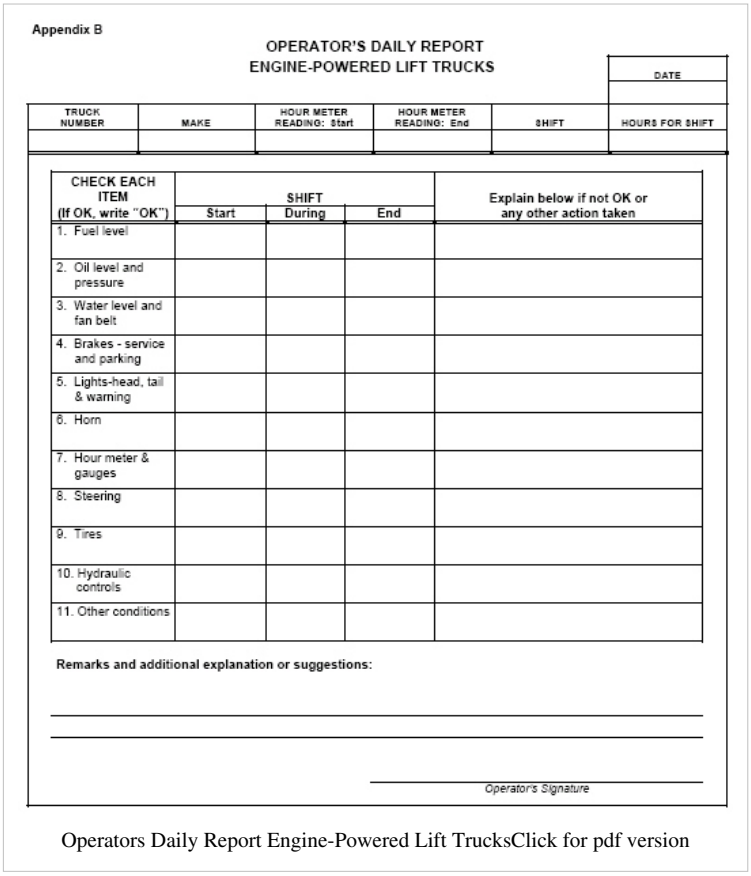
FORK INSPECTION CRITERIA

Forklift forks in service shall be inspected at least every 12 months in accordance with the following criteria. Forks showing any of the following defects shall be removed from service until replaced or repaired by the manufacturer of the fork.

Surface Cracks	The fork shall be thoroughly examined visually for cracks, special attention being paid to the heel and welds attaching all mounting components to the fork blank.
Straightness	The straightness of the upper face of the blade and the front face of the shank shall be checked. The fork straightness shall not exceed 0.5 percent of the length of the blade and/or the height of the shank.
Fork Angle	Any fork shall not exceed a deviation of greater than 3 degrees from the original specification between the upper face of the blade to the load face of the shank.
Fork Tips	The difference in height between the fork tips when mounted on the fork carrier shall not exceed 3 percent of the length of the blade.
Positioning	When provided, it shall be confirmed that the fork Lock positioning lock is in good repair and correct working order.
Wear	The fork blade and shank shall be checked for wear, especially in the vicinity of the heel. A thickness reduction of 10 percent or more of the original thickness is cause for rejection. Excessive wear of fork hooks (due to wear, crushing, or other deformation) which show excessive clearance between the fork and fork carrier is also cause for rejection.

Markings	If the fork load rating marking is not clearly legible, it shall be renewed. (For example, 1500 X 24 means 1500 LB load rating at 24 in. load center.)

Appendix B Operators Daily Report Engine-Powered Lift Trucks



Appendix B

OPERATOR'S DAILY REPORT
ENGINE-POWERED LIFT TRUCKS

DATE

TRUCK NUMBER	MAKE	HOUR METER READING: Start	HOUR METER READING: End	SHIFT	HOURS FOR SHIFT

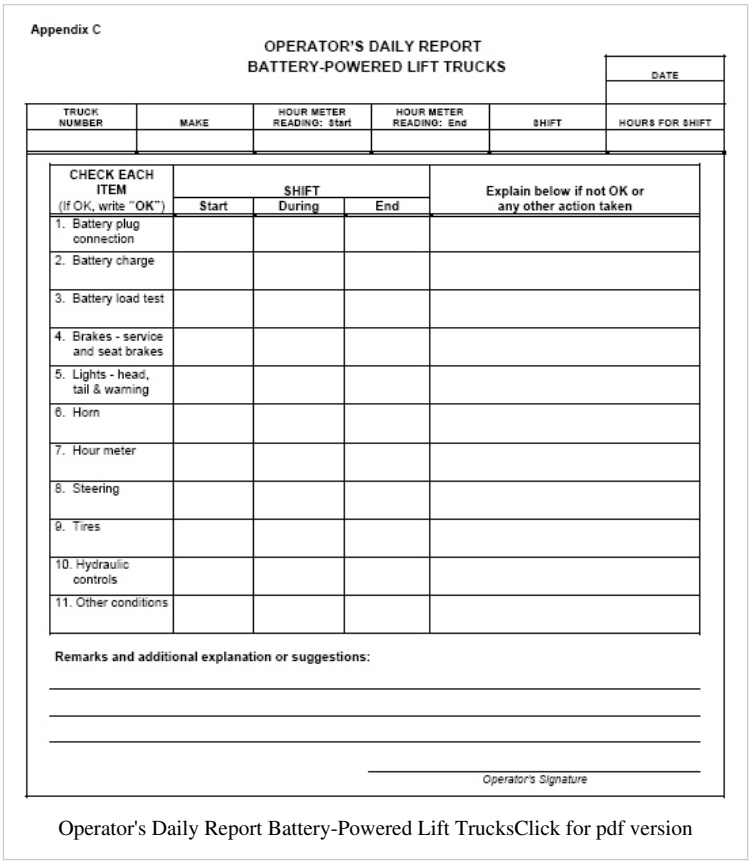
CHECK EACH ITEM (If OK, write "OK")	SHIFT Start	During	End	Explain below if not OK or any other action taken
1. Fuel level				
2. Oil level and pressure				
3. Water level and fan belt				
4. Brakes - service and parking				
5. Lights-head, tail & warning				
6. Horn				
7. Hour meter & gauges				
8. Steering				
9. Tires				
10. Hydraulic controls				
11. Other conditions				

Remarks and additional explanation or suggestions:

Operator's Signature

Operators Daily Report Engine-Powered Lift TrucksClick for pdf version

Appendix C Operator's Daily Report Battery-Powered Lift Trucks



Appendix C

OPERATOR'S DAILY REPORT
BATTERY-POWERED LIFT TRUCKS

DATE

TRUCK NUMBER	MAKE	HOUR METER READING: Start	HOUR METER READING: End	SHIFT	HOURS FOR SHIFT

CHECK EACH ITEM (If OK, write "OK")	SHIFT Start	During	End	Explain below if not OK or any other action taken
1. Battery plug connection				
2. Battery charge				
3. Battery load test				
4. Brakes - service and seat brakes				
5. Lights - head, tail & warning				
6. Horn				
7. Hour meter				
8. Steering				
9. Tires				
10. Hydraulic controls				
11. Other conditions				

Remarks and additional explanation or suggestions:

Operator's Signature

Operator's Daily Report Battery-Powered Lift TrucksClick for pdf version

Procedure 806 Heat Stress

TVA Safety Manual

806 Heat Stress

Procedure Number 806

TVA Safety Procedure

Heat Stress

Revision 7

May 2, 2011

Purpose

This procedure establishes requirements for the management of work activities to control the detrimental effects of heat stress on employees working in high-temperature areas.

Background

1. Operations involving high air temperatures, radiant heat sources, high humidity, direct physical contact with hot objects, or strenuous physical activities have a high potential for inducing heat stress in employees engaged in such operations.
2. Outdoor operations conducted in hot weather may also cause heat stress among exposed workers.
3. The American Conference of Governmental Industrial Hygienists (ACGIH) states that workers should not be permitted to work when their deep body temperature exceeds 100.4°F.

Causal Factors of Heat Related Illness

1. Age, weight, degree of physical fitness, degree of acclimatization, metabolism, use of alcohol or drugs, and a variety of medical conditions such as hypertension all affect a person's sensitivity to heat. However, even the type of clothing worn must be considered. Prior heat injury predisposes an individual to additional injury.
2. It is difficult to predict just who will be affected and when, because individual susceptibility varies. In addition, environmental factors include more than the ambient air temperature.
3. Radiant heat, air movement, conduction, and relative humidity all affect an individual's response to heat.

Heat Stroke

1. Heat stroke occurs when the body's system of temperature regulation fails and body temperature rises to critical levels.
2. This condition is caused by a combination of highly variable factors, and its occurrence is difficult to predict. Heat stroke is a medical emergency.
3. The primary signs and symptoms of heat stroke are confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually); hot, dry skin; and an abnormally high body temperature, e.g., a body temperature of 105.8°F. If body temperature is too high, it causes death.
4. The elevated metabolic temperatures caused by a combination of work load and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.
5. If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a shady or cool area and the outer clothing should be removed.

6. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed.
7. Fluids should be replaced as soon as possible.
8. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of professional medical treatment.

Heat Exhaustion

1. The signs and symptoms of heat exhaustion are headache, nausea, vertigo, weakness, thirst, and giddiness. Fortunately, this condition responds readily to prompt treatment.
2. Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, a medical emergency.
3. Workers suffering from heat exhaustion should be removed from the hot environment and given fluid replacement. They should also be encouraged to get adequate rest.

Heat Cramps

1. Heat cramps are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating.
2. It is important to understand that cramps can be caused by both too much and too little salt. Cramps appear to be caused by the lack of water replenishment.
3. Because sweat contains less salt than body fluids, excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.
4. Under extreme conditions, such as working for 6 to 8 hours in heavy protective gear, a loss of sodium may occur. Studies have shown that drinking commercially available carbohydrateelectrolyte replacement liquids, e.g. (Squincher), is effective in minimizing physiological disturbances during recovery.

Heat Collapse ("Fainting")

1. In heat collapse, the brain does not receive enough oxygen because blood pools in the extremities. As a result, the exposed individual may lose consciousness. This reaction is similar to that of heat exhaustion and does not affect the body's heat balance. However, the onset of heat collapse is rapid and unpredictable.
2. To prevent heat collapse, workers should gradually become acclimatized to the hot environment.

Heat Rash

1. Heat rash is the most common problem in hot work environments. Prickly heat is manifested as red papules and usually appears in areas where the clothing is restrictive.
2. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat, and heat rash may become infected if they are not treated.
3. In most cases, heat rash will disappear when the affected individual returns to a cool environment.

Heat Fatigue

1. Heat fatigue is a factor that predisposes an individual to heat fatigue is lack of acclimatization.
2. The signs and symptoms of heat fatigue include impaired performance of skilled sensorimotor, mental, or vigilance jobs.
3. e is no treatment for heat fatigue except to remove the heat stress before a more serious eat-related condition develops.

Sampling Methods

1. TEMPERATURE MEASUREMENTS. Although instruments are available to estimate deep body emperature by measuring the temperature in the ear canal or on the skin, these nstruments are not sufficiently reliable to use in compliance evaluations.
2. ENVIRONMENTAL MEASUREMENTS. Environmental heat measurements should be made at, or as close as possible to, the specific work area where the worker is exposed.
3. When a worker is not continuously exposed in a single hot area but moves between two or more areas having different levels of environmental heat, or when the environmental heat varies substantially at a single hot area, environmental heat exposures should be measured for each area and for each level of environmental heat to which employees are exposed.

Control Measures

1. Ventilation, air cooling, fans, shielding, and insulation are the five types of engineering controls used to reduce heat stress in hot work environments.
2. Heat reduction can also be achieved by using power assists and tools that reduce the physical demands placed on a worker. However, for the use of these devices to be successful, the metabolic effort required for the worker to use the devices must be less than the effort required without them.
3. Allow workers to take frequent rest breaks in a cooler environment.
4. Encourage workers to drink plenty of fluids.

Acclimatization

1. The human body can adapt to heat exposure to some extent. This physiological adaptation is called acclimatization. After a period of acclimatization, the same activity will produce fewer cardiovascular demands. The worker will sweat more efficiently (causing better evaporative cooling), and thus will more easily be able to maintain normal body temperatures.
2. A properly designed and applied acclimatization program decreases the risk of heat-related illnesses. Acclimatization basically involves exposing employees to work in a hot environment for progressively longer periods. The National Institute for Occupational Safety and Health (NIOSH) says that, for workers who have had previous experience in jobs where heat levels are high enough to produce heat stress, the regimen should be 50% exposure on day one, 60% on day two, 80% on day three, and 100% on day four. For new workers who will be similarly exposed, the regimen should be 20% on day one, with a 20% increase in exposure each additional day.
3. FLUID REPLACEMENT. Cool (50°-60°F) water or any cool liquid (except alcoholic beverages) should be made available to workers to encourage them to drink small amounts frequently, e.g., one cup every 20 minutes. Ample supplies of liquids should be placed close to the work area. Although some commercial replacement drinks contain salt, this is not necessary for acclimatized individuals because most people add enough salt to their summer diets.

Engineering Controls

1. General ventilation is used to dilute hot air with cooler air. This technique clearly works better in cooler climates than in hot ones. A permanently installed ventilation system usually handles large areas or entire buildings. Portable or local exhaust systems may be more effective or practical in smaller areas.
2. Air treatment/air cooling differs from ventilation because it reduces the temperature of the air by removing heat (and sometimes humidity) from the air.
3. Air conditioning is a method of air cooling, but it is expensive to install and operate. An alternative to air conditioning is the use of chillers to circulate cool water through heat exchangers over which air from the ventilation system is then passed. Chillers are more efficient in cooler climates or in dry climates where evaporative cooling can be used.
4. Local air cooling can be effective in reducing air temperature. Cool rooms can be used to enclose a specific workplace or to offer a recovery area near hot jobs or use of a portable blower. The main advantage of a blower, aside from portability, is minimal set-up time.
5. Another way to reduce heat stress is to increase the air flow or convection using fans, etc. in the work area (as long as the air temperature is less than the worker's skin temperature). Changes in air speed can help workers stay cooler by increasing both the convective heat exchange (the exchange between the skin surface and the surrounding air) and the rate of evaporation. Because this method does not actually cool the air, any increases in air speed must impact the worker directly to be effective.
6. If the dry bulb temperature is higher than 95°F, the hot air passing over the skin can actually make the worker hotter. When the temperature is more than 95°F and the air is dry, evaporative cooling may be improved by air movement, although this improvement will be offset by the convective heat. When the temperature exceeds 95°F and the relative humidity is 100%, air movement will make the worker hotter. Increases in air speed have no effect on the body temperature of workers wearing vapor-barrier clothing.
7. Heat conduction methods include insulating the hot surface that generates the heat and changing the surface itself.
8. Simple engineering controls, such as shields, can be used to reduce radiant heat, i.e. heat coming from hot surfaces within the worker's line of sight. Surfaces that exceed 95°F are sources of infrared radiation that can add to the worker's heat load. Flat black surfaces absorb heat more than smooth, polished ones. Having cooler surfaces surrounding the worker assists in cooling because the worker's body radiates heat toward them.
9. With some sources of radiation, such as heating pipes, it is possible to use both insulation and surface modifications to achieve a substantial reduction in radiant heat. Instead of reducing radiation from the source, shielding can be used to interrupt the path between the source and the worker. Polished surfaces make the best barriers, although special glass or metal mesh surfaces can be used if visibility is a problem.
10. Shields should be located so that they do not interfere with air flow, unless they are also being used to reduce convective heating. The reflective surface of the shield should be kept clean to maintain its effectiveness.

Administrative Controls and Work Practices

1. Hot jobs should be scheduled for the cooler part of the day, and routine maintenance and repair work in hot areas should be scheduled for the cooler seasons of the year.
2. The following administrative controls can be used to reduce heat stress:
    - Reduce the physical demands of work, e.g., excessive lifting or digging with heavy objects;
    - Provide recovery areas, e.g., air-conditioned enclosures and rooms;
    - Use shifts, e.g., early morning, cool part of the day, or night work;
    - Use intermittent rest periods with water breaks;
    - Use relief workers;
    - Use worker pacing; and

- Assign extra workers and limit worker occupancy, or the number of workers present, especially in confined or enclosed spaces.

Worker Monitoring

1. Water or electrolyte drinks (such as Squincher) shall be readily available in a location as close as practical to the work area. Employees are encouraged to drink small amounts of cool liquids often, regardless of thirst.
   Water and other drinking fluids within the radiologically controlled areas are controlled by RADCON.
2. Monitor the work environment to determine Wet Bulb Globe Temperature (WBGT) values in accordance with the specific monitoring instrument manufacturer's instructions.
3. The supervisor / foreman, or other properly trained personnel shall perform initial monitoring of suspected hot work areas and re-monitoring as needed to determine if the area meets the definition of a high-heat stress area (90° F and greater WBGT).
4. Whenever work is performed in a high heat stress area the supervisor / foreman, or other properly trained personnel shall mark the dress requirements and provide a work description on Section II of the "High Heat Stress Work Evaluation", Appendix B or equivalent.
5. Supervisors / foreman or other properly trained personnel shall review the "High Heat Stress Work Evaluation" for proper completion prior to personnel entering the hot work area for work other than temperature monitoring or brief inspections necessary to properly assess the work.
6. Supervisors / foreman or other properly trained personnel shall evaluate and recommend work times, and other control measures in accordance with the "High Heat Stress Work Evaluation" for the maximum recommended work times contained in the "Heat Stress Management Work Guide" - Appendix D.
   Note: The exposure times provided within this procedure never take precedence over the subjective feelings of the individual working in the heat stress environment.
7. The work times shown on the "Heat Stress Management Work Guide" are recommended maximum work times.
8. In case of extremely high WBGTs (above 100oF), the work should be delayed if possible, until the work area has cooled down or controlled by other effective methods.
9. No work is permitted in any area where the WBGT is greater than 105oF without the specific review, evaluation, and approval of the plant manager or senior facility manager.
10. No employee shall work alone in an identified high-heat stress area unless they are in visual contact with or working within a pre-specified communication plan with personnel outside the area.
11. Before initial entry into a high-heat stress area, and daily thereafter for extended jobs, the responsible foreman or supervisor shall brief the employees on the controls to be followed, including work times, heat-stress symptoms, and the importance of observing for these symptoms in both themselves and coworkers.
12. Employee work times in the high-heat stress areas along with other pertinent information shall be recorded in the "High Heat Stress Work Evaluation".
    Note: For NPG locations (RWP) timesheets may be used for logging work times related to heat stress in RWP areas.
13. Employees who exhibit heat stress symptoms during the course of entry or after leaving a high heat stress area shall be removed to a cooler area, and either TVA Medical or an EMT contacted.

Evaluation and Implementation

1. Conduct, or arrange for, monitoring and/or evaluation of hot or suspected hot work areas.
2. Ensure that employees entering identified high-heat stress areas have received heat stress training.
3. Plan and supervise the work activity to ensure that work times and adequate heat stress controls are implemented.
4. Employees assigned to work in a high heat stress area shall report to their supervisor any personal health problem (including, but not limited to, diabetes, high blood pressure, anorexia nervosa, bulimia, fever, infection, heart or kidney failure, reduced sweating, diarrhea, recent or past stroke, etc.) or any prescription or over the counter medication (e.g., diuretic, blood pressure control, water pills, etc.) being taken that may adversely affect their health in high heat stress environments.
   Supervisors and foremen shall ensure that whenever employees report a potential health problem that the employee is screened by TVA Medical, EMT or first responder and that this screening is documented on form TVA 40167, Appendix C before the employee enters a highheat stress area.
5. Brief employees on heat stress symptoms and applicable controls prior to the day's entry into the high-heat stress area.
6. Complete, review, and sign the required portions of the "High Heat Stress Work Evaluation" form.
7. Monitor and ensure proper recording of employee work times in high-heat stress areas.
8. Include the "High Heat Stress Work Evaluation" with the completed work package for documentation as part of the overall work activity.
9. Contact a TVA safety professional when necessary for guidance or assistance in implementing these requirements.

Personal Protective Equipment and Clothing

1. Reflective clothing, which can vary from aprons and jackets to suits that completely enclose the worker from neck to feet, can stop the skin from absorbing radiant heat. However, since most reflective clothing does not allow air exchange through the garment, the reduction of radiant heat must more than offset the corresponding loss in evaporative cooling. For this reason, reflective clothing should be worn as loosely as possible. In situations where radiant heat is high, auxiliary cooling systems can be used under the reflective clothing.
2. Commercially available ice vests, though heavy are usually filled with water. Carbon dioxide (dry ice) can also be used as a coolant. The cooling offered by ice packets lasts only 2 to 4 hours at moderate to heavy heat loads, and frequent replacement is necessary.
3. Wetted clothing is another simple and inexpensive personal cooling technique. It is not effective when reflective or other impermeable protective clothing is worn. The clothing may be wetted terry cloth coveralls or wetted two-piece, whole-body cotton suits. This approach to auxiliary cooling can be quite effective under conditions of high temperature and low humidity, where evaporation from the wetted garment is not restricted.
4. Water-cooled garments range from a hood, which cools only the head, to vests and "long johns," which offer partial or complete body cooling. Use of this equipment requires a batterydriven circulating pump, liquid-ice coolant, and a container.
5. Although this system has the advantage of allowing wearer mobility, the weight of the components limits the amount of ice that can be carried and thus reduces the effective use time. The heat transfer rate in liquid cooling systems may limit their use to low-activity jobs; even in such jobs, their service time is only about 20 minutes per pound of cooling ice. To keep outside heat from melting the ice, an outer insulating jacket should be an integral part of these systems.
6. Circulating air is the most highly effective, as well as the most complicated, personal cooling system. By directing compressed air around the body from a supplied air system, both evaporative and convective cooling are improved. The greatest advantage occurs when circulating air is used with impermeable garments or double cotton overalls.

7. One type, used when respiratory protection is also necessary, forces exhaust air from a supplied-air hood ("bubble hood") around the neck and down inside an impermeable suit. The air then escapes through openings in the suit. Air can also be supplied directly to the suit without using a hood:
   - by a single inlet;
   - by a distribution tree; or
   - by a perforated vest.
8. In addition, a vortex tube can be used to reduce the temperature of circulating air. The cooled air from this tube can be introduced either under the clothing or into a bubble hood. The use of a vortex tube separates the air stream into a hot and cold stream; these tubes also can be used to supply heat in cold climates. Circulating air, however, is noisy and requires a constant source of compressed air supplied through an attached air hose.
9. One problem with this system is the limited mobility of workers whose suits are attached to an air hose. Another is that of getting air to the work area itself. These systems should therefore be used in work areas where workers are not required to move around much or to climb. Another concern with these systems is that they can lead to dehydration. The cool, dry air feels comfortable and the worker may not realize that it is important to drink liquids frequently.
10. Respirator usage. The weight of a self-contained breathing apparatus (SCBA) increases stress on a worker, and this stress contributes to overall heat stress.

Training

1. Employees exposed to working in hot areas shall receive training course “Heat Stress”, ATIS Number, 00059130. Reference TVA Safety Procedure 431, “Heat Stress Course Standard” for specific requirements.
2. Employees who take temperature measurements with test instruments to determine employee exposure to heat stress shall receive training on the instruments used to monitor temperature at their plant / facility.
   - Heat Stress Monitor (IST Sensor Lynx), ATIS Number, 00059163
   - Heat Stress Monitor (Metrosonics hs-32, or Quest QT-32), ATIS Number 00059186
   - Heat Stress Monitor (WIBGet RSS-214), ATIS Number 00059187
3. Heat stress training shall include the following components:
   - Knowledge of the hazards of heat stress;
   - Recognition of predisposing factors, danger signs, and symptoms;
   - Awareness of first-aid procedures and the potential health effects of, heat stroke;
   - Employee responsibilities in avoiding heat stress;
   - Dangers of using drugs, including therapeutic ones, and alcohol in heat stress work environments;
   - Use of protective clothing and equipment; and
   - Purpose and coverage of environmental and medical surveillance programs and the advantages of worker participation in such programs.

Definitions

Dry Bulb (DB) Temperature is measured by a thermal sensor, such as an ordinary mercuryin- glass thermometer, that is shielded from direct radiant energy sources.

Calorie is the amount of heat required to raise 1 gram of water 1°C (based on a standard temperature of 16.5 to 17.5°C).

Conduction is the transfer of heat between materials that contact each other. Heat passes from the warmer material to the cooler material. For example, a worker's skin can transfer heat to a contacting surface if that surface is cooler, and vice versa.

Convection is the transfer of heat in a moving fluid. Air flowing past the body can cool the body if the air temperature is cool. On the other hand, air that exceeds 35°C (95°F) can increase the heat load on the body.

Evaporative Cooling takes place when sweat evaporates from the skin. High humidity reduces the rate of evaporation and thus reduces the effectiveness of the body's primary cooling mechanism.

Globe Temperature (GT) is the temperature resulting from radiant heat sources measured with a globe thermometer.

Heat is a measure of energy in terms of quantity.

Heat Stress is the physiological stress which occurs when the body temperature rises above normal. This occurs when the body produces or gains more heat than it is capable of losing. It is caused by any combination of air temperature, thermal radiation, humidity, airflow, restrictive clothing, and physical workload, which may result in elevated core body temperature and subsequent illness.

Heat Stress Area is a high temperature area where the wet bulb globe temperature (WBGT) is equal to or greater than 80° F and less than 90° F.

High Heat Stress Area is a high temperature area where the wet bulb globe temperature (WBGT) is equal to or greater than 90° F.

Metabolic Heat is a by-product of the body's activity.

Natural Wet Bulb (NWB) Temperature is measured by exposing a wet sensor, such as a wet cotton wick fitted over the bulb of a thermometer, to the effects of evaporation and convection. The term natural refers to the movement of air around the sensor.

Pre-Hydration is a hygiene practice whereby the worker drinks an adequate amount of water prior to being exposed to a heat stress environment.

Radiation is the transfer of heat energy through space. A worker whose body temperature is greater than the temperature of the surrounding surfaces radiates heat to these surfaces. Hot surfaces and infrared light sources radiate heat that can increase the body's heat load.

Recovery Area is a subjectively cool environment (usually < 80°F) that allows the dissipation of stored heat. This allows the workers core temperature to return to normal following heat exposure.

Recovery Time aka Rest Time (minutes) = [(Work Time)/(Action Time)] * 60 min

Note: Recovery Time must be spent in a non-Heat Stress environment (e.g.<80°F). Work Time is the time spent working in a Heat Stress environement.

Self-Determination is a concept whereby the worker is allowed to use individual discretion in setting their exposure time and the pace at which the work proceeds. Self-determination is accepted to begin programmatically at 1 times the Action Time. Self-determination cannot be used to exceed a stay time or the rated protection times afforded by PPE (ice vests/cooling suits).

Wet Bulb Globe Temperature (WBGT) is an index of heat stress that utilizes a Vernon Globe black globe) temperature, a natural wet bulb temperature and a dry bulb temperature. See Appendix A - Web Bulb Globe Temperature Index.

Appendix A Wet Bulb Globe Temperature Index

Wet Bulb Globe Temperature Index

Measurement is often required of those environmental factors that most nearly correlate with deep body temperature and other physiological responses to heat. At the present time, the Wet Bulb Globe Temperature Index (WBGT) is the most used technique to measure these environmental factors.WBGT values are calculated by the following equations:

Indoor or Outdoor Wet Bulb Globe Temperature Indexes (WBGT)

Indoor or outdoors with no solar load

WBGT = 0.7NWB + 0.3GT

Outdoors with solar load

WBGT = 0.7NWB + 0.2GT + 0.1DB

where: WBGT = Wet Bulb Globe Temperature Index

NWB = Natural Wet-Bulb Temperature

DB = Dry-Bulb (air) Temperature

GT = Globe Temperature

Direct reading instruments such as the following are typically used to measure WBGT

- Heat Stress Monitor (IST Sensor Lynx)
- Heat Stress Monitor (Metrosonics hs-32, or Quest QT-32)
- Heat Stress Monitor (WIBGet RSS-214)

Appendix B High Heat Stress Work Evaluation

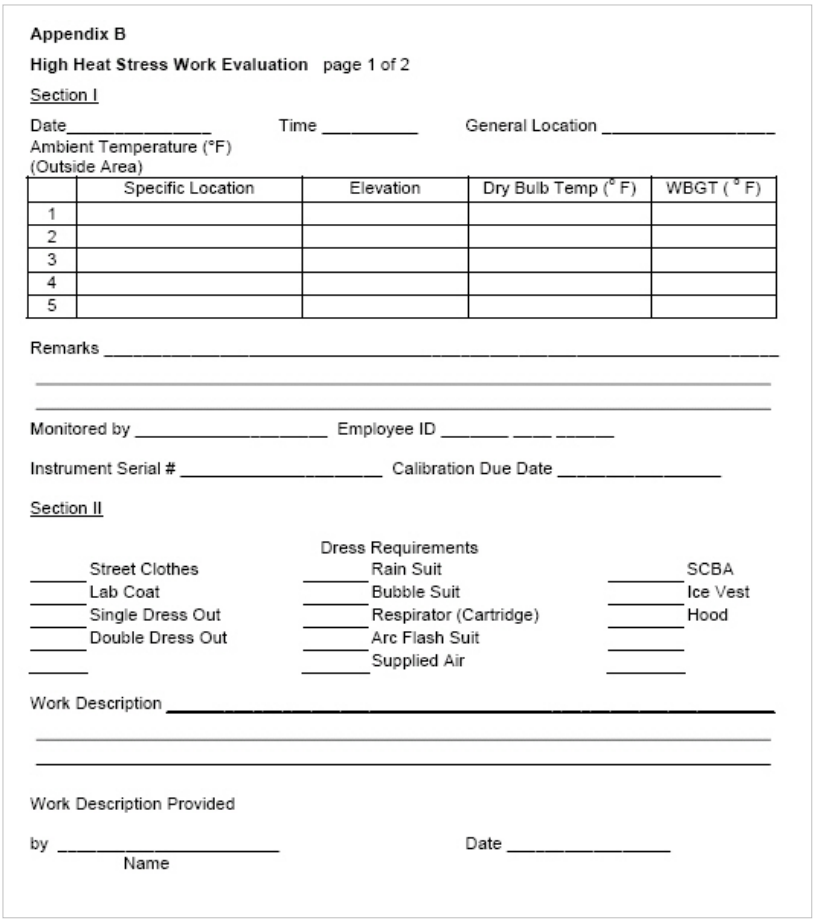
Appendix C High Heat Stress Survey Checklist

Click for TVA 40167 - High Heat Stress Survey Checklist [1]

Appendix D Heat Stress Management Work Guide

Page 1 of 3

Page 1 of this guide provides recommended maximum stay times in minutes for different WBGT's in degrees F by combinations of clothing ensemble and physical effort.



Appendix B

High Heat Stress Work Evaluation page 1 of 2

Section I

Date_____ Time _____ General Location _____

Ambient Temperature (°F)
(Outside Area)

	Specific Location	Elevation	Dry Bulb Temp (° F)	WBGT (° F)
1				
2				
3				
4				
5				

Remarks _____

Monitored by _____ Employee ID _____ ___ _____

Instrument Serial # _____ Calibration Due Date _____

Section II

Dress Requirements

_____ Street Clothes
_____ Lab Coat
_____ Single Dress Out
_____ Double Dress Out
_____

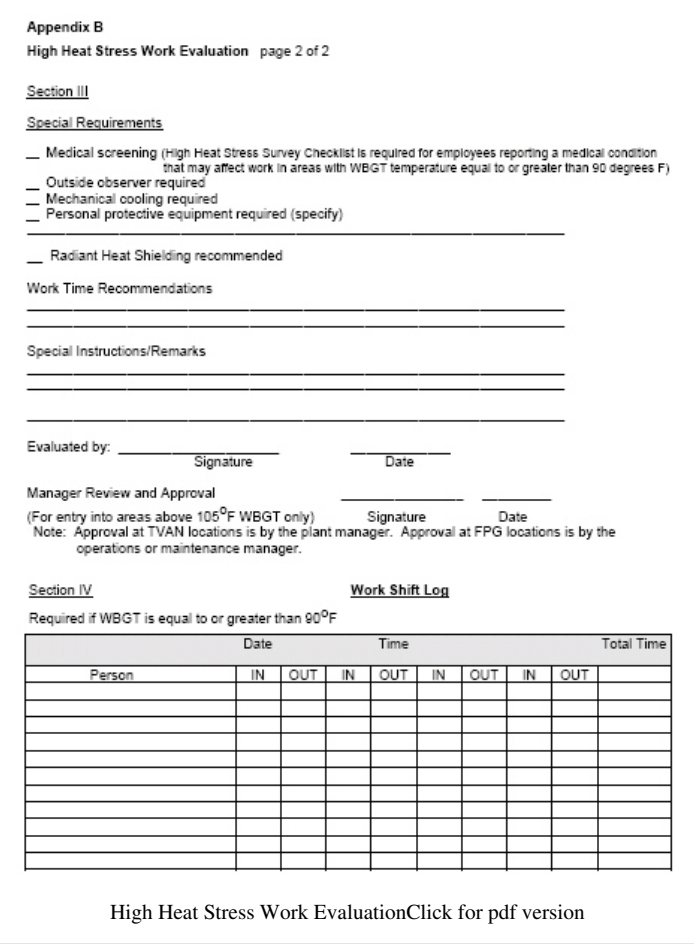
_____ Rain Suit
_____ Bubble Suit
_____ Respirator (Cartridge)
_____ Arc Flash Suit
_____ Supplied Air

_____ SCBA
_____ Ice Vest
_____ Hood
_____
_____

Work Description _____

Work Description Provided

by _____ Date _____
Name



Appendix B

High Heat Stress Work Evaluation page 2 of 2

Section III

Special Requirements

__ Medical screening (High Heat Stress Survey Checklist is required for employees reporting a medical condition that may affect work in areas with WBGT temperature equal to or greater than 90 degrees F)
__ Outside observer required
__ Mechanical cooling required
__ Personal protective equipment required (specify)
_____

__ Radiant Heat Shielding recommended

Work Time Recommendations
_____
_____

Special Instructions/Remarks
_____
_____
_____

Evaluated by: _____ _____
Signature Date

Manager Review and Approval _____ _____
(For entry into areas above 105°F WBGT only) Signature Date
Note: Approval at TVAN locations is by the plant manager. Approval at FPG locations is by the operations or maintenance manager.

Section IV **Work Shift Log**

Required if WBGT is equal to or greater than 90°F

	Date		Time						Total Time
Person	IN	OUT	IN	OUT	IN	OUT	IN	OUT	

High Heat Stress Work EvaluationClick for pdf version

WBGT	Work Clothes (with or without paper type coveralls) or FR Daily Wear Clothing (with Tee-Shirt)			Cotton Coveralls			Double Coveralls			Cottons + Rain Suit/Tyvek		
	Physical Effort Level			Physical Effort Level			Physical Effort Level			Physical Effort Level		
	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
122	30	10	-	15	5	-	15	-	-			
118	45	15	-	30	10	-	20	-	-	15	-	-
115	45	20	-	45	15	-	30	10	-	20	-	-
111	60	25	-	45	20	-	45	15	-	30	10	-
108	90	30	10	60	25	-	45	20	-	45	15	-
104	90	45	20	90	40	10	60	25	-	45	20	-
100	120	45	30	90	45	25	90	30	10	60	25	-
97	240	60	40	120	45	30	90	45	20	90	30	10
93	480	90	45	240	60	45	120	45	30	90	45	20
90	NL	120	60	480	100	50	240	60	40	120	45	30
86	NL	240	120	NL	120	90	480	90	45	240	60	40
82	NL	NL	240	NL	240	180	NL	120	60	480	90	45
79	NL	NL	480	NL	NL	480	NL	240	120	NL	120	60

75	NL	NL	NL	NL	NL	NL	NL	NL	240	NL	240	120
72	NL	NL	NL	NL	NL	NL	NL	NL	480	NL	NL	240
68	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	480
< 68	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL

Recovery time (rest period) is calculated on an individual basis using the following formula:

Actual Work Time in the Hot Environment X 60 Minutes = Rest Period Time

Maximum stay Time Allowed

NL = No Limit

Physical Effort Level

Low - Inspection/sampling type work, light lifting less than 25 pounds, minimal climbing	**Moderate** - Using had tools or portable power tools, lifting 25 - 40 pounds, moderate climbing	**High** - Heavy work such as scaffold building, rigging, lifting over 40 pounds, extensive climbing

Appendix D Heat Stress Management Work Guide

Page 2 of 3

Page 2 of this guide provides recommended maximum stay times in minutes for different WBGT's in degrees F by combinations of clothing ensemble and physical effort.

	Polyester Coveralls Lightweight polyester (98% Nylon)(3 oz) coveralls worn with a hood of the same material (ProTech 2000)			**MB Polyethylene Coveralls - Limited use coveralls with hood (particle barrier only) made from a meltdown polyethylene (e.g. Tyvek 1422A)**			**SMS Polypropylene Coveralls - Limited use coveralls with hood (particle barrier only) made from a spunbonded, meltblown polypropylene**			**Encapsulating Suit Total encapsulating suits (e.g., Level A); reusable whole body chemical protective suits**		
	Physical Effort Level			Physical Effort Level			Physical Effort Level			Physical Effort Level		
WBGT	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
122	15		-	-	-	-	15	-	-			
118	20	10	-	15	-	-	40	15	-	-	-	-
115	40	15	-	30	15	-	50	30	10	-	-	-
111	50	25	-	45	30	-	80	40	15	-	-	-
108	70	30	15	60	40	15	100	50	20	-	-	-
104	100	45	20	100	50	25	150	70	40	20	10	-
100	120	60	30	130	60	35	220	80	50	40	15	-
97	150	70	40	180	70	45	300	100	70	50	25	10
93	240	80	50	240	100	70	420	160	100	60	35	15
90	480	120	80	360	120	90	NL	240	120	80	40	20
86	NL	160	110	480	180	120	NL	480	240	110	50	30
82	NL	260	180	NL	480	240	NL	NL	NL	170	70	40
79	NL	NL	480	NL	NL	480	NL	NL	NL	220	80	50
75	NL	NL	NL	NL	NL	NL	NL	NL	NL	320	120	80
72	NL	NL	NL	NL	NL	NL	NL	NL	NL	420	160	120
68	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	270	160

< 68	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	480	240

Recovery time (rest period) is calculated on an individual basis using the following formula:

Actual Work Time in the Hot Environment X 60 Minutes = Rest Period Time

Maximum stay Time Allowed

NL = No Limit

Physical Effort Level

Low - Inspection/sampling type work, light lifting less than 25 pounds, minimal climbing	**Moderate** - Using had tools or portable power tools, lifting 25 - 40 pounds, moderate climbing	**High** - Heavy work such as scaffold building, rigging, lifting over 40 pounds, extensive climbing

Appendix D Heat Stress Management Work Guide

Page 3 of 3

Page 3 of this guide provides recommended maximum stay times in minutes for different WBGT's in degrees F by combinations of FR Arc Flash Suits and physical effort.

	15 Cal/cm^2 Arc Flash Suit over FR Clothing			**31 cal/cm^2 Arc Flash Suit over FR Clothing**			**50 cal/cm^2 Arc Flash Suit over FR Clothing**			**100 cal/cm^2 Arc Flash Suit over FR Clothing**		
	Physical Effort Level			Physical Effort Level			Physical Effort Level			Physical Effort Level		
WBGT	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
122	-	-	-	-	-	-	-	-	-	-	-	-
118	-	-	-	-	-	-	-	-	-	-	-	-
115	-	-	-	-	-	-	-	-	-	-	-	-
111	10	-	-	10	-	-	10	-	-	-	-	-
108	15	10	10	15	10	-	15	10	-	10	-	-
104	20	15	15	20	15	10	20	15	10	15	10	-
100	25	20	20	25	20	20	25	20	15	20	15	10
97	35	30	25	35	30	25	30	25	20	30	20	15
93	45	40	35	45	35	30	40	30	25	40	25	20
90	50	45	40	50	40	35	45	35	30	45	30	25
86	NL	50	45	50	45	40	50	45	35	45	35	30
82	NL	NL	50	NL	50	45	55	50	45	50	45	40
79	NL	NL	NL	NL	NL	NL	NL	55	50	NL	55	50
75	NL	NL	NL	NL	NL	NL	NL	NL	55	NL	NL	50
72	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	55
68	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
< 68	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL

Recovery time (rest period) is the remaining time, in minutes, of a 60 minute period. For example, if the stay time from this table is 15 minutes, the recovery time (rest period) would be 45 minutes. If the actual work time is less than the maximum recommended work time, the rest period may be reduced in proportion to the difference between the

actual work and maximum recommended work time. In the example given, if the actual work is 10 minutes the rest period may be reduced by 1/3 to 30 minutes.
NL = No Limit
Note: Flame resistant modesty clothing may be worn under arc flash suits in lieu of FR Clothing if doing so does not conflict with other requirements, i.e. RAD safety.

Physical Effort Level

Low - Inspection/sampling type work, light lifting less than 25 pounds, minimal climbing	**Moderate** - Using had tools or portable power tools, lifting 25 - 40 pounds, moderate climbing	**High** - Heavy work such as scaffold building, rigging, lifting over 40 pounds, extensive climbing

References

29 CFR1910.1020, Employee Exposure and Medical Records

Heat-Stress Management Program for Nuclear Power Plants-EPRI NP-4453-L

Criteria for a Recommended Standard Occupational Exposure to Hot Environments, Revised criteria 1986-DHHS (NIOSH) Publication No. 86-113

American Conference of Governmental Industrial Hygienists, (ACHIH) TLV Handbook 2008

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072561795

Procedure 807 Heating / Cooling Components

TVA Safety Manual

807 Heating / Cooling Components

Procedure Number 807

TVA Safety Procedure

Heating / Cooling Components

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to identify and control potential health risks associated with hazardous work such as cryogenic (super cooled) or hot work in enclosed spaces.

This procedure supplements, existing hot work, confined space, respiratory protection, and other applicable procedures. This procedure describes the general approach to identifying and controlling enclosed space and other potential workplace concerns.

Requirement

Prior to conducting cryogenic, hot work, or other similar processes, the supervisor in charge of the process will use this tool to assist in determining the types and level of controls, including personal protective equipment (PPE). A TVA safety professional should be consulted whenever the hazards are beyond the scope of this document.

Roles and Responsibilities

1. **COO Safety Consultant / Organizational Safety Manager** - shall provide technical guidance with regard to workplace evaluations. Also responsible for addressing employee concerns.
2. **Supervisors** - responsible for ensuring that all employees under their direction are aware of identified hazards and control measures. Also responsible for addressing and communicating employee concerns to the safety consultant.
3. **Employees** - responsible for adhering to the requirements of any adopted controls and associated programs. Also responsible for reporting any concerns to their supervisor.

Plan Implementation

Task Evaluation – The responsible supervisor will follow the flow diagram in Appendix A, Heating / Cooling Components Work Flow Diagram, and Appendix G, Supervisor's Checklist. If a stop point is indicated in the flow diagram, the appropriate backup guidance in Appendix B through F will be reviewed. This information will be used as a tool to determine the appropriate protective measures necessary. If directed by the contents of the appendices, or if the hazards present appear to be greater than that indicated in this document, the supervisor will consult with the safety manager prior to the onset of work.

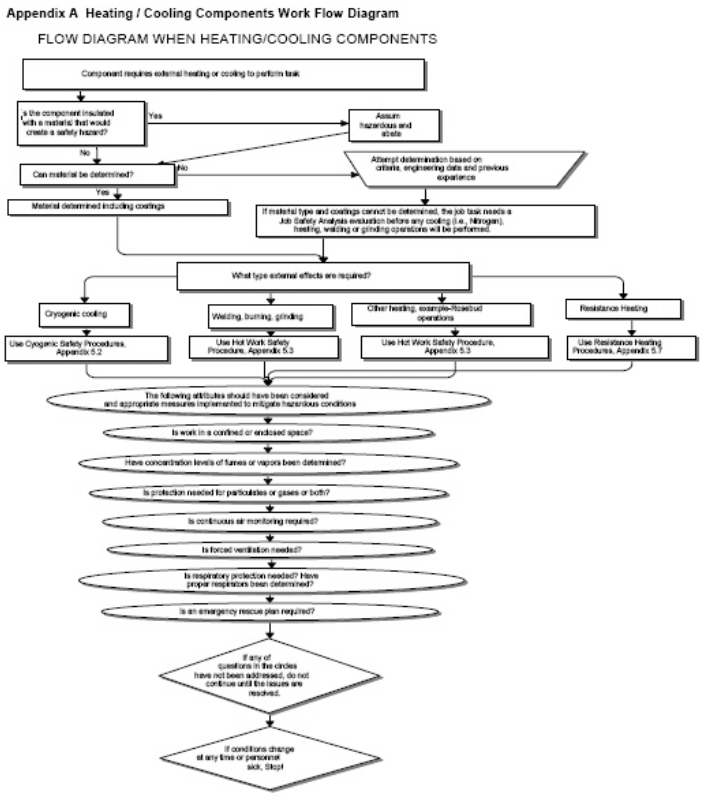
Recordkeeping & Documentation:

- No documentation will be necessary for this program.
- This program may be updated by COO Safety or organizational safety managers as necessary.

Appendix A Heating / Cooling Components Work Flow Diagram

Appendix B Cryogenic Safety Procedures

Cryogenic Safety Procedures



FLOW DIAGRAM WHEN HEATING/COOLING COMPONENTSClick for pdf version

Hazard	Cause/Comment	Controls
Poor visibility	Vapors can be cold enough to condense moisture in the air. The resulting fog cloud can obstruct visibility.	*Do not let cloud interfere with vehicle traffic or escape routes. *Do not let cloud create or compound hazards (e.g., placing hands near rotating equipment not visible)
Oxygen deficiency	Vapors can displace oxygen, creating an oxygen-deficient atmosphere.	*Use an O2 meter when using cryogenics in enclosed areas (3 or more sides closed in on the “box” surrounding the employee). *Consider whether vapors are heavier or lighter than air – this will impact where oxygen deficiency may be found in a work area. *Do not store cryogenic materials in enclosed areas.
Oxygen enrichment	Liquid oxygen significantly increases the risk of fire. Other cryogenics can condense oxygen in air, creating pockets of O_2 enrichment.	*Use liquid oxygen for cryogenic purposes only after approval of Safety Manager. *Use an O2 meter when using cryogenics in enclosed areas
Potential toxicity	Vapors can extend well beyond the fog cloud, and the cloud must not be used to define the leak area. Not an issue with liquid nitrogen.	*Any potentially toxic cryogenic material should be used only after review of the Safety Manager. *Do not inhale cryogenic vapors

Skin or eye burns	From cold nature of material. Vapors coming from these liquids are also extremely cold and can produce burns.	Wear appropriate PPE to protect the face and skin from cold: *Skin – loose fitting thermal insulated or leather gloves, longsleeved shirts and trousers without cuffs *Face - face shield over safety glasses.
Built-up Pressure	Containers holding cryogenic liquids will build up pressure if tightly sealed.	Contain cryogenic materials in unsealed containers, or provide pressure relief if sealed.
Brittle materials	Plastics and some metals can become brittle with extreme cold.	Handle materials that contact cryogenics with caution.

Appendix C Hot Work Safety Procedures

Hot Work Safety Procedures

Health Hazard	Cause/Comment	Controls
Eye burns (Welder's Flash)	High energy consuming types of hot work such as resistance welding can generate infrared light that can damage the eyes	*Use welding curtains to minimize general exposures. *Use the appropriate welding goggles lens when doing hot work
Skin burns (Sunburn)	High energy consuming types of hot work such as resistance welding can generate ultraviolet light that can cause sunburn	*Use leathers or other appropriate PPE when resistance or plasma welding.
Oxygen deficiency	Burning and cutting can use up oxygen in the air	*Use an O2 meter when doing hot work in enclosed areas (3 or more sides closed in on the "box" surrounding the employee) or confined spaces.
Oxygen enrichment	Leaks in oxygen lines can result in excess oxygen concentrations	*Check welding lines prior to use *No welding gas cylinders allowed in confined spaces
Potential toxicity from surface materials	Many coatings have hazardous materials such as lead-based paint	*If surface coatings are not known, work should be conducted only after review with the Safety Manager. *Remove as much hazardous coating as possible near the work location with non-heating means (e.g., needle gun) prior to hot work. 4 inches from the weld is usually adequate.
Potential toxicity from base materials	Many metals and other materials can generate harmful contaminants in air when heated.	If base materials are not known, work should be conducted only after review with the Safety Manager.
Noise	Many processes can be noisy	Wear appropriate hearing protection when needed.
Electrical	Resistance welding uses	Terminals on arc welders must be protected from accidental contact.
Sparks, Spatter	Most hot processes generate sparks and hot airborne particulates	*Use hot work procedures *Use fire watch where applicable *Use appropriate PPE

Appendix D Hot Work Hazards by Material

	Toxic Gases, Particulates										Metals										Physical
	CO	Phosgene	Ozone	NOx	Fluorides	Aldehydes, other	Silica	Asbestos	Fiber-glass	Sulfur compounds	Metal Fumes	Aluminum	Beryllium	Cadmium	Chromium	Copper	Lead	Nickel	Tin	Zinc	Radiation
Galvanized											X									(1)	
Paint – metal-containing	X			X		X					X			(2)	(2)	(2)	(2)	(2)			
Paint – Epoxy	X			X		X															
PCBs	X	X				X															
Zinc-rich silicates							X				X										
Plated											X			X	X	X		X			
Solvents/strippers	X	(3)		X		X															
Natural gas lines										X											(4)
Antiseize/threading agents	X			X		X															
Electrodes					X		(6)				X					(5)					
Petroleum lines	X									X											
Carbon steel											X			X							
Stainless steel											X			X	X			X			
Brass/bronze											X		(9)			X	X		X	X	
Plastic	X	(8)			(7)	X															
Rubber	X					X															
Aluminum			X								X	X									
Copper (Cu)											X		(9)								
Insulation	X					X		X	X												

Legend:

X - Generally recognized hazard, either from the material itself or the process (#) - See note below

Notes:

1. Typically low if good ventilation; higher for arc cutting than oxyacetylene
2. Depends on content of paint (e.g., lead-containing)
3. If chlorinated solvents present
4. From "plating" of naturally occurring radioactive materials out of natural gas
5. If using copper-containing welding wire or electrode
6. Possible with teflon, other fluorine-containing plastics
7. Amorphous silica from silicon in electrode
8. Possible with PVC, other chlorine-containing plastics
9. Beryllium may be a contaminant in copper

Appendix E Hot Work Hazards by Process

	Toxic Gases, Particulates								Metals					Physical		
	Carbon Monoxide	Phosgene	Ozone	NOx	Inert gases	Fluorides	Aldehydes, other	Silica	Metal Fumes	Cadmium	Chromium	Nickel	Copper	Eye Flash	Sunburn	Noise
Arc Gouging	H		M	M			M		H (6)		M	M	M			M
TIG (Heliarc)		M (2)	M	M	U				M (6)					M-H	M	
MIG	(1)	M-H (2)	H	H	U				H (6)		(5)		(3)	M-H	H	
Brazing						M			(6)	M						
Torch Cutting	M-H			H					L-M (6)							M
SM Arc / Stick						M		(4)	L-M (6)				(3)	M	M	
Heating Rods	U						U									
MAPP	M-H			H					L-M (6)							M
Plasma		H (2)	H	H					H (6)					H	H	H

Legend:

L - Typically a low hazard (no overexposures), assuming adequate ventilation in a nonenclosed space.

M - Medium hazard; can result in significant exposures in open areas

H - High hazard; should be controlled with ventilation or PPE as much as possible.

U – Unknown degree of hazard; anticipated to be low

(#) - See note below

Notes:

1. If using CO2 as a shielding gas; typically not a problem if the employee stays out of the weld fume cone
2. If chlorinated solvents present
3. If using Cu-containing welding wire or electrode
4. Amorphous silica from silicon in electrode
5. MIG - High total chromium, low hexavalent chromium
6. Specific metal fumes from surface coatings include: lead, cadmium, chromium, copper, zinc
   Arsenic possible if hot work near coal by-products (e.g., inside boiler)
   Beryllium may be a contaminant in copper

Appendix F Resistance Heating Safety Procedures

Health Hazard	Cause/Comment	Controls
Potential toxicity from surface materials	Many coatings have hazardous materials such as lead-based paint	*If surface coatings are not known, work should be conducted only after review with the Safety Manager. *Remove as much hazardous coating near the work location with nonheating means (e.g., needle gun) prior to hot work. 4 inches from the weld is usually adequate.
Potential toxicity from base materials	Many metals and other materials can generate harmful contaminants in air when heated.	If base materials are not known, work should be conducted only after review with the Safety Manager.
Electrical	Resistance welding uses electricity to heat the elements.	Wiring should be protected from accidental contact or damage.

Appendix G Supervisor's Checklist

Appendix G Supervisor's Checklist

Work to be performed

_____
_

Work Area (esp degree of enclosure)

_____
_

Known Base Material [Y/N] _____

Known Coating Material (if applicable) [Y/N] _____

Indicate all applicable:

Potential Health Hazards	Due To	Controls Used
☐ Cryogenic Materials		
☐ Electrical Hazards		
☐ Oxygen Deficiency / Enrichment		
☐ Toxic Materials (base materials)		
☐ Toxic Materials (coatings)		
☐ Skin/eye burns		
☐ Noise		
☐ Other		
☐ Other		

FLOW DIAGRAM WHEN HEATING/COOLING COMPONENTSClick for pdf version

Procedure 808 Helicopter Operations

TVA Safety Manual

808 Helicopter Operations

Procedure Number 808

TVA Safety Procedure

Helicopter Operations

Revision 1

April 30, 2007

Purpose

The purpose of this procedure is to improve the effectiveness and safety of TVA helicopter operations in meeting the needs of TVA program organizations. The procedure contains the final joint agreement for TVA helicopter use.

Joint Operating Agreement - TVA Helicopter Usage

As a result of the 1998 Utilities/Aviation Specialists, Inc., review and the TVA Serious Accident Investigation findings, TVA is implementing the following guidelines in all work involving the use of helicopters. Action contrary to this agreement will be investigated and documented as to the reason and actual consequences.

TVA uses helicopters in a variety of settings to enhance service delivery and internal operations. Some missions are completed using TVA flight crews and equipment; others are completed using contracts with private helicopter operators or using military aircraft. Regardless whose crews and equipment are being used, TVA expects the tasks to be completed safely and with minimal risk to life, limb, and property.

General

1. TVA uses its helicopters and flight crews to perform all or portions of the following assignments.
   - Transmission line patrol
   - Emergency line patrol
   - Detail line inspection
   - Industrial site surveys
   - Aerial herbicide application
   - Aerial fertilizer/seed application
   - Air quality sampling
   - Aerial photography
   - Shoreline inspection
   - Light pole setting (transmission line construction)
2. TVA uses pre-certified contract helicopters and flight crews to perform the following assignments.
   - Transmission line construction
   - Other transmission facility construction
   - Live transmission line maintenance
   - Emergency line patrol
   - Aerial herbicide application

3. If it is determined by the Helicopter Services Manager, that TVA helicopters and flight crews are not available, overflow and emergency work may also be performed by precertified contract providers. Military aircraft may be used as appropriate for emergency line patrol.
4. Only aircraft approved by TVA Helicopter Services are to be used to transport TVA personnel.

Operations

1. TVA will continue to operate its helicopter fleet for public use under Advisory Circular 00-11 and for civil operations under FAR 91, and will follow provisions of FARs 133, 135, and 137 for applicable operational practice.
2. All routine helicopter work should be coordinated in advance with the Helicopter Services Manager or the Helicopter Services Manager's designee. The Helicopter Services Manager, or the Helicopter Services Manager's designee, will work with the responsible parties to resolve any helicopter/flight crew scheduling conflicts. In the unlikely event that such conflicts cannot be resolved satisfactorily, the Chief Operations Officer will be asked to make a decision. Emergency work should be coordinated with the TVA Emergency Operations Center, if it has been activated, or with the Helicopter Services Manager.
3. Before beginning an assignment that requires simultaneous or sequential efforts by ground and flight crews, the ground and flight personnel will brief each other on the operations and methods that will be used to complete the assignment.
4. To the extent practicable, each helicopter assignment will be completed following standardized procedures that complement the job safety analysis (JSA) for each assignment type. All parties are committed to identifying technology and work methods that may improve the effective and safe completion of helicopter assignments. ***Under no circumstances may safety be compromised knowingly or made secondary to any other assignment consideration.***
5. Assignments involving external loads will be accomplished using quick-connect devices on the helicopters. Standard helicopter hand signals (graphically depicted in Appendix A) will be used for assignments requiring personnel external to the aircraft to direct the pilot's maneuvering of the aircraft and/or the external load. Other ground-to-aircraft communications devices, such as in-helmet two-way radios, may be used by mutual agreement to enhance the safety of the operation. The provisions apply to both TVA and contractor aircraft and crews.

Safety

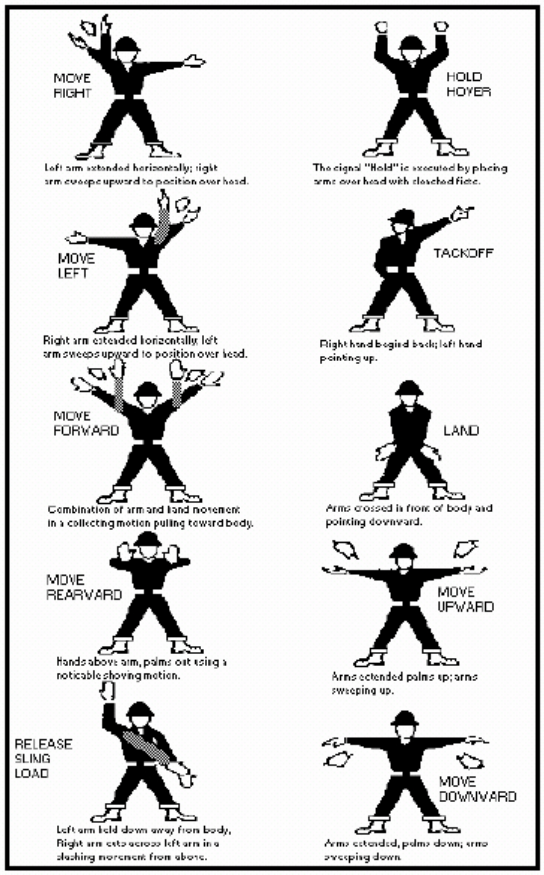
1. TVA will maintain a job safety analysis (JSA), which is prepared using form TVA 15943, for each type of helicopter assignment. The JSA identifies job steps, potential hazards, and safe practices to eliminate or minimize the hazards. The JSAs will be prepared and maintained jointly by the organization requesting the work and Helicopter Services; the appropriate safety staffs/officers will participate in the development and review. The JSAs will be followed for all helicopter assignments, whether carried out by contractor or TVA employee/contract pilot flight crews. At the start of each helicopter assignment, the participants will carefully review the JSA and related safety procedures/information.
2. The pilot may, at any time, decide to abort, delay, postpone, or cancel an assignment for safety reasons. No person has the authority to overrule this decision.
3. Each flight and ground crew person is responsible for alerting others to possible safety issues and recommending solutions. Safety issues should be raised immediately, and the work in question suspended until the safety issue has been resolved.
4. TVA will continue to require its employees and contract pilots and mechanics to attend initial and annual refresher training for each helicopter model TVA uses. Training records of potential contract service providers will be reviewed as part of the pre-certification process.
5. The use of fixed wing aircraft is NOT approved for scheduled or emergency transmission line inspections.

Reference

29 Code of Federal Regulations 1926.551, “Helicopters”

Appendix A - Helicopter Hand Signals

OSHA Helicopter Hand Signals



OSHA Helicopter Hand SignalsClick for pdf version

Procedure 809 Hot Work

TVA Safety Manual

809 Hot Work

Procedure Number 809

TVA Safety Procedure

Hot Work

Revision 3

July 15, 2006

Purpose

This procedure establishes requirements for safe performance of hot work involving cutting, welding, open-flame, and other spark-producing work.

NOTE: TVAN hot work shall also comply with SPP-10.11, "Control of Ignition Sources (Hot Work)".

General Requirements

1. All hot work activities performed outside of designated shop areas shall be reviewed for applicability of this procedure.
2. The "Cutting, Welding Open Flame and Spark Production Permit", Appendix A, shall be used to control work activities involving hot work as defined in this procedure.
3. The following examples require use of the permit process. No area should be waived without the review.
   - All coal handling structures.
   - Open flame or calrod heater use inside buildings.
   - Tar kettle operations typically used in roofing applications.
   - Cable tunnels and cable tray runs.
   - Pressurized systems containing combustible or flammable liquids or gases.
   - Tanks, vessels, or piping containing, or having contained, combustible or flammable chemicals, gases, etc.
   - Activities such as arc gouging or plasma arc which produce large quantities of molten material.
   - Electrical soldering activities shall be performed in accordance with this procedure, however, no permit or fire watch is required.
   - Any plant area containing a process covered under TVA Safety Procedure 219, "Process Safety Management", such as ammonia systems used in Selective Catalytic Reduction.
4. If the hot work activity is to continue for more than one shift, then the work area shall be re-inspected and the permit re-validated at the beginning of each shift that hot work is to be performed.
5. Upon completion of the hot work activity, the responsible supervisor shall:
   - Ensure equipment used to perform hot work has been removed from the area.
   - Ensure fire detection system/equipment is restored to operable status.
   - Ensure work area is cleaned in accordance with site housekeeping procedures.
   - Ensure that the designated fire watch maintains surveillance in the work area as specified in the permit.

Specific Requirements

1. Welding curtains, tarpaulins, or other spark containing/arc protection features installed in the area of hot work shall be either non-combustible or constructed of fabrics that are Underwriters Laboratory (UL) listed or Factory Mutual Approved (FM) as weather resistant and flame retardant.
2. All combustible material below or within 35 feet of the work area is removed. If the material cannot be removed then it shall be thoroughly protected by metal guards or flame retardant fabric.
3. If it is not practical to remove or cover all material within 35 feet of the work location then it is permissible to "box in" the work location using metal guards or flame retardant fabric in order to prevent the spread of sparks, slag, and molten metal from the immediate area.
4. Adequate precautions shall be taken to prevent the spread of sparks, slag, and molten metal by covering all floor (i.e., grating) and wall openings including gaps under and around doors with flame retardant fabric.
5. Edges of covers at the floor shall be tight to prevent sparks from going under them. This precaution is also important at overlaps where several covers are used to protect large areas.
6. For work involving electric soldering, ensure that any area(s) below the work area are free of combustible materials or are adequately protected.
7. Any plant equipment (pumps, valves, piping, cables, instruments, etc.) which could be damaged by sparks, slag, or molten metal is thoroughly protected by metal guards or flame retardant fabric.
8. Ensure that plant equipment or components, such as valves, piping, instruments, electrical cables, etc., which could be damaged by an accidental arc strike have been adequately protected.
9. Provide adequate smoke control measures or remove from service smoke detectors located in the area of the hot work, prior to starting the hot work activity.
10. Equipment to be used shall be checked and in good working condition (oxygen/acetylene hoses, regulators, welding leads, etc.).
11. A fire extinguisher shall be available at the hot work site that is properly rated and adequately sized for the hazard(s) involved. Fire extinguishers permanently installed in plant buildings and structures can be used by Hot Work Fire Watches. If the nearest fire extinguisher is not easily accessible, then obtain another fire extinguisher.
12. During extended periods of non-use (periods exceeding 24 hours) oxygen/acetylene units shall be removed from critical areas and stored in designated areas in accordance with TSP 706, "Compressed Gas Cylinders".
13. All welding machines shall be turned off when not in use. In areas where multiple welding machines are located, each machine should have an identified number to allow quick identification in the advent of an emergency.

Employee Responsibilities

1. Prepares the work area and performs the work in accordance with this procedure.
2. Ensures that a qualified fire watch is in attendance prior to the start of the actual hot work activity when required.

Fire Watch

1. The fire watch shall have fire extinguishing equipment readily available and shall be trained in its use.
2. The fire watch shall be familiar with facilities for sounding fire alarms in the event of a fire.
3. The fire watch shall watch for fires in all exposed areas and try to extinguish them only when obviously within the capacity of the equipment immediately available (otherwise sound the alarm and notify appropriate supervisor/control room.
4. A fire watch shall be maintained for a minimum of 30 minutes after completion of work or as directed by the permit approver.
5. For cutting or welding in coal handling facilities there will be a minimum 2 hour period after completion of the work. A detailed inspection should be made during and at the end of the period to detect or verify no possible

smoldering fires or hot spots.

6. The fire watch attendant's name and time to remain on watch will be documented on the permit.
7. Hot work and fire watch personnel shall be briefed by the responsible supervisor prior to beginning the work activity. The briefing shall include potential process hazards, special precautions, and additional requirements specified on the "Cutting, Welding Open Flame and Spark Production Permit".
8. One fire watch is permitted to cover all hot work activities provided they are located on the same elevation and area, and are in view of the watch at all times.
9. The fire watch shall remain in the immediate work area for a minimum of 30 minutes (**2 hours minimum in coal handling areas**) after the completion of the hot work activity or as directed by the responsible supervisor.
10. The fire watch is trained and alert for any signs of fire, in constant attendance of the work area during the activity, and remains for 30 minutes afterward in accordance with this procedure.
11. Responsibilities of the fire watch include:
    - Stops work if area is not properly protected.
    - Inspects area assigned and ensures that combustible materials are removed or protected.
    - Inspects work area for location of telephone(s) and fire extinguisher(s).
    - Checks fire extinguisher(s) to see if it is of the appropriate rating for the hazards in the area.

Foreman / Supervisor Responsibilities

1. Inspects the work area prior to start of work activity to ensure the requirements of this procedure are met.
2. Ensures that requirements or restrictions listed on the "Cutting, Welding Open Flame and Spark Production Permit" are complied with.
3. Ensures the permit is available at the work location.
4. Assigns TRAINED fire watch personnel for hot work activity monitoring.
5. Re-inspects the work area and re-validates the permit at the beginning of each work shift the hot work activity remains in progress.
6. Reviews and approves permits prior to start of the work activity.
7. Maintains copies of permits for 90 days subsequent to work closure.

Definitions

Combustible Material - Any material which in the form it is used and under the conditions anticipated, may ignite and burn (e.g. wood, flame retardant materials,pressure treated lumber, plastic sheeting, paper, plastic sheeting, and cloth).

Hot Work - Hot work is any activity which requires the use of an open flame, controlled electrical arcing, grinding which produces sparks, or a heat source capable of causing ignition of combustible material. These activities include activities such as welding, cutting, grinding, and soldering.

Fire Watch - An individual who is trained in accordance with this procedure. The individual monitors the area where ignition source (Hot Work) activities are being performed. The individual is to be in attendance during activity and for 30 minutes afterward

Non-Combustible Material - A material which in the form it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat

Critical Area - An area where conditions could pose a hazard to oxygen/acetylene cylinders during periods of non-use or where an incident involving oxygen/acetylene cylinders could have an adverse impact on plant operations or endanger personnel

Reference

29 Code of Federal Regulations 1910, Subpart Q, “Welding, Cutting and Brazing”

NFPA-51b, Fire Prevention During Welding/Cutting/Other Hot work

Appendix A - TVA 6561A [1-2003], “Cutting, Welding, Open Flame and Spark Production Permit”

TVA 6561A - Cutting, Welding, Open Flame and Spark Production Permit [1]

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072562074

Procedure 810 Marine Operations for Tugboats and Deckhands

TVA Safety Manual

810 Marine Operations for Tugboats and Deckhands

Procedure Number 810

TVA Safety Procedure

Marine Operations for Tugboats and Deckhands

Revision 3

November 21, 2011

Purpose

The purpose of this procedure is to establish safe work practices for employees who perform work activities on vessels operating on inland waterways in support of TVA operations and align TVA marine operations with the Code of Federal Regulations governing marine operations activities on inland waterways.

Small boating safety requirements are identified in TVA Safety Procedure 603, “Boating Safety”.

Roles and Responsibilities

1. The Manager, Yard Operations has responsibility for Marine Operations for Fossil Power Group (FPG) and is responsible for implementation of the requirements of this procedure.
2. The Yard Operations Supervisor at each fossil plant where marine operations are conducted is responsible to provide for safe operation of towboats and barges. This includes, but is not limited to (1) selecting and assigning operators and deckhands, (2) requesting physical examinations, (3) providing required training and proficiency evaluation and (4) providing for proper maintenance and upkeep of all marine equipment.
3. The Yard Operations Supervisor shall ensure that employee safety issues and concerns are solicited from employees and addressed in a timely manner.
4. Complete assigned safety training prior to performing related tasks.
5. The Yard Operations Supervisor shall ensure that all new Staff Augmented Pilot and Deckhands receive Safety Orientation for Staff Augmented Contractors, ATIS 00059193 prior to the start of production work. This course is available through TVA On-line Learning.

Qualifications for Pilots and Deckhands

1. Pilots and Deckhands shall have the ability to swim and be determined to be medically fit for duty. This determination shall be accomplished through a physical examination in accordance with the most recent guidelines in the TVA Medical Examination Guide, Medical Examination for Marine Pilots and Deckhands. Failure to pass all medical requirements shall disqualify the candidate from performing those duties of Pilot/Deckhand.
2. Pilots and Deckhands will complete a physical examination every two years, or more frequent if health conditions warrant reassessment.
3. Pilots must demonstrate the ability to safely operate towboats which includes towing vessel proficiency. A designated person qualified by virtue of training, experience, will evaluate current and candidate marine pilots. Applicants must pass a practical documented skills test before assuming his/her duties.
4. Pilots must complete the Rivers and Decks Skills training course ATIS 00059148 and demonstrate towing vessel proficiency to the evaluator to which they are assigned.
5. When Yard Operations Management initially assigns a new TVA or staff augmented Pilot or Deckhand to work on the river, each employee must successfully complete a 3 hour instructor lead training class which addresses the basic safety and operational requirements of the job assignment. Within the first 90 work days, each new pilot or deckhand shall attend and successfully complete a TVA authorized 3 day Rivers and Deck Skills training course. In the event Yard Operations Management can not arrange to have the newly assigned pilots or deckhands complete this 3 day training requirement with in time limits, it is Yard Operations Management responsibility to not allow these pilots or deckhands to function in this capacity in TVA until the training is complete.
6. Deckhands must successfully complete the Rivers and Decks Skills training course ATIS 00059148. Applicants must pass a practical documented skills test. Upon completion of the Rivers and Deck Skills Training, each deckhand shall work with a trained deckhand for a period of 90 days and shall be successfully evaluated before assuming his/her duties. Appendix C, "… Pilot/Deckhand Performance Evaluation", shall be the instrument for evaluation. This document shall be maintained at the site for 5 years.
7. Each qualified employee must become familiar with the relevant characteristics of the vessel on which engaged prior to independently assuming work status. These characteristics include but are not limited to the following:
   - General arrangement of the vessel.
   - Maneuvering characteristics.
   - Proper operation of all communication equipment.
   - Firefighting and lifesaving equipment.
8. Each qualified deckhand and pilot must have a Marine Operations Performance Evaluation annually. This evaluation is to be completed by the supervisor to which they are assigned work status or his/her designee. This evaluation must be kept on file for no less than 5 years by the supervisor to which they are assigned work status. Evaluation Performance factors shall include:
   - Overall safety
   - Job performance (boat)
   - Job performance (barge staging)
   - Job knowledge
   - Attitude
   - Leadership
   - Development recommendations
   - Manager's comments, signature, and date
   - Employee's comments, signature, and date
9. Each deckhand and pilot shall successfully complete First-Aid / CPR training.

Personal Flotation Devices

1. A Type V, U.S. Coast Guard approved personal flotation device with Type I retroflective material shall be worn at all times by deckhands and other employees performing work operations aboard a vessel where there is an exposure to a fall overboard.
2. A Type III, U.S. Coast Guard approved personal flotation device with Type I retroflective material shall be readily available for immediate use by marine operation pilots and other employees on board a vessel.
3. A Type I, U S. Coast guard approved personal flotation device with Type I retroflective material shall be readily available for immediate use by any authorized passenger.
4. Each vessel shall be equipped with at least two ring buoys with an attached 90-foot synthetic line. The ring buoys should be located by the pilot house and along the main deck forward, and maintained in a serviceable condition.
5. All personal flotation devices shall be inspected quarterly. Inspection records shall be maintained on file for a period of one year. Physical condition shall be documented and kept on file with the Yard Operations Supervisor. (Appendix B).
6. Each personal flotation device shall be equipped with an Emergency/Life Preserver Flashing Light. This emergency light attaches to the personal life preserver and uses one “D” size cell battery.
7. Effective July 1, 2007, each personal flotation device shall also be equipped with a whistle. Manufacturer “…SCOTTY…”, Model No. 784 Pea less Whistle1-800-214-0141. Cost is $1.98 each.

Inspections

1. All TVA owned or leased towboats and barges shall undergo a comprehensive safety inspection quarterly to determine fitness for service. The inspection shall be documented on the Fossil Power Group Vessel Audit Report, Appendix A. A copy of the inspection report must remain on file with the facility Manager responsible for yard operations or the Yard Operations Supervisor, and must remain on file for a period of not less than five years.
2. All towboats shall undergo a visual walk-down inspection at the beginning of each shift before movement is commenced. The following items shall be noted as to operational readiness:
   - Exterior condition.
   - List and draft.
   - All critical electrical and mechanical components responsible for powering and maneuvering the vessel.
   - All auxiliary and safety components which support vessel operation.
   - Obstructions to movement in water.
3. Any vessel that has undergone extensive modification, alteration, or repair that could potentially affect the safe operation of the vessel shall be re-inspected by a qualified technician prior to returning the vessel to service.
4. Any deficiencies which could potentially affect the safe efficient movement of a vessel shall be corrected before the vessel is placed in operation. If the vessel is unsafe to operate, a defective equipment tag shall be placed in the pilot house on the vessel until the hazards are corrected. Work to correct any deficiency to the vessel shall be conducted only by a qualified technician.

Security

1. Unauthorized personnel shall not be allowed aboard vessels whether moored or underway without proper clearance from the Yard Operations Supervisor and shall always be accompanied by a crew member or other authorized personnel.
2. Any incidents such as suspected acts of sabotage, theft, fire, damage from collision or severe weather, or misconduct of employees shall be promptly reported to management and investigated before operations continue.

Communications

1. Towboats will be equipped with a system that allows two-way communication between the pilot and deckhands.
2. The towboat will also have the capability of communicating with other marine craft and with personnel on shore in the event of an emergency.
3. Voice communication and a whistle or horn will be provided.
4. Pilots and deckhands will communicate using the appropriate hand signals
5. Optional: Man overboard pilot house alarm (GAF), Emerald Products, Alert 2, Man overboard Alarm.
   Note: The ALERT 2 System consists of a water-activated radio transmitter, which begins to transmit a unique signal upon hitting the water. A receiver sits aboard the boat, and it howls like mad when it receives the unique signal. It also has the ability to shut down the engine and mark a position on a compatible GPS or Loran.

Illumination/Lights

1. All marine operations shall be adequately illuminated.
2. Towboats shall have appropriate lights. As a minimum, the boat must have a red light on the port side of the pilot house, a green light on the starboard side of the pilot house, and two amber lights in a vertical line visible from the stern not less than two feet apart.

Basic Requirements for Towboats

1. Towboats will be maintained in serviceable condition.
2. General housekeeping will be maintained including keeping the deck clear of unnecessary equipment and foreign materials that may cause slip and trip hazards.
3. A non-slip surface will be maintained on all outside decks.

Man Overboard and Rescue Drills

1. Man overboard and rescue drills shall be conducted semi annually for each crew/shift assigned to the vessel.
2. When any deckhand or pilot inadvertently or intentionally enters the water; a complete near miss investigation shall be conducted and results documented.

Fire Drills and First Aid

1. Fire drills involving the vessels, moored or underway, shall be conducted for each crew/shift assigned to the vessel annually. All fire drill scenarios and responses shall be reviewed by the Yard Operations Supervisor.
2. Fire extinguishers shall be the ABC dry chemical type with a current inspection tag.
3. A first-aid kit shall be kept and maintained in the pilot house of each towboat for emergency use. It is the responsibility of the Shift Foreman to ensure the first- aid kit is adequately stocked.

Reference

Code of Federal Regulations, Chapter 1, “Shipping”

Code of Federal Regulations 1926.106 “Working Over or Near Water”

Definitions

Deckhand - Employees who perform all the deck work on towboats and barges.

Pilot - An employee qualified to operate and maneuver a towing vessel and its associated cargo of vessels towed on inland waters utilized by TVA. The pilot has the overall responsibility for the towboat and crew.

Appendix A Fossil Power Group Vessel Audit

FOSSIL POWER GROUP VESSEL AUDIT

PILOT HOUSE INTERIOR	YES	NO	N/A	RECOMMENDED ACTIONS
1. Floors in good condition and free of slippery spots.				
2. Stairways in good condition with non-skid applied.				
3. Handrails in place and secure.				
4. Gages, indicator lights and alarm panel operating properly.				
5. Electrical equipment grounded.				
6. Remote winch controls operable.				
7. Stairwell caution sign in place.				
8. Fire extinguishers mounted, pin secure, tag current.				
9. Pilot house chair serviceable.				
10. Non-skid surface provided and serviceable.				
11. Walkie talkie provided and operable.				
12. VHF radio provided and operable.				
13. Stairways provided with adequate lighting.				
14. Area free of exposed wiring.				
15. All electrical equipment labeled and identified.				
16. Electrical receptacles covered properly.				

COMMENTS:

FOSSIL POWER GROUP VESSEL AUDIT

PILOT HOUSE EXTERIOR	YES	NO	N/A	RECOMMENDED ACTIONS
1. Stairs and ladders in good condition, hand rails secure and non-skid applied.				
2. Non-skid surface at doorways.				
3. Ring buoys in good condition, with ninety (90) feet of line attached.				
4. Save-U-Lights properly attached with six (6) feet of line.				
5. Walking surfaces unobstructed.				
6. Guard rails in good condition.				
7. Doors and hardware in good repair.				
8. Vessel navigation lights operable and properly screened.				

COMMENTS:

FOSSIL POWER GROUP VESSEL AUDIT

FIRST DECK EXTERIOR	YES	NO	N/A	RECOMMENDED ACTIONS
1. Deck painted with non-skid.				
2. Safety border around vessel.				
3. Stairs and ladders in good condition, handrails secure and non-skid applied.				
4. Light provided with plastic globes and/or guards.				
5. Guard ropes and stanchion supports serviceable.				
6. Walking surfaces unobstructed.				
7. Doors and hardware in good repair.				
8. Winches operable, wires serviceable, controls identified.				
10. Hatches in good condition and properly secured, deck openings watertight.				
11. Fire extinguishers identified and mounted, pin secure, tag current, and proper type for area.				
12. Ring buoys in serviceable condition with ninety (90) feet of line.				
13. Fire axes provided and serviceable.				
14. Rigging deck low overhead hazards identified.				
15. Pike pole available and serviceable.				
16. Face wires serviceable and free of kinks and burrs.				
17. Deck fittings in serviceable condition.				
18. Exterior piping properly identified, and color coded.				
19. Fixed fuel station containment covered and clean.				
20. Flame screens serviceable and present in fuel, lube and waste oil tank vents.				

COMMENTS:

FOSSIL POWER GROUP VESSEL AUDIT

ENGINE ROOM	YES	NO	N/A	RECOMMENDED ACTIONS
1. Deck is free of slippery spots.				
2. Machine guards are in place.				
3. Warning signs are posted.				
4. Electrical equipment grounded				
5. Overhead hazards properly identified.				
6. Fire extinguishers mounted, pin secure, tag current, and proper type for the area.				
7. Non-skid applied at doorways.				
8. Handrails upright and secure.				
9. Area free of exposed wiring.				
10. Lights provided with plastic globes and/or guards.				
11. Deck plates properly secured.				
12. Ventilation fans clean, and guards in place.				
13. Area free of combustible and flammable materials.				
14. Adequate lighting provided.				
15. All supplies stowed safely.				
16. Exhaust manifolds guarded.				
17. Covered metal container for oily rags identified.				
19. Rubber mat provided at high voltage panel				
20. Piping diagram available for fuel system				
21. Walkways unobstructed				
22. Smoke alarms provided and operable				
23. Bilge pump serviceable.				
24. High level bilge alarm operable				
25. All electrical control panels labeled and identified				
26. Valves properly identified				
27. Shaft water containment area clean and free of debris				
28. Type 1 PFD present and serviceable				
29. Other				

COMMENTS:

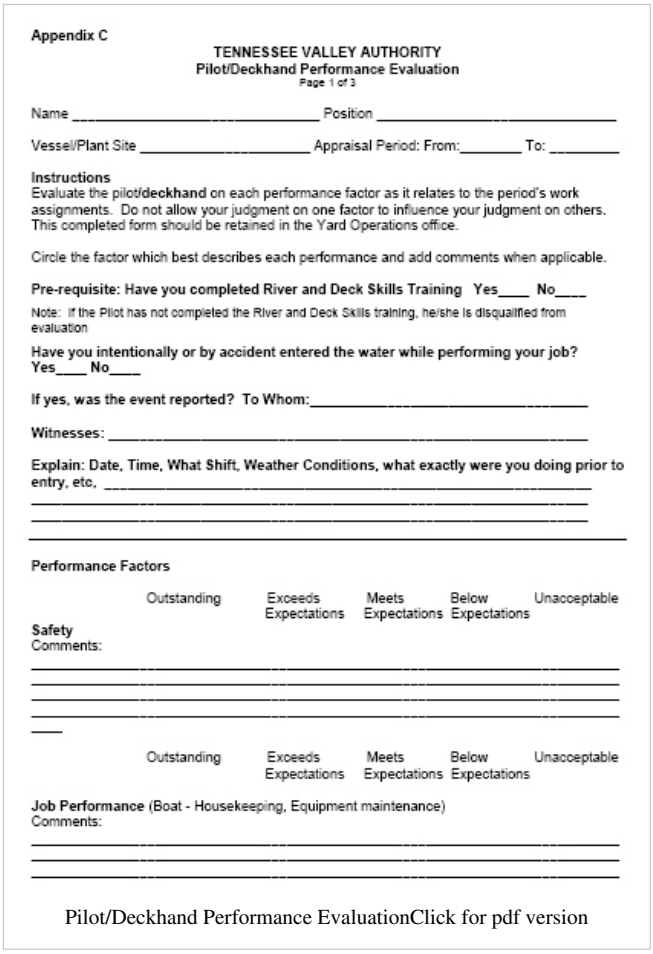
Appendix B Personal Flotation Device Assignment / Quarterly Inspection Log

PERSONAL FLOTATION DEVICE ASSIGNMENT / QUARTERLY INSPECTION LOG

EMPLOYEE DATE	ISSUED	LAST INSPECTION DATE	TYPE	STROBE LIGHT	REFLECTIVE TAPE	SNAPS	STRAPS	PHYSICAL CONDITION	SIGNATURE

COMMENTS:

Appendix C - Pilot / Deckhand Performance Evaluation



Appendix C

TENNESSEE VALLEY AUTHORITY
Pilot/Deckhand Performance Evaluation
Page 1 of 3

Name _____ Position _____

Vessel/Plant Site _____ Appraisal Period: From:_____ To: _____

Instructions
Evaluate the pilot/**deckhand** on each performance factor as it relates to the period's work assignments. Do not allow your judgment on one factor to influence your judgment on others. This completed form should be retained in the Yard Operations office.

Circle the factor which best describes each performance and add comments when applicable.

Pre-requisite: Have you completed River and Deck Skills Training Yes____ No____

Note: If the Pilot has not completed the River and Deck Skills training, he/she is disqualified from evaluation

Have you intentionally or by accident entered the water while performing your job? Yes____ No____

If yes, was the event reported? To Whom:_____

Witnesses: _____

Explain: Date, Time, What Shift, Weather Conditions, what exactly were you doing prior to entry, etc, _____

Performance Factors

Outstanding | Exceeds Expectations | Meets Expectations | Below Expectations | Unacceptable

Safety
Comments:

Outstanding | Exceeds Expectations | Meets Expectations | Below Expectations | Unacceptable

Job Performance (Boat - Housekeeping, Equipment maintenance)
Comments:

Pilot/Deckhand Performance EvaluationClick for pdf version

Procedure 811 Radiography Operations

TVA Safety Manual

811 Radiography Operations

Procedure Number 811

TVA Safety Procedure

Radiography Operations

Revision 1

October 16, 2009

Purpose

The purpose of this procedure is to establish the method and requirements for requesting, authorizing, controlling and monitoring radiography operations performed at all TVA plants / facilities.

This procedure when fully implemented will ensure that personel are protected during conduct of radiography operations and that all radiography work is properly authorized and conducted according to established requirements.

Roles and Responsibilities

1. The **Plant / Facility Manager** provides the necessary resources to ensure implementation of this procedure.
2. The radiographer is responsible for all aspects of radiography operations. The requesting organization supervisor shall support radiography as follows:
   - Contacting Inspection Services Organization to request radiography services.
   - Authorization of radiography.
   - Restriction and prohibition of radiography.
   - Notifying the Shift Supervisor.
   - Making announcements prior to, and at the completion of radiography to ensure plant personnel are aware of the work in progress.
   - Reviewing and approving the Radiography Authorization, Appendix B.

   The radiographer is responsible for verifying that the above responsibilities have been met to ensure that radiography is not conducted until all requirements of this procedure are met.

   The requesting organization supervisor shall assure that clearly visible notification signs are posted to notify personnel when and where radiography will be performed. Notification signs shall be posted during the shift prior the scheduled radiography to allow notification of personnel returning to work for the shift which radiography is scheduled. The radiographer is responsible for verifying that the notification signs have been properly posted for the radiography to be done.

   If the requesting organizations supervisor will not be available the Shift Operations Supervisor may be designated to handle these responsibilities.
3. The **Inspection Services Organization (ISO)** contacts and coordinates with the Radiographers /Radiography Organization to ensure that properly trained and qualified personnel are assigned to perform radiography. ISO ensures that all radiographic operations comply with the requirements of this procedure and applicable regulations and license(s), complete applicable parts of Appendix A (Request for Radiography) and Appendix B (Radiography Authorization).

4. **Radiographer** performs radiography in accordance with the requirements of this procedure and applicable regulations and license(s), completes applicable parts of Appendix B (Radiography Authorization), and completes self study training on this procedure prior to start of work.
5. **RadCon Manager (Nuclear)** provides support per TVAN Radiological Control Program.
6. **Radiation Safety Manager (Non Nuclear)** provides oversight of the TVA Radiography Program. (Memorandum of Understanding)
7. **FPG Program Administrator** - Environmental (PAE) establishes hazardous chemical waste satellite accumulation area; ensures proper disposal of hazardous wastes.

Basic Requirements for Radiography

1. All radiography shall be performed by properly licensed organizations, TVA or contractors, under the direction of the Inspection Services Organization. A copy of the organizations license, operating and emergency procedures and required “Notice to Employees” postings shall be onsite and available for review.
2. Radiography operations shall be conducted in accordance with all requirements of the radiography organization’s by-product materials license, applicable state and / or federal regulations and TVA requirements.
3. Radiography shall be scheduled, when possible, during a time when there is the least potential for boundary crossings and exposure to employees, and shall be communicated during job/shift briefing and posting of clearly visible notification signs.
4. Unauthorized, non-radiography personnel shall not cross radiography boundaries. If nonradiography personnel must gain access to the area, radiographic operations shall be stopped, a portion of the radiography boundary shall be dropped and the individual shall be escorted by the radiographer or assistant radiographer. When the non-radiography individual has completed his/her task, they shall be escorted out of the area and the boundaries re-established.
5. During all radiography operations, the radiographer(s) shall reasonably control the area to prevent unauthorized entry. If unauthorized personnel enter the radiography area, radiographic operations shall be stopped immediately. The unauthorized individual shall be immediately escorted out of the radiography area and detained. The responsible supervisor or his / her designee shall be notified. The unauthorized individual shall be questioned to determine the following:
   - Where did he / she enter the radiography area,
   - Where did he / she go while in the area,
   - How long was he / she in each location within the area.
6. A determination shall be made if the unauthorized individual received radiation exposure and how much exposure, while in the radiation area; through calculations and / or re-enactment, as necessary.
7. The radiographer shall make proper notification to his / her supervision and the Radiation Safety Officer, as necessary. **If notification to the regulatory authorities (e.g. NRC) is required, that notification shall be made by the Radiography Organization. No notification to regulatory authorities is required or should be made by plant personnel.**
   NOTE: TVAN site NRC notifications are governed by appropriate procedures and take precedence. SPP 3.5 requires that operations make immediate NRC notifications, several of which may be triggered by a radiography event.
8. A copy of the Radiography Operating and Emergency Procedure must be available from the radiographer upon request.

Radiography Work Procedure

1. Radiography work should be requested by responsible plant personnel when needed, using Appendix A (Request for Radiography). Appendix C Radiography Operation Guideline provides guidance for requesting and performing radiography work.
2. The Radiography request shall identify the location where the work is needed, the dates and time needed, a description of the work required, along with names and phone numbers of the plant personnel responsible for the work.
3. The ISO Lead and radiography personnel shall notify the responsible supervisor or his / her designee when they arrive on site. The radiographer shall be provided with available information showing potential areas affected by scheduled radiography. Access to the affected area will be restricted to personnel directly involved with the radiography or carrying out this procedure
4. The radiographer shall complete the required portion of the Radiography Authorization form, Appendix B, and submit to the responsible supervisor or his / her designee for approval.
5. The work area in which radiography is to occur will be identified and evaluated by the radiographer to determine where radiography boundaries will be placed. Special attention should be given to vacant pipe sleeves, piping and conduit penetrations, ventilation ducts and doors.
6. The radiographer(s) shall establish proper radiography boundaries such that all entrances to the radiography area are barricaded. Care shall be taken to adequately post main traffic areas to alert non-radiography personnel of the restricted area. When the radiography area is barricaded and verified to be clear of all personnel, the radiographer will inform the responsible supervisor that all conditions are satisfactory to commence the radiography. Radiography boundaries shall be posted with yellow and magenta rope or ribbon and shall be marked with proper signs with the standard radiation symbol and the words;
   CAUTION RADIATION AREA
   And flashing lights to alert individuals that radiography is in process. If radiography is being conducted with a radiation producing machine, X-Ray machine, the control panel shall have a sign or label stating, “This machine produces harmful radiation when energized.”
7. After all radiography boundaries have been established, before radiographic operations begin, the ISO Lead, the radiographer and the responsible supervisor (at his/her discretion) shall “walk the boundaries” to assure that all entrances to the radiography area are indeed barricaded.
8. When the radiography boundaries are acceptable, the responsible supervisor shall grant approval to begin radiography and complete and sign the Radiography Authorization form, Appendix B.
9. For radiography, the responsible supervisor or his / her designee will inform the radiographer that upon completion of the plant announcement, permission to commence radiography is granted. A typical plant announcement is as follows:
   “Attention all personnel Radiography will commence at (location) for approximately (hours), All personnel stay clear of the roped-off and posted areas“
   NOTE 1: The announcement will be made twice.
   NOTE 2: Areas outside the main plant building where the public address announcement system (PA) cannot be reliably heard and facilities that do not have a fully functional PA system, the announcement shall be made locally by the radiographer(s), (voice amplification must be used when non-amplified voice levels can not be heard over ambient noise levels in the area).
10. Upon completion of the announcement, the radiographer(s) may commence radiography.
11. Whenever the radiation source is exposed and/or the radiation producing machine is energized, the radiographer(s) shall periodically obtain exposure rates at the boundaries. Any change in beam or orientation will require surveys by the radiographer(s).
12. The radiographer shall cease radiography should unsafe or degrading conditions exist. At such time, the radiographer will immediately place the source in the camera or de-energize the radiation producing machine. No

further radiography acitivities shall occur until the responsible supervisor or his / her designee gives the radiographer permission to resume work.

13. Upon completion of radiography, the radiographer will inform the responsible supervisor or his / her designee that radiography is complete.
14. Normal access to the area will be allowed only when all barriers and postings have been removed.
15. The responsible supervisor and his / her designee shall make announcements or notifications as appropriate to employees and plant management that radiography work is complete.
16. **NOTE: FPG Program Administrator - Environmental (PAE) shall determine the need for and establish, if necessary, a satellite accumulation area for the collection of hazardous chemical waste. If hazardous chemical waste is generated, the radiographer(s) shall place it in the container provided by the PAE.**
17. Radiography personnel shall have a calibrated survey instrument and means for immediate communication with the responsible supervisor or his / her designee.

Precautions and Limitations

1. All activities involving radiography shall be conducted so that radiation exposure to personnel is maintained AS LOW AS REASONABLY ACHIEVABLE (ALARA).
2. If any individual finds an access to a radiography area not barricaded, or finds an unauthorized individual in an area, immediately notify the radiographer(s).
3. For the purpose of enforcing the requirements of this process or other regulatory documents, only radiography personnel are allowed to cross a radiography barrier.
4. Radiation producing devices will be de-energized and the controls will be secured in a manner which will prevent unauthorized operation when radiography personnel are not present.
5. Source storage devices shall be locked at all times when radiography personnel are not present.
6. Source cameras shall be moved to a designated storage area when not in use under direct surveillance of the radiography personnel.
7. Permanent and temporary storage areas for radiographic sources shall be conspicuously posted with signs bearing the standard radiation symbol and the words:

CAUTION (OR DANGER) RADIOACTIVE MATERIAL

Training

All employees who work in areas where radiography operations are conducted shall receive training course “Radiation Boundary”, ATIS 00059142.

NOTE: TVAN employees who have received radiation control area training are exempt.

Radiography Emergencies

Any incident, boundary violations, boundary crossings, radiation exposures, or other emergency event involving radiography operations shall be thoroughly investigated by the ISO Radiation Safety Officer or Assistant Radiation Safety Officer and documented on the Radiographic Incident Report, which is established as part of the “TVA Industrial Radiography Operating and Emergency Procedure”.

Definitions

Industrial Radiography is the examination of the structure of material by nondestructive methods using sealed sources of radioactive by-product material or electrical X-Ray devices.

Camera is a device, usually constructed of lead or other dense material, used to store and/or transport radiographic material.

Radiographer is any individual who performs or who, while present at the site where sources of radiation are being used, personally supervises radiographic operations and is responsible to the licensee for ensuring compliance with applicable regulations, license, and TVA requirements.

Radiography Area is an area or location designated by radiography personnel which identifies the potential of radiation resulting from the performance of radiography and is marked by radiography barriers, ropes, signs, and flashing lights.

Radiography Barrier consists of ropes, signs, or placards, and flashing lights posted to control access to an area where radiography is taking place or areas affected by radiography.

Reference

10 Code of Federal Regulations 19: "Notices, Instructions and Reports to Workers: Inspections and Investigations", or equivalent agreement state regulations.

10 Code of Federal Regulations 20: "Standards for Protection Against Radiography", or equivalent agreement state regulations.

10 Code of Federal Regulations 30: "Rules of General Applicability to Licensing of By-Product Material", or equivalent agreement state regulations.

10 Code of Federal Regulations 31: "General Domestic Licenses for By-Product Material", or equivalent agreement state regulations.

10 Code of Federal Regulations 34: "Licenses for Radiography and Radiation Safety Requirements for Radiographic Operations", or equivalent agreement state regulations.

10 Code of Federal Regulations 150: “Exemptions and Continued Regulatory Authority inAgreement States and in Offshore Waters Under Section 274.”

10 Code of Federal Regulations 170: “Fees for Facilities, Materials, Import and ExportLicenses, and Other Regulatory Services Under the Atomic Act of 1954, as Amended.”

TVA, Inspection Services Organization "Industrial Radiography By-Product Material Operating and Emergency Procedure."

TVA-DMI-E86-4: "Directives Manual-Central Office Procedure."

Nuclear Regulatory Commission "Materials License 41-06832-06."

Memorandum of Understanding “TVAN Radiological Control Program”.

TVA : Fossil Power Group: “Hazardous Materials & Waste Management Procedure”

Appendix A - Request for Radiography

Appendix A

TENNESSEE VALLEY AUTHORITY
REQUEST FOR RADIOGRAPHY

PART 1: To be completed by individual requesting radiography

Plant/Unit:_____/_____
Plant Site Unit

Date and Time Radiography is Requested:_____/_____
Date Time

Requested By:_____ /_____/_____/_____/_____
Name Phone Fax Date

Components (Tube Welds, Pipe Welds, Plate Welds, etc.)

_____

_____

_____

Project or Work: _____

Short Code to be Charged: _____

PART 2: To be completed by the Inspection Services Organization

Request Received: _____/_____
Date Time

Request Received by: _____/_____/_____
Name Phone Fax

Request for radiographyClick for pdf version

Appendix B Radiography Authorization

Appendix B

TENNESSEE VALLEY AUTHORITY
RADIOGRAPHY AUTHORIZATION

Date _____

Site / Unit _____

Components _____

Areas / Floors Affected _____

_____

Scheduled Start Time _____

Scheduled Completion Time _____

Radiation Source _____ Curies _____

_____ _____

Responsible Radiographer ISO Lead

Contact Number:

Authorization to Begin Radiography **_____Approved **** **_____Disapproved**

_____ _____

Responsible Supervisor / Designee **Date / Time**

** Approval/authorization does not imply acceptance of responsibility for radiological safety: Responsibility remains with the Radiography Organization.

Boundary Walkdown(s) 1st _____ 3rd _____

2nd _____ 4th _____

Radiography Operation Complete

_____ _____

Responsible Supervisor / Designee **Date / Time**

Radiography AuthorizationClick for pdf version

Appendix C Radiography Operation Guideline

Appendix C

TENNESSEE VALLEY AUTORITY
RADIOGRAPHY OPERATION GUIDELINE

- The individual requesting radiography should complete Part 1 of Appendix A, Radiography Request Form and transmit to the Inspection Services Organization
- Inspection Services Organization should complete Part 2 of Appendix A and return to the individual requesting the radiography.
- The responsible supervisor or designee should submit the completed Appendix A to the plant Outage Control Center (OCC).
- The responsible supervisor or designee shall announce the radiography schedule in the morning or shift turn-over meetings, as applicable, and discuss the affected areas and components to assure all plant personnel area aware.
- The responsible supervisor or designee shall assure that notification signs are posted prior to the scheduled radiography.
- The responsible radiographer shall complete Appendix B, Radiography Authorization. Appendix B shall be approved and signed by the responsible supervisor or designee. Radiography can not begin until Appendix B is approved and signed.
- When the radiography boundaries are established, the responsible supervisor or designee, the ISO Lead and the radiographer shall check/walk down the boundaries to assure that all access points to the radiation area are barricaded with proper boundaries, signs and lights.
- Assure that proper PA announcements are made prior to beginning radiography. (Local announcements, by the radiographer(s) if a PA system is not available.)
- When radiography is complete, the radiographer shall notify the responsible supervisor or designee and request that a PA announcement be made that radiography is complete.
- Radiography personnel shall assure that all radiography boundary rope, signs and flashing lights are removed.

Radiography Operation GuidelineClick for pdf version

Procedure 812 Railroad Operations

TVA Safety Manual

812 Railroad Operations

Procedure Number 812

TVA Safety Procedure

Railroad Operations

Revision 1

April 30, 2007

Purpose

The purpose of this procedure is to establish basic requirements for safe operation of locomotives at TVA plants / facilities.

General Safety Requirements

1. Only authorized employees that have received Railroad Safety training and the Supervisor in charge has verified in writing the employee has passed a practical skills test are permitted to operate railroad equipment.
2. Before a locomotive is moved, the locomotive horn shall be used to give a warning to employees in the area.
3. Pre-job briefings shall be conducted daily for railroad operations crews as specified in TVA-SPP-18.005,"Plan Job Safely".
4. Locomotive speed in yard, maximum 5 miles per hour.
5. Locomotive speed on main line, maximum 10 miles per hour.
6. Keep adequate body clearance to avoid injury. Adequate distance is at least arm length from any rotating or moving equipment. Special care shall be given to all pinch points where an employee could be caught between or struck by moving equipment.
7. When stepping from between rail cars, be on the lookout for equipment working on adjacent tracks.
8. Immediately report defects or obstructions found on tracks or bridges to your Supervisor/Foreman. The Supervisor/Foreman shall coordinate the issuance of a work order request. If the tracks in question are utilized by the contract rail carrier, the Master Dispatcher for the Railroad Company shall be notified.
9. Never crawl under a railroad car unless clearance precautions have been taken for maintenance or repair. Clearance precautions shall be as a minimum, three way communications shall be utilized to discuss the work scope with the operator and the switchman, also the duration of time needed to complete the work. The rail car shall not be moved until the maintenance employee communicates face to face with the locomotive operator and switchman the release of the equipment.
10. When the locomotive is in service, never crawl over couplings unless clearance precautions have been taken for maintenance or repair.
11. Riding on the lead footboard of an engine or sitting on handrails, uncoupling rods, or draw heads of engines or rail cars is not permitted.
12. Use blue flags or lights to designate tracks which are closed to prevent movement beyond that point. This information where appropriate should be communicated and passed down to next shift.
13. Any signal, voice or radio communication that is not fully understood by the train operator shall be considered a stop signal until the misunderstanding has been cleared up.
14. Employees should avoid walking or standing on the tracks except in the performance of their assigned duties.

15. All hand, light, or radio signals from the switchman or other employees must be transmitted from a position that can be clearly understood by the engineer from his/her normal operating position.
16. Employees must ensure that rail car brakes are properly set before leaving them uncoupled from the engine.
17. Do not intentionally roll cars.
18. Both the conductor and engineer are responsible for the safety of their train and observance of the rules that govern operations including but not limited to the unloading process.

Switching

1. While switching the engineer must remain at the controls.
2. Employees engaged in switching or dumping cars may not use their feet to line up drawheads, the train can not move until the switchman is in line of sight of the operator or clear communication has been established and understood.
3. Cars being cut must have the air fully bled off and the brakes set before the engine leaves the site.
4. Employees must be constantly observant for other equipment moving in the area.
5. Switchman must maintain safe body position to avoid pinch point.
6. Employees involved in switching operations must fully understand and acknowledge what is being done. Utilization of three way communication is required.
7. Only the person throwing the switch may be in the immediate vicinity of switching operations.
8. Manual running switching is specifically prohibited.

Locomotive Operations

1. Only trained, authorized employees shall operate rail equipment. Visitors shall not be permitted to ride on any Locomotive unless authorized to do so and then only by the Supervisor/Foreman and only for performance of work.
2. Locomotives must pass a safety check performed by the engineer daily. If the locomotive is found to have defects that could affect the safe operations of the equipment, the locomotive shall be immediately taken out of service until the repairs can be completed. Repairs to locomotives shall only be conducted by authorized employees or vendors.
3. Drawheads and knuckles may not be shifted while locomotives or cars are in motion. (refer to foot note 3)
4. Coupling operations on grade require an adequate number of hand brakes be set before the air is broken and the locomotive uncoupled.
5. The locomotive may not be moved until the engineer has a clear understanding of yard conditions. The yard conditions shall be thoroughly discussed in the pre-job briefing, any conditions that impose a hazard to employees' shall be mitigated prior to beginning the unloading operation.
6. When a railroad car is stopped for unloading, the car shall be secured from displacement that could endanger employees. If in the case of the rotary car dumper all components of the dumper shall be fully operational prior to dumping.
7. An emergency means of stopping dump operations shall be provided at railcar dumps.

Equipment/Track Maintenance

1. If any defect or condition which might cause an accident is discovered with the track, report it to your supervisor/foreman. If the tracks in question are utilized by the contract rail carrier, the Master Dispatcher for the Railroad Company shall be notified.
2. Supervisors should share this information with other crews, and take action to mitigate the hazard.
3. All tools must be used and stored properly.
4. Do not use defective tools. Any tool found to be defective shall be removed from service and a TVA Defective Equipment tag placed on it. If the tool can not be repaired it shall be replaced. If the tool is taken out of service, the person responsible for the defective equipment tag shall be notified.
5. Following any derailment the track in the area must be inspected prior to going back in service. This inspection shall be conducted by a qualified person; findings shall be immediately reported in written form to the site Supervisor. The site Supervisor shall maintain the repair records for 3 years for auditing purposes.

Rotary Car Dumpers

1. Attention to detail is critical.
2. Be fully aware of your immediate surroundings at all times.
3. Only trained and authorized personnel shall operate this equipment.
4. Personal Protective Equipment required, Hard Hat, Safety Glasses with side shields, gloves, hearing protection, and mono goggles available in case of windy or dusty situations.
5. Any safety related defects that can affect the safe operation of this equipment shall be reported to the responsible supervisor, corrective action taken to mitigate the hazard, or the operation shall be shut down.
6. Employees involved in dumper operations must be trained to recognize pinch points and how to avoid them.
7. No rail cars or locomotives may be moved with an employee in a potential pinch point.
8. Rotary car dumper operations require 2 employees, one on each end of the dumper to observe clearances and ensure safe operations.
9. The dumper employees must be in continuous visual, verbal or radio communication.
10. When the loss of communication exists, dumper operations shall be stopped immediately.
11. During normal operations, no employee is to approach the car being dumped while it is in the dumper structure.
12. If a retarder is inoperative the use of hand brakes is required, and a safe work plan must be developed before beginning operations.
13. Remote control devices which are utilized to maneuver cars must be maintained in safe operating condition at all times. The remote control shall be tested prior to operation.
14. Employees involved in rotary car dumper operations are responsible for ensuring the tracks are clear before moving the rail cars and that other personnel maintain a safe distance from the operations.
15. Signs must be posted stating “Danger-dumper Operation- Authorized Employees Only” at each end of the dumper building.
16. Any person not classified as authorized to be in the car dumper area, shall receive permission first of the Supervisor/Foreman and then the Operator and Switchman before entering the area. When possible any visitor should be escorted at all times. Each visitor shall report to the Switchman and Operator when he/she leaves the car dumper area.
17. Repair of derailments inside the rotary car dumper requires a safe work plan prior to beginning the repair process. When the repairs are complete the car dumper shall be inspected prior to operation by a qualified employee/OEM (Original Equipment Manufacturer) representative.

Bottom Dump Operations

1. Attention to detail is critical. Be fully aware of your surroundings at all times.
2. Personal Protective Equipment required, Hard Hat, Safety Glasses with side shields, gloves, hearing protection, and mono goggles available in case of windy or dusty situations.
3. Any person not classified as authorized to be in the car dumper area, shall receive permission first of the Supervisor/Foreman and then the Operator and Switchman before entering the area. When possible any visitor should be escorted at all times. Each visitor shall report to the Switchman and Operator when he/she leaves the car dumper area.
4. All employees involved in the bottom dump operation shall have a radio for communication. Three way communications is encouraged to insure the directions are clear for all employees.
5. The use of hand signals is permitted if all employees have line of sight to the locomotive switchman.
6. When the locomotive is approaching the bottom dump pit area with a cut of rail cars the locomotive operator shall initiate a short blast of the horn to insure all employees are made aware of the presence of the train.
7. When the rail cars are positioned to begin the dumping operation, the switchman is the person of authority to instruct the locomotive operator.
8. The locomotive operator shall not initiate movement of the rail cars unless he/she clearly understands the switch mans commands.
9. Each rail car hot shoes should be inspected prior to the rail car entering the dump pit area. Maintenance on hot shoes if possible should be conducted outside of the pit area to eliminate the fall potential onto the grizzle or into the pit.
10. When the rail car enters the dump pit extreme caution should be taken as the hot shoe and the hot rail make contact. Insure the rail car(s) are centered over the dump pit.
11. If the dump solenoid is activated and the dump gates on the rail car do not open, the bypass solenoid switch will activate the manual bypass valve.
12. Extreme caution shall be used in operating the manual bypass solenoid valve switch. The rail car is positioned over the dump pit and therefore has fall potential onto the grizzle, into the pit, or under the rail car.
13. When the manual solenoid switch must be operated make sure the locomotive operator understands exactly what you will do to open the switch. The locomotive operator shall not move the rail cars until instructed by the switchman all employees are clear.
14. Never climb on a hand rail or guard to operate the manual solenoid switch. In some cases an employee will be required to go to the other side of the rail car to activate the manual solenoid switch.
15. Under no circumstances will the employee climb over the coupling of the rail car to gain access to the other side of the rail car.
16. The switchman is responsible to monitor the level of the dump pit, do not over fill the pit onto the railroad tracks, a build up of spilled coal could cause the rail car to de-rail.
17. When the locomotive is required to move the rail cars, a short blast of the locomotive horn is required to warn all employees of the movement.
18. Employees are prohibited from crossing the coupling to gain access to the other side of a rail car.
19. If an employee is required to step between rail cars to make up hoses or perform other activities, the employee shall have three way communications with the locomotive operator prior to entering.
20. If airlines are required to be disconnected, insure the air is isolated and bled off prior to breaking the air coupling.
21. All damaged rail cars shall be so identified and reported in writing to the Foreman/Supervisor. It is the responsibility of the Supervisor to insure the damaged car report is forwarded to the Coal Supply and Acquisition Organization for disposition. Coal Acquisition & Supply telephone number is 423-751-3247
22. If the rail car is damaged to the extent the rail car poses a danger to employees or TVA Property/equipment, the rail car should be removed from the cut. The Yard Supervisor shall immediately inform Fuels Supply and

Acquisition Organization for disposition.

23. When the cut of rail cars are dumped and ready to return to the interchange yard, the Locomotive Operator shall contact the contract rail carrier to insure the two trains do not meet while returning to the interchange yard. At more than one of the TVA sites the interchange yard is located away from the dump area and TVA Locomotives and employees are required to travel to the interchange yard to deliver empties. At Paradise Fossil Plant several blind curves/spots can pose hazards if two trains meet.
24. If the contract rail carrier is required to deliver products other than coal (example, anhydrous ammonia) on TVA property, communication shall be initiated with the contract carrier before traveling to the interchange yard. If the locomotive radio can not contact the contract rail carrier locomotive, the Yard Supervisor/Foreman shall contact the Master Dispatcher for the rail accessibility. The Contract carrier Master Dispatcher is responsible for all train movements on the railways. The Master Dispatcher can give the location of any and all trains on the rail way 24/7.
25. When the dumping of the rail cars is complete, all hand rails and guards shall be placed in the proper location to prohibit employees and visitors access to the dump pit area.

Special Considerations

1. Adverse weather conditions such as high winds, fog, extreme cold or heat, snow and ice require special attention to all rail equipment and operating safety.
2. In the case of fog, three way communications by radio shall be utilized at all times.
3. Emergency application of air brakes requires inspection of equipment before continuing operations.

Employee Behavior

1. Attention to detail is critical to safe work performance.
2. All employees involved in rail operations must develop a “stop-think-act-review” attitude in their daily operations.
3. Shortcuts are unacceptable and can lead directly to injury, employees shall take time to follow the proper process/procedure and perform railroad operations safely.
4. If unsure how to perform any rail operation, STOP, and take the time to ask your supervisor.
5. Railroad crews must work as a team, ensuring good communication. This will lead to an absence of injuries and equipment damage.
6. All employees are responsible for reporting any defect to equipment that could affect the safe operations to their Supervisor/Foreman immediately.
7. The failure to follow these safety instructions will result in disciplinary action up to and including termination.

Inspection of Locomotives

1. Each locomotive in use must be inspected at least once during each calendar day.
2. The purpose of the daily inspection is to ascertain that locomotives are safe to operate.
3. A written report of the inspection shall be made.
4. If it is known the locomotive was not used on any particular calendar day, the words "NOT USED" should be entered on the report.
5. Locomotive engineers or other designated employees are considered qualified to make the inspection.
6. If the inspection of the locomotive reveals a defect which will require correction before the locomotive is used, this fact must be immediately brought to the attention of supervisory personnel in order that necessary repairs may be arranged.
7. All repairs of locomotives shall be conducted by qualified mechanic. When the repairs are completed, the locomotive shall be re-inspected and signed off by the qualified mechanic prior to use. This inspection report shall

be maintained for three years.

What to Inspect

1. **Protection against personal injury** - Fan openings, exposed gears and pinions, and exposed moving parts must be inspected to determine that no significant safety hazard exists.
2. **Exhaust and battery gases** - It must be ascertained that the exhaust manifold system and connections contains no breaks, cracks or openings creating an obvious exhaust gas leak into the engine compartment.
3. **General conditions** - Any condition that would endanger the safety of the crew, locomotive or train.
4. **Brakes, general** - The locomotive brakes must be tested to determine they operate as intended. The test procedure should include operating the independent and automatic brake valves to observe that the brakes apply and release properly. Water and oil must be drained from the main air reservoir.
5. **Coupler Systems** - Couplers and uncoupling mechanisms must be inspected to determine that they are not bent or broken and function as intended. A coupler, when not coupled to any other equipment, should be operated with the uncoupling lever, and the knuckle must move to the open position freely. The coupler must be inspected to determine that it is free of any cracks, and that the coupler carrier is not broken and secured in position. Extreme caution should be taken and proper tools utilized when inspecting the coupler if the coupler is to be opened and closed.
6. **Emergency brake valve** - The emergency brake valve should be inspected. The valve must be properly marked. There is no requirement that the valve be tested when the daily inspection is performed to determine if it will initiate an emergency application of the locomotive brakes.
7. Doors and cover plates marked "Danger" - A visual inspection of all plates covering high voltage electrical apparatus must be performed to ascertain that they are secured in their proper locations.
8. **Jumper cable connections** - Determine that jumper cables are properly stored (ends of cables should not be hanging free) and do not create a tripping hazard.
9. **Motors and generators** - Visual inspection of traction motors and generators must be made to ascertain that they are free of excessive accumulations of oil, that all visible cables and cable connections are free from damage and that no traction motor is cut out.
10. **Safety cut-off device** - Visual inspection of the three safety cut-off devices must be made to ascertain that they are properly marked and free of any impediment which could prevent their operation. Testing of the push-button type electrical safety cut-off device will result in an immediate engine shut down of a locomotive.
11. **Speed indicators** - Visual inspection of the speed indicator equipment to ascertain that the indicator and related apparatus is undamaged.
12. **Cabs, floors, and passageways** - Visual inspection should be conducted of passageways, walkways, cab control compartment floors, and engine compartment floors. Accumulations of oil, water, debris and other items should only be reported if the condition presents an immediate hazardous and unsafe condition for any person who would use them, e.g. oil accumulation does not provide secure footing or creating a slipping hazard. A visual inspection of the cab seats and windows must also be made to determine that the seats are properly secured to the floor or sides and that the cab windows provide clear vision and are free of broken areas which could create an injury hazard.
13. **Headlights** - Inspect the headlights to ascertain that they operate properly, and that they can be dimmed as required.
14. **Cab lights** - Visual inspection of the cab lights must be performed to ascertain that they are operative and provide sufficient illumination. Passageway lights used to illuminate walkways over which railroad personnel walk must be lighted.
15. **Audible warning device** - Operate the horn to ascertain that it functions. The locomotive bell, when equipped, should also be tested for operation.

16. A written report shall be prepared by the railroad inspector after the inspection of a locomotive has been completed. The report must contain:
    - The number of the locomotive;
    - The place;
    - The date;
    - The time of the inspection;
    - A description of any non-complying conditions disclosed by the inspection; and
    - The signature of the employee making the inspection.
17. All non-complying conditions reported by the inspector must be repaired before the locomotive is used. The inspector performing the inspection should also examine any work reports found on a locomotive which may have information entered by previous engineers regarding defective conditions, and these items should also be inspected. The report of deficiencies and the report of repair shall be maintained for three years for auditing purposes.
18. Any non-complying safety critical condition, found by an inspector and not included in this list, shall also be reported.

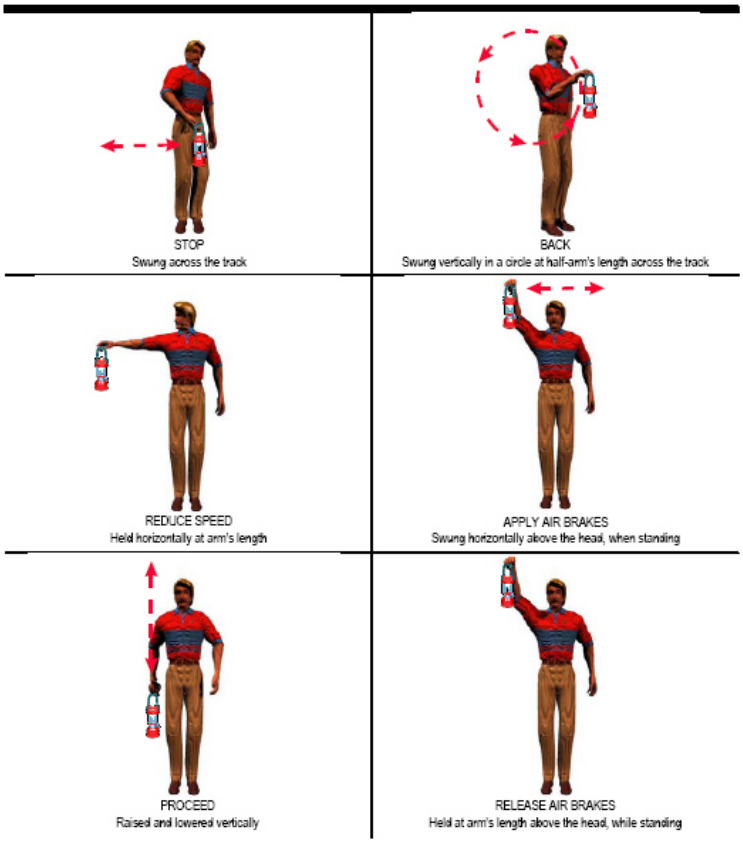
Training

All employees involved in railroad operations shall receive training course “Railroad Safety”, ATIS 00059144.

Appendix A - “Railroad Operations Hand Signals”

Railroad Hand, Flag, and Lamp Signals

Note: The hand or a flag, moved the same as the lamp, as illustrated in the following diagrams, gives the same indication except in the observance of rule one, the hand or movement may be above the shoulder or across the body.



Procedure 813 Scaffolds and Temporary Work Platforms

TVA Safety Manual

813 Scaffolds and Temporary Work Platforms

Procedure Number 813

TVA Safety Procedure

Scaffolds and Temporary Work Platforms

Revision 7

August 3, 2011

Purpose

The purpose of this procedure is to establish requirements for TVA and contractor employees working on temporary scaffolds and elevated work platforms and to ensure that all scaffolds or elevated work platforms are erected or suspended in accordance with applicable standards.

Note: Nuclear Power Group scaffolds shall comply with MMTP-102, "Erection of Scaffolds / Temporary Work Platforms and Ladders". Documentation and installation requirements for Nuclear Power Group sites in MMTP-102 take precedence over this procedure.

Roles and Responsibilities

1. Supervisors and managers shall be responsible for implementing the requirements of this procedure within their area of responsibility.
2. Foremen and supervisors shall be responsible for identifying the need for scaffolding.
3. Foremen or supervisors responsible for work to be performed shall be responsible for erecting and dismantling scaffolds and for ensuring that scaffolds are constructed in accordance with the requirements of this procedure.
4. Foremen and supervisors responsible for the job shall conduct a pre-job briefing that addresses the typical safety hazards involved with scaffold erection, dismantling and use.
5. All employees shall be responsible for complying with the requirements of this procedure.

General Requirements for all Scaffolds

1. Scaffolds shall be built and dismantled in accordance with this procedure.
2. NO EMPLOYEE SHALL WORK FROM ANY SCAFFOLD THAT HAS NOT BEEN INSPECTED OR DOES NOT HAVE A SCAFFOLD PERMIT ATTACHED.
3. The footing or anchorage for scaffolds shall be sound, rigid, and capable of carrying the maximum intended load without settling or displacement. Scaffolds shall not be supported by piping, guard rails, conduit, cable trays or similar structures unless an engineer has inspected the worksite and determined that the structure is capable of supporting the scaffold and four (4) times the maximum intended load.
4. Scaffolds and their components shall be capable of supporting without failure at least four times the maximum intended load. Wire rope used for suspended scaffolds shall support six times the maximum intended load.
5. Scaffolds and temporary work platforms shall be maintained in safe condition. Scaffolds shall not be altered or moved horizontally while they are in use or occupied.

6. Any scaffold damaged or weakened from any cause shall be immediately repaired and shall not be used until repairs have been completed.
7. Scaffolds shall not be loaded in excess of the working load for which they are intended.
8. An access ladder or equivalent safe access shall be provided.
9. The poles, legs, or uprights of scaffolds shall be plumb, and securely and rigidly braced to prevent swaying and displacement.
10. Materials being hoisted onto a scaffold shall have a tag line.
11. Overhead protection shall be provided for workers on a scaffold exposed to overhead hazards.
12. Employees shall not work on scaffolds during storms or high winds.
13. Employees shall not work on scaffolds which are covered with ice or snow, unless all ice or snow is removed and planking sanded to prevent slipping.
14. Tools, materials, and debris shall not be allowed to accumulate in quantities to cause a hazard.
15. The use of shore scaffolds or lean-to scaffolds is prohibited.
16. Special precautions shall be taken to protect scaffold members, including any wire ropes, when using a heat-producing process.
17. All scaffolds and temporary work platforms shall be erected and dismantled by personnel trained to do so.
18. Scaffolding and temporary platforms shall not be erected on or supported by structures and components that could be subjected to damage from overloading or could create a potentially hazardous work environment (i.e. asbestos release, release of live steam, etc.) without an evaluation by the plant manager or his /her designee.
19. When a scaffold is no longer required, the responsible supervisor shall have the scaffold dismantled no later than the next working day. All scaffolding components / material shall be placed in the designated storage area.
20. Caution must be used when erecting or disassembling scaffolds near the main generator or isophase bus ducts during plant operations. The electric field around the main generator or isophase ducts can induce voltages in nearby metal objects, such as scaffolds, which can lead to an adverse consequence. This type of event does not occur frequently, but the occurrence can have a major affect on plant personnel and/or equipment.
21. When units are in operational status, post signs under generators that read "No metal Scaffolds or Scaffold Components under Generator".

Scaffolds Requiring Design Approval by Registered Professional Engineer

1. Whenever scaffolds must be constructed outside the construction specifications detailed in 29 Code of Federal Regulations 1910.28 - "Safety Requirements for Scaffolding", a registered professional engineer must design the scaffold and it must be built in accordance with the engineer's design. A copy of the scaffold design drawings shall be kept at the plant/facility for review.
2. Three specifications determine the need for a registered professional engineer design: (1) scaffold height, (2) distributed floor load of the scaffold, and (3) scaffold board span. Following are specific "trigger" points.
    - Tube and coupler light duty scaffolds, with heights exceeding 125 feet for one working level, 25 pounds per square foot uniformly distributed loads and planking spans exceeding 10 feet. The height level decreases to 91 feet for three working levels.
    - Tube and coupler medium duty scaffolds, with heights exceeding 125 feet for one working level, 50 pounds per square foot uniformly distributed loads and planking spans exceeding 8 feet. The height level decreases to 78 feet for two working levels.
    - Tube and coupler heavy duty scaffolds, with heights exceeding 125 feet, 75 pounds per square foot uniformly distributed loads and planking spans exceeding 6 ½ feet.
    - Wood pole scaffolds with heights exceeding 60 feet.
    - Needle beam scaffolds with platform spans exceeding 8 feet.

Scaffold Permit

1. A Scaffold Permit is required for all scaffolds over four feet high. This requirement is applicable to both TVA and contractor personnel. Each plant/site/organization may elect to use either the single white Scaffold Permit or the three color-coded Scaffold Permits.
   Single Card Option:
   TVA 19590 - Scaffold Permit - WHITE [1](Appendix A)
   Three Color-Card Option:
   TVA 19590B - Scaffold Permit - GREEN (Completed Scaffold, No Fall Protection Required) [2](Appendix C)
   TVA 19590C - Scaffold Permit - YELLOW (Incomplete Scaffold, Fall Protection Required) [3](Appendix D)
   TVA 19590D - Scaffold Permit - RED (Do Not Use) [4](Appendix E)
   Note: FPG has chosen to use the three color card option only.
   The permit system is designed around two (2) documents--the actual permit and the permit log. The purpose of the permit is to ensure accountability for erection of a safe scaffold, its safe use, and inspection. It also serves to alert employees that the scaffold is safe or that fall protection equipment must be worn. If the scaffold is four (4) feet or lower, ensure that the platform is structurally safe and has a safe means of access. If the work location restricts the use of a scaffold, ensure that the ladder or other means of access to the point of work is safe.
   Note: Nuclear Power Group scaffolds shall also comply with MMTP-102, "Erection of Scaffolds / Temporary Work Platforms and Ladders". Documentation required for Nuclear Power Group sites in MMTP-102 takes precedence over this procedure.
2. The permit log is used for tracking scaffolds to ensure accountability and to identify scaffold locations for oversight. The log shall be at a location accessible to the responsible supervisor/foreman at all times. There shall be a separate scaffold permit log and location log for the partner. There also may be a separate scaffold permit log and location log for major contractors at the discretion of the plant manager. Smaller contractors must use the plant scaffold permit log. Appendix B is a copy of a Scaffold Permit Log.
3. Foremen or supervisors responsible for work to be performed that requires a scaffold shall initiate the permit. If an existing scaffold is to be left in place for use by another craft after the erecting crew's work has been completed, or for work continuing by another crew, the responsibility for maintenance and safety of the scaffold shall be transferred to the next supervisor/foreman. Upon transfer, a new permit will be initiated and the permit log so annotated. The erecting competent person shall close out the permit and log entry.
4. Incomplete scaffolds shall be identified on the scaffold permit. Warning signs shall be posted at all points of access with the message, **"The Use of Fall Protection is Required on this Scaffold".**
5. Immediately upon completion of the scaffold, the competent person shall inspect the scaffold to ensure compliance with the requirements of this procedure.
6. When a scaffold has been dismantled, the responsible foreman/supervisor shall complete the permit and close the permit log, and turn the completed permit in to the responsible supervisor.
7. All completed permits and logs shall be maintained on file for 90 days.

Scaffold Inspections

1. A competent person shall inspect all scaffolds and temporary work platforms before they are placed into service, following any alteration and daily for as long as the scaffold remains in use. He/she shall determine that the scaffold is safe and constructed in accordance with the requirements of this procedure.
   NOTE: "Scaffolds NOT in USE". It is recognized that scaffolding may need to remain in place for limited periods of time even though there will be no ongoing work activity requiring its use. To eliminate the necessity for the responsible competent person to inspect and sign permits on a daily basis, he / she may sign, date, and write on the permit "HOLD UNTIL <u>date</u> FOR (<u>reason</u>)". A scaffold that is expected to remain in hold status longer than 30 days shall require approval from the plant manager.

2. Each scaffold inspection completed by TVA and contractor personnel shall be recorded on the scaffold permit affixed to the scaffold.
3. Whenever it is necessary for another crew or group to use an existing scaffold, the responsible foreman or supervisor shall verify that a competent person has inspected the scaffold to ensure that it is safe for use.
4. Periodic inspections shall be made of all scaffolding components and accessories, and any maintenance, including painting, or minor corrections authorized by the manufacturer shall be made before further use.

Fall Protection

1. All scaffolds and temporary work platforms over 4 feet high shall be provided with guardrails consisting of a top rail 38-45 inches above the work surface, a mid-rail, and a 4- inch toeboard. This protection shall be provided on all open sides of the platform.
2. All scaffolds over water, moving machinery, or hot or hazardous materials shall be provided with guardrails.
3. When it is not feasible to install guardrails, fall protection must be provided to the workers on the scaffold by means of a personal fall arresting system consisting of a safety harness, lanyard, shock absorber, and lifeline attached to an approved anchorage point. There are no exceptions to this requirement. The scaffold shall be placarded with a caution sign at the access to the ladder "Use of Fall Protection is Required on this Scaffold".
4. Guardrails shall be made of rigid material. The top rail shall be constructed of 2 x 4 inch lumber or material of equivalent or superior strength. The upright supporting posts shall be equivalent to 2 x 4 inch lumber or material of equivalent or superior strength, plumbed on not more than 8 foot centers. Toeboards shall be 2 x 4 inch lumber or equivalent.
5. When it may be necessary for persons to pass or work under a scaffold, a screen consisting of number 18 gauge US standard wire, 1/2 inch mesh, or equivalent shall be provided between the toeboard and the guardrail.
6. On suspension scaffolds, in addition to the standard guardrails, fall protection must be provided to the workers by means of a personal fall arresting system as required in TVA Safety Procedure 305, “Fall Protection Systems”, tied off to an independent structure.
7. Body harnesses, safety straps, lanyards, and lifelines shall be inspected before each days use to determine that the equipment is in safe working condition.
8. Defective equipment shall not be used.
9. Lifelines shall be protected against being cut or abraded.
10. Personal fall arrest systems shall be rigged such that an employee can neither free fall more than 6 feet nor contact any lower level.
11. Only one person may be attached to any vertical lifeline.
12. Snaphooks may not be connected to loops made in webbing-type lanyards and may not be connected to each other.
13. Anchoring points for lanyards and/or lifelines shall be independent of the scaffold if possible and shall limit the fall potential to six feet or less. Designated points on the scaffold may be used for anchorage points only when it is not possible to obtain an independent anchorage point and the following conditions are met: (1) the scaffold anchorage point is capable of supporting at least 5,000 pounds or (2) the scaffold anchorage point is designed, installed, and used as part of a complete fall arrest system which maintains a safety factor of at least two. In addition, documentation must exist to show the scaffold anchorage point was engineered by a competent person to meet the requirements for a scaffold anchorage point. The use of a scaffold as an anchorage point is not permitted under any circumstances for single-point suspended and two-point suspended scaffolds.

Scaffold Planking

1. Planks used in scaffolds shall be scaffold grade 2X10 inch nominal or equivalent. Special laminated planks or aluminum scaffold planks may also be used.
2. All scaffolds shall be at least two planks wide or a minimum of 18 inches. They should preferably be fully decked.
3. All decking must be placed so that no more than one inch exists between planks so that material may not fall and strike someone below.
4. Decking cannot be more than 14 inches from the edge of the work / structure or guard rail system, or fall protection must be used.
5. All planking shall be overlapped a minimum of 12 inches or secured from movement. Planks shall extend over their end supports not less than 6 inches or more than 18 inches. The ends of the planks shall not be abutted.
6. Plywood shall not be used as a platform material except to cover floor openings where objects may be likely to fall to an area below.

Tube and Coupler Scaffolds

1. A light-duty tube and coupler scaffold shall have all posts, bearers, runners, and bracing of nominal 2-inch O.D. steel tubing. The posts shall be spaced no more than 6 feet apart by 10 feet along the length of the scaffold.
2. A medium-duty tube and coupler scaffold shall have all posts, runners, and bracing of nominal 2-inch O.D. steel tubing. Posts spaced not more than 6 feet apart by 8 feet along the length of the scaffold shall have bearers of nominal 2 1/2-inch O.D. steel tubing. Posts spaced not more than 5 feet apart by 8 feet along the length of the scaffold shall have bearers of nominal 2-inch O.D. steel tubing.
3. A heavy-duty tube and coupler scaffold shall have all posts, runners, and bracing of nominal 2-inch O.D. steel tubing, with the posts spaced not more than 6 feet apart by 6 feet 6 inches along the length of the scaffold.
4. Posts shall be accurately spaced, erected on suitable bases, and maintained plumb.
5. Runners shall be erected along the length of the scaffold located on both the inside and the outside posts at even height. Runners shall be interlocked to form continuous lengths and coupled to each post. The bottom runners shall be located as close to the base as possible. Runners shall be placed not more than 6 feet 6 inches on centers.
6. Bearers shall be installed transversely between posts and shall be securely coupled to the posts bearing on the runner coupler. When coupled directly to the runners, the coupler must be kept as close to the posts as possible.
7. Bearers shall be at least 4 inches but not more than 12 inches longer than the post spacing or runner spacing. Bearers may be cantilevered for use as brackets to carry not more than two planks.
8. Cross bracing shall be installed across the width of the scaffold at least every third set of posts horizontally and every fourth runner vertically. Such bracing shall extend diagonally from the inner and outer runners upward to the next outer and inner runners.
9. Longitudinal diagonal bracing shall be installed at approximately a 45-degree angle from near the base of the first outer post upward to the extreme top of the scaffold. Where the longitudinal length of the scaffold permits, such bracing shall be duplicated beginning at every fifth post. In a similar manner, longitudinal diagonal bracing shall also be installed from the last post extending back and upward toward the first post. Where conditions preclude the attachment of this bracing to the posts, it may be attached to the runners.
10. The entire scaffold shall be tied to and securely braced at intervals not to exceed 30 feet horizontally and 26 feet vertically.

Tubular Welded Frame Scaffolds

1. Spacing of panels or frames shall be consistent with the loads imposed.
2. Scaffolds shall be properly braced by cross bracing or diagonal braces, or both, for securing vertical members together laterally, and the cross braces shall be of such length as will automatically square and align vertical members so that the erected scaffold is always plumb, square, and rigid. All brace connections shall be made secure.
3. Scaffold legs shall be set on a level concrete floor or the legs shall be set on adjustable or plain bases placed on foundations adequate to support the maximum intended load.
4. The frames shall be placed one on top of the other with coupling or stacking pins used in every joint to provide proper vertical alignment of the legs.
5. Panels shall be locked together vertically by pins or other equivalent suitable means.
6. To prevent movement, the scaffold shall be secured at intervals not to exceed 30 feet horizontally and 26 feet vertically.
7. Drawings and specifications for all frame scaffolds over 125 feet in height above the base plates shall be designed by a registered professional engineer and copies made available to the employer and for inspection purposes.
8. Frames and accessories for scaffolds shall be maintained in good repair and every defect, unsafe condition, or noncompliance with this section shall be immediately corrected before further use of the scaffold. Any broken, bent, excessively rusted, altered, or otherwise structurally damaged frames or accessories shall not be used.

Outrigger Scaffolds

Outrigger beams shall extend not more than 6 feet beyond the face of the building or structure. The beams shall rest on edge, the sides shall be plumb, and the edges shall be horizontal. The beam shall be secured in place against movement and shall be securely braced at the fulcrum point against tipping.

Two-point suspension scaffolds (swinging scaffolds)

1. Suspension scaffolds shall comply with the requirements of ANSI A10.8, “Scaffold Safety Requirements”.
2. Two-point suspension scaffold platforms shall be not less than 20 inches nor more than 36 inches wide overall. The platform shall be securely fastened to the hangers by U-bolts or by other equivalent means.
3. The hangers of two-point suspension scaffolds shall be made of wrought iron, mild steel, or other equivalent material having a cross-sectional area capable of sustaining four times the maximum intended load, and shall be designed with a support for guardrail, intermediate rail, and toeboard.
4. Hoisting machines used on two-point suspension scaffolds, shall be of a design tested and approved by a nationally recognized testing laboratory such as Underwriter's Laboratories or Factory Mutual.
5. Two-point suspension scaffolds shall be suspended by wire ropes.
6. On suspension scaffolds designed for a working load of 500 pounds no more than two men shall be permitted to work at one time. On suspension scaffolds with a working load of 750 pounds, no more than three men shall be permitted to work at one time. Each workman shall be protected by a fall arrest system as specified in paragraph Fall Protection.

Single-point Adjustable Suspension Scaffolds

1. The scaffolding, including power units or manually operated winches, shall be a type tested and listed by a nationally recognized testing laboratory such as Underwriter's Laboratories or Factory Mutual. Suspension scaffolds shall comply with the requirements of ANSI A10.8, “Scaffold Safety Requirements”.
2. All power-operated gears and brakes shall be enclosed.
3. In addition to the normal operating brake, all-power driven units must have an emergency brake which engages automatically when the normal speed of descent is exceeded.
4. The hoisting machines, cables, and equipment shall be regularly serviced and inspected after each installation and every 30 days thereafter or before the next use.
5. Two units when combined form a two-point suspension scaffold.
6. The supporting cable shall be straight for its entire length, and the operator shall not sway the basket and fix the cable to any intermediate points to change his original path of travel.
7. Equipment shall be maintained and used in accordance with the manufacturers' instructions.

Mobile Scaffolds

1. The maximum height of any mobile scaffold shall not exceed four times the minimum base dimension.
2. All casters shall have a positive locking device which shall be kept locked whenever persons are working on the scaffold. Two of the casters shall be of the swivel type.
3. Casters shall be properly designed for strength and dimensions to support four times the intended load.
4. The force necessary to move the mobile scaffold shall be applied near or as close to the base as practical and provision shall be made to stabilize the tower during movement from one location to another. Scaffolds shall only be moved on level floors, free of obstructions and openings.
5. Personnel shall not be permitted to ride on mobile scaffolding.

Training

1. All employees involved in the construction, inspection, or use of tube and coupler scaffolds, welded frame scaffolds, outrigger scaffolds, bracket scaffolds, and/or mobile scaffolds shall receive training course ATIS 00059150, "Scaffolds (Built-up & Suspended)".
2. All employees subject to use of a fall arresting system by any of the requirements of this procedure shall receive training course ATIS 00059120, "Fall Protection Systems".

Maintaining Scaffold Components and Material

1. Plants will establish a program to re-supply scaffolding components and materials and provide preventive maintenance on components.
2. Scaffold storage locations shall be established. These locations shall be identified by signs. Storage locations should provide protection from damage, such as liquid spills and weather.

Partner / Contractor Scaffold Requirements

All partner and contractor work involving the use of scaffolds and temporary work platforms shall be consistent with the applicable OSHA requirements and shall use **TVA Scaffold Permits as defined by paragraph, "Scaffold Permit".**

Definitions

Competent Person One who is capable of identifying existing and predictable scaffolding hazards which are dangerous to employees and who has authorization to take prompt corrective measures to eliminate them. Approves scaffolds for use after erection, to assure its structural integrity, and that adequate fall protection is provided.

Heavy-duty Scaffold A scaffold designed and constructed to carry a working load not to exceed 75 pounds per square foot.

Light-duty Scaffold A scaffold designed and constructed to carry a working load not to exceed 25 pounds per square foot.

Mobile Scaffold A portable rolling scaffold supported by casters.

Medium-duty Scaffold A scaffold designed and constructed to carry a working load not to exceed 50 pounds per square foot.

Outrigger Scaffold A scaffold supported by outriggers or thrustouts projecting beyond the wall or face of the building or structure.

Qualified Person A Registered Professional Engineer who is thoroughly familiar with this work practice/procedure. Has the ability to solve or resolve problems related to scaffolds.

Scaffold Any temporary elevated platform and its supporting structure used for supporting workmen or materials or both.

Single Point Suspended Scaffold A manually operated or power operated unit designed for light duty use, supported by a single wire rope from an overhead support so arranged and operated as to permit the raising and lowering of the platform to desired positions.

Tube and Coupler Scaffold An assembly consisting of tubing which serves as posts, bearers, ledgers, ties, and runners a base supporting the posts and special couplers which serve to connect the uprights and to join the various members.

Tubular Welded Frame Scaffold A sectional panel or frame metal scaffold substantially built of prefabricated welded sections which consist of posts and horizontal bearer with intermediate members.

Two-point Suspended Scaffold A scaffold, the platform of which is supported by hangers at two points from overhead supports so as to permit raising or lowering the platform to the desired working position by tackle or hoisting machines.

Reference

29 Code of Federal Regulations 1910.21 -" Definitions (Walking and Working Surfaces)"

29 Code of Federal Regulations 1910.28 - "Safety Requirements for Scaffolding"

29 Code of Federal Regulations 1910.29 - "Manually Propelled Mobile Ladder Stands and Scaffolds (Towers)"

29 Code of Federal Regulations 1926.451 - "Scaffolding, General Requirements"

29 Code of Federal Regulations 1926.452 - "Scaffolds, Additional Requirements for Specific Types of Scaffolds"

29 Code of Federal Regulations 1926.453 - "Aerial Lifts"

29 Code of Federal Regulations 1926.104 - "Safety Belts, Lifelines, and Lanyards"

29 Code of Federal Regulations 1926, Subpart L, Appendix A, - “Scaffold Design Specifications"

29 Code of Federal Regulations 1926.454, - “Training Requirements"

29 Code of Federal Regulations 1926.450, - “Scope, Applications and Definitions"

American National Standard ANSI A10.8 - "Scaffold Safety Requirements (Suspension scaffolds including hoists)"

Appendix A Scaffold Permit

Click for TVA 19590 - Scaffold Permit [1]

Appendix B Scaffold Permit Log

Click for TVA 19590A - Scaffold Permit Log [5]

Appendix C Scaffold Permit - GREEN

Click for TVA 19590B - Scaffold Permit (Green) [2]

Appendix D Scaffold Permit - YELLOW

Click for TVA 19590C - Scaffold Permit (Yellow) [3]

Appendix E Scaffold Permit - RED

Click for TVA 19590D - Scaffold Permit (Red) [4]

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=072561468
[2] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=112130779
[3] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=112130781
[4] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=112130783
[5] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=060870048

Procedure 814 Underwater Diving

TVA Safety Manual

814 Underwater Diving

Procedure Number 814

TVA Safety Procedure

Underwater Diving

Revision 5

March 24, 2010

Purpose

The purpose of this procedure is to establish requirements for TVA's underwater diving operations.

Diving operations in TVA are under the supervision of the Customer Support and Repair Group, Field Services, Diving Services All diving operations shall meet the requirements of this procedure.

Qualifications of Dive Team

1. Dive Teams shall consist of a minimum of four (4) qualified individuals, two (2) divers and two (2) dive tenders.
2. Divers shall have a minimum of three (3) years of power plant related diving experience, and performed diving work on a regular and routine basis during the past two (2) years in addition to the qualifications listed below.
3. Each dive team member shall have the experience or training necessary to perform assigned tasks in a safe and healthful manner.
4. Each dive team member shall have experience or training in the following:
   - Basics of commercial diving acquired by graduating from an accredited commercial dive school, or the military equivalent;

   Exception: Individuals having graduated from Commercial Dive Schools prior to 1996 are considered grandfathered for their basics in commercial diving. Grandfathering shall also apply to individuals having graduated from Commercial Dive training facilities which discontinued their commercial dive training program prior to 1996.

   Note: Commercial Diving or Surface Supplied Diving Specialist training from NAUI, PADI, YMCA or other recreational diving organizations or programs, does not meet the requirement for 'basics of commercial diving training' and shall not be acceptable unless other formal commercial diving training, in accordance with ANSI/ACDE-01-1998, has been completed.

   - The use of tools, equipment and systems relevant to assigned tasks;
   - Techniques of the assigned diving mode; and
   - Diving operations and emergency procedures.
5. All dive team members shall be trained in cardiopulmonary resuscitation (CPR) and first aid (American Red Cross (ARC) standard course or equivalent) and shall follow ARC retraining schedules, i.e., annual CPR and 3-year first aid.
6. All dive team members shall have an annual diving physical, performed by a physician knowledgeable in hyperbaric exposure.
7. Dive team members who are exposed to or control the exposure of others to hyperbaric conditions shall be trained in diving-related physics and physiology.

8. Each dive team member shall be assigned tasks in accordance with the employee's experience or training, except that limited additional tasks may be assigned to an employee undergoing training provided that these tasks are performed under the direct supervision of an experienced dive team member.
9. A dive team member shall not be exposed to hyperbaric conditions against the employee's will, except when necessary to complete decompression or treatment procedures.
10. Dive team members shall not be permitted to dive or be otherwise exposed to hyperbaric conditions for the duration of any temporary physical impairment or condition which is known and is likely to affect adversely the safety or health of a dive team member.

Designated Person-in-Charge

1. A designated person-in-charge shall be at the dive location in charge of all aspects of the diving operation affecting the safety and health of dive team members.
   Note: At times when the designated person-in-charge is diving, undergoing decompression (in water or in a recompression chamber), undergoing treatment for decompression sickness or when otherwise rendered unable to oversee the diving operation, a second or back-up designated person-in-charge shall be at the dive location and in charge of all aspects of the diving operation.
2. The designated person-in-charge shall have experience and training in the conduct of the assigned diving operation.
3. This procedure shall be available at the dive location to each dive team member. For each diving mode, this safety procedure includes:
   - Safety procedures and checklists for diving operations;
   - Assignments and responsibilities of the dive team members;
   - Equipment procedures and checklists; and
   - Emergency procedures for fire, equipment failure, adverse environmental conditions, and medical illness and injury.
4. A list shall be kept at the dive location of the telephone or call numbers of the following:
   - An operational decompression chamber (if not at the dive location);
   - Accessible hospitals;
   - Available physicians;
   - Available means of transportation; and
   - The nearest U.S. Coast Guard Rescue Coordination Center.

Diving Tender

1. Diving tenders shall have training and qualifications as defined in paragraph Qualifications of Dive Team, items 4 – 7.
2. Diving tenders shall be responsible for the following:
3. Safely and efficiently perform topside tasks under the direction of the dive supervisor.
4. Support the dive team and the diver when performing underwater tasks. This includes, but is not limited to the following:
   - assisting with the set-up and maintenance of equipment;
   - monitoring the equipment during the job;
   - assisting the diver with dressing and undressing;
   - tending the diver during dives and knowing the approximate depth and location of the diver;
   - assisting with topside support of the diver;
   - being attentive for conditions that may produce a hazard to the diver and / or the dive team;
   - being attentive to the diver for indications of decompression sickness;

- a diving tender may as requested perform dives under the supervision of the Designated Person in Charge.

Responsibilities of the Diver

1. Safely and efficiently perform both underwater and topside tasks under the direction of the Diving Supervisor.
   - This includes, but is not limited to:
   - assisting with setting up and maintaining equipment;
   - ensuring the equipment is tested and ready for use;
   - reporting the condition of the job site, informing topside of any potential hazards;
   - maintaining open communication with the dive supervisor regarding illness, physical fatigue, pain or problems before and after all dives;
   - immediately obey all commands from the Diving Supervisor to return to the surface, exit the water, or return to a decompression stop;
   - ensure the deepest depth of the dive is established;
   - know and follow TVA and OSHA policies relating to commercial diving;
   - act as stand by diver as required
2. The diver is directly responsible to the diving supervisor for his instruction.

Responsibilities of the Standby Diver

1. Under no circumstance shall the stand by diver be requested, directed or ordered to enter the water to aid a stricken diver if the nature of the problem encountered by the diver is unknown.
2. The standby diver is the individual who is responsible for maintaining a state of readiness to dive, in the event that the diver(s) in the water require immediate assistance or emergency rescue.
3. Safely and efficiently perform both underwater and topside tasks under the direction of the Diving Supervisor.
4. The standby diver shall have no other assignments and shall be dressed in a manner which will allow him/her to perform as required, relative to the water depth, condition, and temperature on all dives outside of the No-Decompression limits.
5. The standby diver should understand the scope of work to be performed during the dive, by the diver, as well as monitor the progress and condition of the diver throughout the course of the dive.
6. The standby diver reports directly to the diving supervisor.

Responsibilities of the Field Supervisor Diving Services

1. Customer Support and Repair, the Field Supervisor Diving Services has total responsibility of diving operations for a given project.
2. The Field Supervisor Diving Services is responsible for all planning and performance of diving operations for a given project.
3. The role of the Field Supervisor Diving Services is to manage and direct both the surface support operations as well as the performance of each diver for CSR Field Services and the customer.
4. The Field Supervisor Diving Services also serves the customer in providing onsite technical consultation, related to the underwater operations of the project.
5. The Field Supervisor Diving Services is directly responsible for all facets of the management and administration of the diving services required of the CSR Field Services.
6. It is his/her function to purpose the level of diving services required by the customer for a particular application, and to mobilize the diving personnel and equipment necessary for each project.
7. Further, the Field Supervisor Diving Services is responsible for administration of all project requirements, and provision of all logistical support effecting diving operations.

Safety Responsibilities of Diving Crew Members

1. **Dive Foreman:**
   Directly responsible for overseeing and directing the project. This includes, but is not limited to the following:
   - Job planning and coordination
   - Recordkeeping
   - Safety and health of dive team
   - Knowledge and understanding of all regulations and procedures related to Commercial Diving Operations being performed
   - Educating less experienced dive team members on Clearances (TSP 613/615), walk-downs, boundary issues and performance of tasks
   - Providing guidance and coaching to less experienced members of the dive team.
2. **Divers:**
   Safely and efficiently perform both underwater and topside tasks under the direction of the Dive Foreman. This includes, but is not limited to the following:
   - Assisting with setting up
   - Maintaining equipment
   - Ensuring the equipment is tested and ready for use
   - Reporting the condition of the job site
   - Informing topside of any potential hazards
   - Maintaining open communication with the Dive Foreman regarding illness, physical fatigue, pain or problems before and after all dives
   - Immediately obey all commands from the Dive Foreman to return to the surface, exit the water, or return to a decompression stop
   - Ensure the deepest depth of the dive is established
   - Know and follow the employer's and OSHA policies relating to commercial diving
   - Act as stand by diver as required
   - Provide guidance and coaching to less experienced members of the dive team.
   - Fulfill the responsibilities of the Dive Foreman when the Dive Foreman is in the water, undergoing decompression or treatment when designated by the Dive Foreman as the Person in Charge.
3. **Tenders:**
   Safely and efficiently perform topside tasks under the direction of the Dive Foreman to support the dive team and the diver when performing underwater tasks. This includes, but is not limited to the following:
   - Assisting with the set-up and maintenance of equipment
   - Monitoring the equipment during the job
   - Assisting the diver with dressing and undressing
   - Tending the diver during dives and knowing the approximate depth and location of the diver
   - Assisting with topside support of the diver
   - Being attentive for conditions that may produce a hazard to the diver and / or the dive team
   - Being attentive of the diver for indications of decompression sickness and reporting of possible indications to the Dive Foreman.
   - Performing underwater tasks under the direction of the Dive Foreman.
4. **Field Supervisor Diving Services**
   Should the Field Supervisor Diving Services be present at the dive site, then he will be the person in charge while he is present, but this responsibility will revert to the topside diver as soon as the Field Supervisor Diving Services leaves.

First-aid Supplies

1. A first aid kit appropriate for the diving operation and approved by a physician shall be available at the dive location.
2. When used in a decompression chamber or bell, the first aid kit shall be suitable for use under hyperbaric conditions.
3. In addition to any other first aid supplies, an American Red Cross standard first aid handbook or equivalent, and a bag-type manual resuscitator with transparent mask and tubing shall be available at the dive location.

Dive Planning

1. Planning of a diving operation shall include an assessment of the safety and health aspects of he following:
   - Diving mode;
   - Surface and underwater conditions and hazards;
   - Breathing gas supply (including reserves);
   - Thermal protection;
   - Diving equipment and systems;
   - Dive team assignments and physical fitness of dive team members (including any impairment known to the supervisor);
   - Repetitive dive designation or residual inert gas status of dive team members;
   - Decompression and treatment procedures (including altitude corrections); and
   - Emergency procedures.
2. To minimize hazards to the dive team, diving operations shall be coordinated with other activities in the vicinity which are likely to interfere with the diving operation.

Employee Briefing

1. Dive team members shall be briefed on:
   - The tasks to be undertaken;
   - Safety procedures for the diving mode;
   - Any unusual hazards or environmental conditions likely to affect the safety of the diving operation; and
   - Any modifications to operating procedures necessitated by the specific diving operation.
2. Prior to making individual dive team member assignments, the supervisor shall inquire into the dive team member's current state of physical fitness, and indicate to the dive team member the procedure for reporting physical problems or adverse physiological effects during and after the dive.
3. The breathing gas supply system including reserve breathing gas supplies, masks, helmets, thermal protection, and bell handling mechanism (when appropriate) shall be inspected prior to each dive.
4. When diving from surfaces other than vessels in areas capable of supporting marine traffic, a rigid replica of the international code flag "A" at least one meter in height shall be displayed at the dive location in a manner which allows all-round visibility, and shall be illuminated during night diving operations.

Water Entry and Exit

1. A means capable of supporting the diver shall be provided for entering and exiting the water.
2. Jumping or diving are not acceptable normal methods of water entry.
3. The means provided for exiting the water shall extend below the water surface a minimum of three (3) feet.
4. A means shall be provided to assist an injured diver from the water or into a bell.

Communications

1. An operational two-way voice communication system shall be used between:
   - Each surface-supplied air or mixed-gas diver and a dive team member at the dive location or bell (when provided or required); and
   - The bell and the dive location.
2. An operational, two-way communication system shall be available at the dive location to obtain emergency assistance.
3. Decompression tables. Decompression, repetitive, and no-decompression tables (as appropriate) shall be at the dive location.
4. A depth-time profile, including when appropriate any breathing gas changes, shall be maintained for each diver during the dive including decompression.

Hand-held Power Tools and Equipment

1. Hand-held electrical tools and equipment shall be de-energized before being placed into or retrieved from the water.
2. Hand-held power tools (pneumatic and/or hydraulic) shall not be supplied with power from the dive location until requested by the diver and when placing into or retrieving from the water.

Welding and Cutting

1. A current supply switch to interrupt the current flow to the welding or burning electrode shall be:
   - Tended by a dive team member in voice communication with the diver performing the welding or burning; and
   - Kept in the open position except when the diver is welding or burning.
2. The welding machine frame shall be grounded.
3. Welding and burning cables, electrode holders, and connections shall be capable of carrying the maximum current required by the work, and shall be properly insulated.
4. A full wet or dry suit and insulated gloves shall be in use by divers performing welding and burning operations.
5. Prior to welding or burning on closed compartments, structures or pipes, which may contain a flammable vapor or in which a flammable vapor may be generated by the work, they shall be vented, flooded, or purged with a mixture of gases which will not support combustion.
6. Ensure the machine frame and supporting structure are grounded.
7. Ensure that neither terminal of the welding machine is short circuited, or may become short circuited by machine vibration.
8. Ensure all electrical connections are secure.
9. Only Direct Current (DC) shall be used for underwater burning or welding, NEVER ALTERNATING CURRENT (AC). Use of a combination AC/DC machine is acceptable, but requires conformation of current setting after a break in use, i.e., shift change, lunch, location or site evacuation, etc.
10. Use straight polarity when burning or welding. NOTE: Some welding procedures may call for Reverse Polarity.

Explosives

1. Diving crews shall transport, store, and use explosives in accordance with the applicable provisions of 1910.109 and 1926.912 of Title 29 of the Code of Federal Regulations.
2. Electrical continuity of explosive circuits shall not be tested until the diver is out of the water.
3. Explosives shall not be detonated while the diver is in the water.

Termination of Dive

1. The working interval of a dive shall be terminated when:
   - A diver requests termination;
   - A diver fails to respond correctly to communications or signals from a dive team member;
   - Communications are lost and can not be quickly re-established between the diver and a dive team member at the dive location, and between the designated person-incharge and the person controlling the vessel in liveboating operations; or
   - A diver begins to use diver-carried reserve breathing gas or the dive-location reserve breathing gas.
2. After the completion of any dive, the supervisor shall:
   - Check the physical condition of the diver;
   - Instruct the diver to report any physical problems or adverse physiological effects including symptoms of decompression sickness;
   - Advise the diver of the location of a decompression chamber which is ready for use; and
   - Alert the diver to the potential hazards of flying after diving.
3. For any dive outside the no-decompression limits, deeper than 100 feet of sea water (fsw) or using mixed gas as a breathing mixture, the supervisor shall instruct the diver to remain awake and in the vicinity of the decompression chamber which is at the dive location for at least one hour after the dive (including decompression or treatment as appropriate).

Recompression Capability

1. A decompression chamber capable of recompressing the diver at the surface to a minimum of 165 fsw (6 ATA) shall be available at the dive location for:
   - Surface-supplied air diving to depths deeper than 100 fsw and shallower than 220 fsw;
   - Mixed gas diving shallower than 300 fsw; or
   - Diving outside the no-decompression limits shallower than 300 fsw.

   Note: The TVA Field Supervisor Diving Services shall evaluate diving operations to be performed and may require a decompression chamber to be present at the dive location at depths less than specified in this procedure.
2. A decompression chamber capable of recompressing the diver at the surface to the maximum depth of the dive shall be available at the dive location for dives deeper than 300 fsw.
3. The decompression chamber shall be:
   - Dual-lock;
   - Multiplace; and
   - Located within 5 minutes of the dive location.
4. The decompression chamber shall be equipped with:
   - A pressure gauge for each pressurized compartment designed for human occupancy;
   - A built-in-breathing-system with a minimum of one mask per occupant;
   - A two-way voice communication system between occupants and a dive team member at the dive location;
   - A viewport; and

- Illumination capability to light the interior.

5. Treatment tables, treatment gas appropriate to the diving mode, and sufficient gas to conduct treatment shall be available at the dive location.
6. A dive team member shall be available at the dive location during and for at least one hour after the dive to operate the decompression chamber (when required or provided).

Record of Dive

1. The following information shall be recorded and maintained for each diving operation:
   - Names of dive team members including designated person-in-charge;
   - Date, time, and location;
   - Diving modes used;
   - General nature of work performed;
   - Approximate underwater and surface conditions (visibility, water temperature and current); and
   - Maximum depth and bottom time for each diver.
2. For each dive outside the no-decompression limits, deeper than 80 fsw or using mixed gas, the following additional information shall be recorded and maintained:
   - Depth-time and breathing gas profiles;
   - Decompression table designation (including modification); and
   - Elapsed time since last pressure exposure if less than 24 hours or repetitive dive designation for each diver.
3. For each dive in which decompression sickness is suspected or symptoms are evident, the following additional information shall be recorded and maintained:
   - Description of decompression sickness symptoms (including depth and time of onset); and
   - Description and results of treatment.

Decompression Procedure Assessment

1. Investigate and evaluate each incident of decompression sickness based on the recorded information, consideration of the past performance of decompression table used, and individual susceptibility;
2. Take appropriate corrective action to reduce the probability of recurrence of decompression sickness; and
3. Prepare a written evaluation of the decompression procedure assessment, including any corrective action taken, within 45 days of the incident of decompression sickness

Surface Supplied Air Diving

1. Surface-supplied air diving shall comply with the following requirements, unless otherwise specified.
2. Surface-supplied air diving shall not be conducted at depths deeper than 190 fsw, except that dives with bottom times of 30 minutes or less may be conducted to depths of 220 fsw.
3. A decompression chamber shall be ready for use at the dive location for any dive outside the no-decompression limits or deeper than 100 fsw.
4. A bell shall be used for dives with an inwater decompression time greater than 120 minutes, except when heavy gear is worn or diving is conducted in physically confining spaces.
5. Each diver shall be continuously tended while in the water by a designated dive team member.
6. A diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.
7. Each diving operation shall have a primary breathing gas supply sufficient to support divers for the duration of the planned dive including decompression.
8. For all diving operations:
   - A separate dive team member shall tend each diver in the water;

- A standby diver shall be available while a diver is in the water;
- A diver-carried reserve breathing gas supply shall be provided for each diver except when heavy gear is worn; and
- A dive-location reserve breathing gas supply shall be provided.

9. For dives deeper than 100 fsw or outside the no-decompression limits:
   - A separate dive team member shall tend each diver in the water;
   - A standby diver shall be available while a diver is in the water;
   - A diver-carried reserve breathing gas supply shall be provided for each diver except when heavy gear is worn; and
   - A dive-location reserve breathing gas supply shall be provided for heavy-gear diving deeper than 80 fsw or outside the no-decompression limits
   - For heavy-gear diving deeper than 100 fsw or outside the no-decompression limits:
10. An extra breathing gas hose capable of supplying breathing gas to the diver in the water shall be available to the standby diver.
11. An inwater stage shall be provided to divers in the water.
12. Except when heavy gear is worn or where physical space does not permit, a diver-carried reserve breathing gas supply shall be provided whenever the diver is prevented by the configuration of the dive area from ascending directly to the surface.
13. Each diving operation shall have a dive-location reserve breathing gas supply.

Mixed Gas Diving

1. Mixed-gas diving shall comply with the following requirements, unless otherwise specified.
2. Mixed-gas diving shall be conducted only when:
   - A decompression chamber is ready for use at the dive location; and
   - A bell is used at depths greater than 220 fsw or when the dive involves inwater decompression time of greater than 120 minutes, except when heavy gear is worn or when diving in physically confining spaces; or
   - A closed bell is used at depths greater than 300 fsw, except when diving is conducted in physically confining spaces.
3. A separate dive team member shall tend each diver in the water.
4. A standby diver shall have no other assignments and shall be dressed in a manner which will allow him/her to perform as required, relative to the water depth, condition, and temperature on all dives.
5. A standby diver shall be available while a diver is in the water.
6. A diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.
7. Each diving operation shall have a primary breathing gas supply sufficient to support divers for the duration of the planned dive including decompression.
8. Each diving operation shall have a dive-location reserve breathing gas supply.
9. When heavy gear is worn:
   - An extra breathing gas hose capable of supplying breathing gas to the diver in the water shall be available to the standby diver; and
   - An inwater stage shall be provided to divers in the water.
10. An inwater stage shall be provided for divers without access to a bell for dives deeper than 100 fsw or outside the no-decompression limits.
11. When a closed bell is used, one dive team member in the bell shall be available and tend the diver in the water.
12. Except when heavy gear is worn or where physical space does not permit, a diver-carried reserve breathing gas supply shall be provided for each diver:

- Diving deeper than 80 fsw or outside the no-decompression limits; or
- Prevented by the configuration of the dive area from directly ascending to the surface.

Liveboating

1. Diving operations involving liveboating shall comply with the following requirements.
2. Diving operations involving liveboating shall not be conducted:
   - With an inwater decompression time of greater than 120 minutes;
   - Using surface-supplied air at depths deeper than 190 fsw, except that dives with bottom times of 30 minutes or less may be conducted to depths of 220 fsw;
   - Using mixed gas at depths greater than 220 fsw;
   - In rough seas which significantly impede diver mobility or work function; or
   - In other than daylight hours.
3. The propeller of the vessel shall be stopped before the diver enters or exits the water and when the diver leaves bottom.
4. A device shall be used which minimizes the possibility of entanglement of the diver's hose in the propeller of the vessel.
5. Two-way voice communication between the designated person-in-charge and the person controlling the vessel shall be available while the diver is in the water.
6. A standby diver shall be dressed in a manner which will allow him/her to perform as required, relative to the water depth, condition, and temperature on all dives.
7. A diver-carried reserve breathing gas supply shall be carried by each diver engaged in liveboating operations.

Equipment Modification, Repair, Test, Calibration

1. Each equipment modification, repair, test, calibration or maintenance service shall be recorded by means of a tagging or logging system, and include the date and nature of work performed, and the name or initials of the person performing the work.
2. Compressors used to supply air to the diver shall be equipped with a volume tank with a check valve on the inlet side, a pressure gauge, a relief valve, and a drain valve.
3. Air compressor intakes shall be located away from areas containing exhaust or other contaminants.
4. Respirable air supplied to a diver shall not contain:
   - A level of carbon monoxide (CO) greater than 20 ppm;
   - A level of carbon dioxide (CO(2)) greater than 1,000 ppm;
   - A level of oil mist greater than 5 milligrams per cubic meter; or
   - A noxious or pronounced odor.
5. The output of air compressor systems shall be tested for air purity every 6 months by means of samples taken at the connection to the distribution system, except that non-oil lubricated compressors need not be tested for oil mist.

Breathing Gas Supply Hoses

1. Breathing gas supply hoses shall:
   - Have a working pressure at least equal to the working pressure of the total breathing gas system;
   - Have a rated bursting pressure at least equal to 4 times the working pressure;
   - Be tested at least annually to 1.5 times their working pressure; and
   - Have their open ends taped, capped or plugged when not in use.
2. Breathing gas supply hose connectors shall:
   - Be made of corrosion-resistant materials;
   - Have a working pressure at least equal to the working pressure of the hose to which they are attached; and
   - Be resistant to accidental disengagement.
3. Umbilicals shall:
   - Be marked in 10-ft. increments to 100 fsw beginning at the diver's end, and in 50 ft. increments thereafter;
   - Be made of kink-resistant materials; and
   - Have a working pressure greater than the pressure equivalent to the maximum depth of the dive (relative to the supply source) plus 100 psi.

Buoyancy Control

1. Helmets or masks connected directly to the dry suit or other buoyancy-changing equipment shall be equipped with an exhaust valve.
2. A dry suit or other buoyancy-changing equipment not directly connected to the helmet or mask shall be equipped with an exhaust valve.

Decompression Chambers

1. Each decompression chamber manufactured shall be built and maintained in accordance with the ASME Code or equivalent.
2. Each decompression chamber manufactured prior to the effective date of OSHA 29 CFR 1910 Sub-part T, 1910.430(f), shall be maintained in conformity with the code requirements to which it was built, or equivalent.
3. Each decompression chamber shall be equipped with:
   - Means to maintain the atmosphere below a level of 25 percent oxygen by volume;
   - Mufflers on intake and exhaust lines, which shall be regularly inspected and maintained;
   - Suction guards on exhaust line openings; and
   - A means for extinguishing fire, and shall be maintained to minimize sources of ignition and combustible material.

Gauges and Timekeeping Devices

1. Gauges indicating diver depth which can be read at the dive location shall be used for all dives except SCUBA.
2. Each depth gauge shall be deadweight tested or calibrated against a master reference gauge every 6 months, and when there is a discrepancy greater than two percent (2 percent) of full scale between any two equivalent gauges.
3. A cylinder pressure gauge capable of being monitored by the diver during the dive shall be worn by each SCUBA diver.
4. A timekeeping device shall be available at each dive location.

Masks and Helmets

1. Surface-supplied air and mixed-gas masks and helmets shall have:
   - A non-return valve at the attachment point between helmet or mask and hose which shall close readily and positively; and
   - An exhaust valve.
2. Surface-supplied air masks and helmets shall have a minimum ventilation rate capability of 4.5 acfm at any depth at which they are operated or the capability of maintaining the diver's inspired carbon dioxide partial pressure below 0.02 ATA when the diver is producing carbon dioxide at the rate of 1.6 standard liters per minute.

Oxygen Safety

1. Equipment used with oxygen or mixtures containing over forty percent (40%) by volume oxygen shall be designed for oxygen service.
2. Components (except umbilicals) exposed to oxygen or mixtures containing over forty percent (40%) by volume oxygen shall be cleaned of flammable materials before use.
3. Oxygen systems over 125 psig and compressed air systems over 500 psig shall have slowopening shut-off valves.

Weights and Harnesses

1. Except when heavy gear is worn, divers shall be equipped with a weight belt or assembly capable of quick release.
2. Except when heavy gear is worn or in SCUBA diving, each diver shall wear a safety harness with:
   - A positive buckling device;
   - An attachment point for the umbilical to prevent strain on the mask or helmet; and
   - A lifting point to distribute the pull force of the line over the diver's body.

Availability of Records

1. The supervisor shall record the occurrence of any diving-related injury or illness which requires any dive team member to be hospitalized for 24 hours or more, specifying the circumstances of the incident and the extent of any injuries or illnesses.
2. Records and documents required by this procedure shall be retained by TVA for the following period:
   - Dive team member medical records (physician's reports) - 5 years;
   - Depth-time profile - until completion of the recording of dive, or until completion of decompression procedure assessment where there has been an incident of decompression sickness;
   - Recording of dive - 1 year, except 5 years where there has been an incident of decompression sickness;
   - Decompression procedure assessment evaluations - 5 years;
   - Equipment inspections and testing records - current entry or tag, or until equipment is withdrawn from service;
   - Records of hospitalizations - 5 years.
3. After the expiration of the retention period of any record required to be kept for five (5) years, TVA or diving services contractor shall forward such records to the National Institute for Occupational Safety and Health, Department of Health and Human Services.

Reference

- 29 Code of Federal Regulations 1910, Subpart T, Commercial Diving Operations
- United States Navy Diving Manual, Current Revision
- Association of Diving Contractors International Consensus Standards, Current Revision
- United States Army Corps of Engineers Safety and Health Requirement Manual, Current Revision

Appendix A - Pre-dive Planning

Pre-Dive Planning

After completing the transportation and installation of the equipment at the job site, the next step common to all operations is the planning of the actual diving operations This requires the following actions:

1. Identify all plant operations personnel whose activities might impact diving operations and develop written procedures covering their actions before, during, and after diving operations.
2. Identify plant operating systems which will require clearance procedure hold orders during underwater operations. Follow clearance procedure for assuring that these systems are in fact tagged out and locked out during operations. Use locks on electrical breakers, control valves, and equipment whose use might represent a hazard to diving operations.
3. Assessment of work tasks by the diving supervisor for the forthcoming dive(s) and development of a dive plan for the accomplishment of each task. Divide the procedure into general blocks of work, with amounts in each block targeted for completion on each dive. Give consideration to the manner in which each block of work will “blend” in with the successive block.
4. Development of a dive rotation and notification of the diving crew of this ordering. Place divers who have special skills which will be required at specific junctures during the job, in rotation with the current requirement for that dive.
5. Ensure that the diver personally inspects all equipment which he may use during a dive, and that he is familiar with both its configuration and proper operation.
6. Ensure that the dive forman inspects materials required for each dive and accounts for them as they are used
7. Discuss the recovery methods for all equipment, tools, and materials with the diving supervisor/lead diver. Define an agenda before the beginning of the dive. These points are especially important when diving in waters having poor visibility or physical factors which might inhibit the work process, such as currents or underwater obstructions.
8. Notify all plant personnel having an interest in the planned operations, or in control of systems whose operation might affect, or be affected by, the underwater operations, of the intent to begin operations. The notification should include the starting time and location of the operations, an estimated time to completion, and the name and contact number of the person in charge. This will allow easy confirmation of the status of operations by all departments.
9. Discuss special considerations, such as critical procedures, potential hazards, or other safety concerns with the diver, standby diver and diving supervisor/lead diver, before beginning the dive.

Appendix B - Pre-dive Inspection

Pre-dive Inspection

1. Before beginning operations, the diving foreman will inform the diver and standby diver of that portion of the procedure to be undertaken for a particular dive.
2. Both the diver and standby diver will prove their understanding of the scope of the work for each dive, in their discussion with the diving supervisor, before beginning the dive.
3. Perform the following checks before allowing the diver to enter the water.
   - Inspect and verify in writing that clearance procedure has been properly implemented.
   - Dressing-in of diver, including inspection of all seals and fasteners used.
   - Inspect all personal diving equipment, including the diving dress, helmet, harness, knife, quick-disconnect shackle, and miscellaneous equipment.
   - Test the two-way communications link between the diving supervisor and each diver.
   - Inspect, test, and reset the timekeeping and depth monitoring devices.
   - Check any batteries or battery backups used in support of operations.
   - Provision of a safe and efficient means for the diver to enter and exit the water, from the dive location.
4. Notify all concerned parties of the readiness to begin diving

Appendix C - Pre-dive Checklist

Pre-dive Checklist

1. **Basic Preparation**
2. Determine if a decompression chamber must be present on the diving job. For dives over 100 fsw, a recompression chamber must be present on the diving job.
3. Make sure that all personnel concerned or in the vicinity have been informed that diving operations are underway.
4. Determine that all valves, switches, controls and equipment components that influence the diving operation are properly “tagged out’ in accordance with TVA clearance procedure to prevent inadvertent shut-down or activation

   General Equipment
5. Check that all needed accessory equipment, tools, lights, special systems, spares, etc., are on scene and in working order.
6. Erect the diving stage or attach the diving ladder.

   Preparing the Air Supply
7. Check that a primary and suitable back-up supply is available with a capacity in terms of purity, volume, and supply pressure to completely service all divers and accessory equipment, throughout all phases of the planned operation.
8. Verify that all air supply systems have a volume tank installed in the air supply line between the supply source and the diver’s hose connection. An oil separator must be installed between the volume tank and the air source.
9. Determine that qualified personnel are available to operate and stand watch on the air supply.

   Compressors
10. Determine that sufficient fuel, and lubricants are available to service all components throughout the operation. All compressors should be fully fueled, lubricated and serviced (with all spillage cleaned up completely).
11. Verify that appropriate operating and service manuals are on hand.
12. Check that the compressor exhaust is vented away from work areas and, specifically, does not foul the compressor intake.
13. Check that the compressor intake is obtaining a free and pure suction without contamination.
14. Check all filters cleaners, and oil separators for cleanliness.
15. Bleed off all condensed moisture from filters and from the bottom of volume tanks.

16. Check that all petcocks are closed.
17. Check that all belt-guards are properly in place on drive units.
18. Check all pressure-release valves, check valves, and automatic unloaders. Make sure that the wing nut on the unloader is in the compressing position.
19. Verify that all supply hoses running to and from the compressors have proper leads, are free of kinks and bends, and are not exposed on deck in such a way that they could be rolled over, damaged, or even severed by machinery or other activities.
20. Activate the air supply
21. Make sure that all run-up and warm-up procedures are completely followed.
22. Check all petcocks, filler valves, filler caps, overflow points, bleed valves, and drain plugs for leakage or malfunction of any kind.
23. Soap test all valves and connections.
24. Verify that there is a pressure gauge on the air receiver and that it is functioning properly, and that the compressor is meeting its delivery requirements.
25. Check that the air supply is not being delivered below purity standards (smell, taste), or in excess of 95o F.
26. In all cases where compressors are used as a back-up, either to a cylinder bank, or another compressor—the back-up compressor will be kept running throughout the diving operation.

Cylinders

27. Gauge all cylinders for proper pressure.
28. Verify the availability and suitability of the reserve cylinders.
29. Check all manifolding and valving for operation.
30. Activate and check delivery.

Air Hoses

31. Check that all hoses have a clear lead and are not subject to excessive heating or damage.
32. Check that no hose length used exceeds maximum shelf life.
33. Soap test hose connections after they have been hooked up to the air supply and pressurized.
34. Check that the newest (or best) hose length is the section nearest the surface, where the hose will be subject to the greatest pressure change.
35. Check that all tie-offs, and the canvas chaffing over the first length of hose are in good condition.

Test of Equipment with Activated Air Supply

36. Hook-up all air hoses to helmets, masks, chamber, and make connections between backup supply and primary supply manifold.
37. Verify flow to helmets and masks.
38. Check all exhaust and air control valves.
39. Hook up and test all communications.
40. Check air flow from both primary and back-up supplies to chamber.
41. Detach all hoses except that leading to chamber. Make sure chamber supply is completely shut off and no air is leaking to chamber, depleting the air supply.

Recompression Chamber Checkout- (Pre-dive only)

42. Check that chamber is completely free and clear of all combustible materials.
43. Check primary and back-up air supply to chamber as well as all pressure gauges.
44. Check that the chamber is free of all orders or other contaminants.
45. Check the chamber oxygen supply, and that sufficient oxygen masks are rigged for at least two divers, and one tender.
46. Verify the presence of a sanitary bucket in the chamber in case of sickness.
47. Verify that the medical kit is completely outfitted and in close proximity to the chamber.
48. Check all hatches and seals.

49. Verify that all chamber electrical fittings are fitted with armored cable and special lighting fixtures and bulbs. All switches should be on the outside of the chamber.

Equipment Preparation

50. Assemble all members of the diving crew for a pre-dive briefing.
51. Assemble and lay out all equipment that may be used on the dive, either as primary equipment or standby spares for the diver (or standby diver). This should include all accessory equipment and tools.
52. Check all equipment for superficial wear, tears, dents, distortion or any apparent discrepancies.
53. Check all masks, helmets, viewing ports, faceplates, seals, and visors for broken glass or plastic.
54. Check umbilical connected to helmet.
55. Check air to helmet.
56. Leak test hose connection (first dive only)
57. Don helmet.
58. Check locking pins secure.
59. Ensure diver breathing comfortably.
60. Check communications.
61. Check life line shackled to D-ring on harness.
62. Purge and test pneumofathometer.

Final Preparations

63. Verify that "AIR DIVE RECORDS" are on the diving location.
64. Check that appropriate decompression tables are at hand.
65. Check that a stopwatch is at the dive station for diver and standby diver.
66. Place the dressing bench in position, reasonably close to the diving ladder or stage, and thus minimize diver travel.

Appendix D - Pre-dive Operations

While accessing the water, provide the diver with enough slack in the diving umbilical to avoid immediately restraining the diver's movements in the event of a slip or fall, or wave action, which might reduce the effective amount of slack in the umbilical. (Note: In the event of a diver requiring assistance from the standby diver, jumping into the water may be the most expedient method of reaching the diver. Under normal conditions jumping is not an acceptable means to enter the water). Too little in these instance would place undue strain on the diver. After entry, the diver will orient himself and perform final systems checks on the surface, before descending to the work site.

During the conduct of the actual diving operations:

1. Maintain regular communications with the diver, while paying particular attention to the quality of the diver's voice and breathing patterns. These provide general indications of the physical condition of the diver. Slurred or incoherent speech is a reliable sign of physical disability on the part of the diver, and may result from a variety of causes. Prolonged rapid breathing on the part of the diver can be a precursor to overexertion, as well as a sign of several other conditions, each of which may require special attention by the diving supervisor.
2. Pay close attention to the depth of the diver, monitoring it during the initial descent, and from time to time thereafter. It is especially important to watch the divers depth during movements away from the work site.
3. Establish the physical location of the diver at all times, through communication with the diver, and verified by alternative methods if available.
4. Relay changes in the physical relationships of objects in the work environment, resulting from the movement of equipment or materials, the diver, or the vessel (if applicable), to the diver. Take these changes into account in assessing the work, and evaluate all changes in the work environment, which effect the diver of the surface support crew, for their potential impact on operations
5. Monitor changing levels of consumables used during operations, such as compressed gas, system fuels, battery power levels.

Appendix E - Pre-dive Documentation

1. During each dive conducted in commercial diving operations, a common series of events take place. Record each event in the project air dive record as follows.
   - Left Surface. Abbreviated in the air dive record as (LS). The dive foreman, using two separatetimekeeping devices, will, or will direct a designated time keeper to, record this time in the air diver record.
   - Reached Bottom. Abbreviated in the air dive record as (RB). The dive foreman will, or will direct a designated time keeper to, record this time in the air dive record to show the time at which the diver actually arrived at the work depth, regardless of whether it is actually “on bottom”.
   - Left Bottom. Abbreviated in the air dive record as (LB). The dive foreman will, or will direct a designated time keeper to record this time in the air dive record to show the time at which the diver actually began his/her ascent to the surface, from the work depth.
   - Bottom Time. Abbreviated in the air dive record as (BT). This represents the period from LS to LB and is determined in commercial diving operations by the lesser of either 1) the time necessary to successfully complete a task, or 2) the limitations of the applicable decompression schedule which the diver must follow, based as a function of time vs. depth.
2. Reached Surface. Abbreviated in the air dive record as (RS). The dive foreman will, or will direct a designated time keeper to, record this time in the air dive record to show the time at which the diver actually returned to the surface.
3. These five elements, along with decompression, make up the dive profile. Development of a projected dive profile for a series of dives is useful in preparing an estimated work schedule in support of general operations planning.
4. Each dive profile becomes part of an overall project chronology. This chronology details significant events which occur during the project, as a function of time. Events related to the underwater work, such as the five items listed above, and descriptions of work accomplished during each diver’s bottom time should all be documented. Also document significant events associated with surface support activities.
5. Provisions are made in the Pre-Dive Hazard Identification / Mitigation form for documentation of factors related to assurance of proper clearance procedure for diving operations. These are recorded by the diving project manager, dive foreman or non-diving supervisor in the spaces labeled Plant Representative and Clearance Order No. prior to beginning a dive. They serve to identify and confirm that clearance procedure has been properly implemented before a diver enters the water.
6. Other spaces in the air dive record are used to describe the environment. The dive foreman, or his designee, should complete as many of the blank spaces as possible based on the conditions that exist at the job site. Some of these will of necessity be estimates.

In summary, successful diving operations are accomplished by thoughtful pre-planning and attention to detail in developing and following the operational procedures prepare for the procedure. A series of common sequences and events have been shown which are generic to virtually all diving operations, regardless of location or other contributing factors.

Appendix F - Pre-Dive Hazard Identification / Mitigation Form

(Example Only)

PRE-DIVE HAZARD IDENTIFICATION / MITIGATION FORM

Completed at the start of each job and for work scope change(s)

Hold orders will be walked after any boundary modification occurs

DATE: PLANT:

PLANT REPRESENTATIVE:

HOLD ORDER #'S:

ASSIGNED TASK(S):

HAZARDS IDENTIFIED:

NOTES:

SOLUTIONS AGREED ON BY PLANT REPRESENTATIVE AND LEAD DIVER:

SIGNATURE OF PLANT REPRESENTATIVE:_____

SIGNATURE OF LEAD DIVER:_____

SIGNATURE OF LEAD TENDER:_____

Appendix G - Diving Boat Safety Checklist

Diving Boat Safety Checkist All personnel involved in the operation of diving boats, launches, barges, floats, and other types of secondary small craft should be briefed and must understand the following safety precautions.

1. Inspect the specified boat or craft and determine its suitability for the intended job and operating environment. Ensure that :
   - Boat (craft) is sound, seaworthy, and well found.
   - Power plant is running well and fully tested.
   - Required safety and running equipment is on board and in workable condition.
   - Proper gear for diving operation is on board and operational.
   - The assigned boat crew is fully qualified to operate that particular craft.
2. Know the details of the emergency assistance checklist. Make sure it is completely filled out for small craft operations, with a legible copy place on board.
3. Inspect all communications gear radios, underwater communications, walkie-talkies, and ensure that they have been fully tested and are operational.
4. Know all pre-determined signals, proper call-signs, etc.
5. Know all routine and emergency signals (for divers):
6. Determine that adequate and safe mooring equipment is on board, and personnel are familiar with proper mooring techniques.
7. Know who is in charge of the boat and responsible for giving of orders to "Stop" and "Start" the small craft. Orders to commence boat operations that affect divers are given only by the designated person in charge.
8. Before getting underway, check with designated person in charge for:
   - As "all-aboard" head-count.
   - His approval that all diving equipment, lines, safety equipment, etc. are onboard.
9. Plan for various boat handling during Diving Operations to include:
   - Getting underway in an emergency.
   - Positioning boat for diving operations.
   - Handling of divers' lines during descent, ascent, hanging off, raising or lowering tools and gear.

10. Ensure that stowage of diving supplies and gear does not block access to:
    - Fire extinguisher
    - Life preservers
    - Ground tackle
    - Engine spaces
    - Communications
    - First aid kit
11. Know these general safety precautions that apply to boat operations.
    - Place all intakes for the diving air compressor upwind of engine or auxiliary power plant exhaust.
    - Ensure safety of the boat when: Handling gasoline or fuel.
    - Shoring or handling of heavy equipment.
    - Cutting, welding operations and space heaters.
    - The propeller of the vessel shall be stopped before the diver enters or exits the water and when the diver leaves bottom.
12. Complete the diving boat checklist prior to getting underway,
13. Inform management of your intended track.

Procedure 815 Welding and Cutting

TVA Safety Manual

815 Welding and Cutting

Procedure Number 815

TVA Safety Procedure

Welding and Cutting

Revision 2

April 30, 2007

Purpose

The purpose of this procedure is to establish requirements for welding and cutting operations.

General Requirements for Welding and Cutting

1. Only qualified employees shall operate welding or cutting equipment.
2. Approved fire-extinguishing equipment shall be readily available in the work area.
3. Adequate ventilation shall exist or job-approved respirators used while welding in confined spaces or on zinc, brass, bronze, stainless steel, galvanized, or lead-coated materials.
   Note: Reference TVA Safety Procedure 915, “Hexavalent Chromium”, if welding or cutting stainless steel materials.
4. Before welding or cutting a painted surface, determine if the paint or undercoat contains lead or cadmium. If these substances are present, the material shall not be cut or welded until necessary precautions are taken.
5. Approved eye protection, gloves, and clothing shall be worn during welding or cutting operations. Other employees shall not observe welding operations unless they use approved eye protection.
6. Highly combustible clothing such as polyester shall not be worn by employees performing welding and cutting operations. Clothing must be fastened around wrists and neck and pants shall cover the shoe tops.
7. Gauntlet gloves shall be worn when welding or cutting. Outer clothing shall be free from oil and grease. Flame-resistant clothing may be necessary in confined areas. If not sure, check with the safety consultant prior to entry.
8. Shirt sleeves and trouser legs shall be 100% cotton and shall not be rolled up as hot metal may lodge in the rolls and cause burns.
9. Employees operating burning or welding equipment wear proper approved eye protection, helmets, gloves, sleeve covers, jackets, and approved spats.
10. Employees working adjacent to welding operations shall wear approved goggles.
11. Open flames shall not be brought near and welding or soldering shall not be done on, any vessel which may have contained flammable or explosive substances until the vessel has been thoroughly purged by steam, or filled with water, or otherwise handled by special approved safety procedures.
12. Welding or cutting shall not be done in areas containing combustible gases, vapors, or dusts until precautions have been taken to safeguard the area from fire or explosions.
13. Material being welded or cut should not be placed directly on a concrete floor.
14. Hot material should be cooled or plainly marked before leaving it unguarded.
15. When welding or cutting is to be done in elevated positions, precautions should be taken to prevent hot metal from falling on people or into combustible materials. Where flammable material cannot be removed from

exposure to sparks, it should be protected by a shield of noncombustible or fire-resistant material.

16. All welding equipment should be checked by the welder before being used.
17. Adequate fire fighting equipment shall be on hand when performing any burning or welding operations. When necessary, a trained fire watch shall be provided.
18. When cutting or welding work is done overhead, precautions shall be taken to protect the head and shoulders from sparks and hot slag.
19. Welding operations shall be done in areas free of combustibles. Combustible materials shall be removed if possible, or protected with approved fire resistant screens or blankets. Care must be taken to prevent sparks from falling through openings.
20. When a welder is to work on any subsurface structure or other confined area, confined space entry requirements shall be implemented and a fire watch stationed in or adjacent to the work area.
21. Precautions shall be taken to protect the public and employees from harmful rays, flying sparks, or metal chips by arranging effective screens of sheet metal or other fire resistant material free from grease or oil. When necessary, the work area shall be closed off by barricades or other effective means.
22. Welding or burning equipment shall not be used in rooms, manholes, or confined areas unless adequate ventilation is provided.
23. All exhaust ventilation systems used to control welding fumes shall be tested for adequate capture velocity at 1-year intervals.

Permit

The “Cutting, Welding, Open Flame, and Spark Production Permit” established in TVA Safety Procedure 809, “Hot Work”, Appendix A, shall be used for all welding and cutting activities outside established shop areas, in areas where hazardous materials are present and in confined spaces.

Electric Welding

1. The electric welding machine shall be properly grounded before use.
2. Adequate ventilation shall be used when gasoline-driven arc welders are operated in enclosed or confined spaces.
3. When electrode holders are left unattended, the electrodes shall be placed or protected so that electrical contact cannot be made with employees or conducting objects.
4. When the welder must leave his work or stop work for any appreciable length of time or when the welding machine is to be moved, the power supply switch shall be turned off.
5. The welding machine, cables, holders, and ground clamp shall be inspected before use and kept in safe working condition.
6. Cables should be positioned to avoid creating hazardous obstructions.
7. Welding screens should be used, whenever other persons could be exposed to the arc of the welding operation. Welders should not strike an arc with an electrode without first alerting persons nearby to the possible danger.
8. Terminals for welding leads should be protected from accidental electrical contact by personnel or by metal objects i.e., vehicles, crane hooks, etc.
9. If a welding lead terminal which is intended to be used exclusively for connection to the work is connected to the grounded enclosure, it must be done by a conductor at least two AWG sizes smaller than the grounding conductor and the terminal shall be marked to indicate that it is grounded.

Installation of Arc Welding Equipment

1. Conduits containing electrical conductors shall not be used for completing a work-lead circuit.
2. Pipelines shall not be used as a permanent part of a work-lead circuit, but may be used during construction, extension or repair providing current is not carried through threaded joints, flanged bolted joints, or caulked joints and that special precautions are used to avoid sparking at connection of the work-lead cable.
3. Chains, wire ropes, cranes, hoists, and elevators shall not be used to carry welding current.
4. Where a structure, conveyor, or fixture is regularly employed as a welding current return circuit, joints shall be bonded or provided with adequate current collecting devices.
5. All ground connections shall be checked to determine that they are mechanically strong and electrically adequate for the required current.

Supply Connections and Conductors

1. A disconnecting switch or controller shall be provided at or near each welding machine which is not equipped with such a switch or controller.
2. Overcurrent protection shall be provided.
3. A disconnect switch with overload protection or equivalent disconnect and protection means, shall be provided for each outlet intended for connection to a portable welding machine.
4. For individual welding machines, the rated current-carrying capacity of the supply conductors shall be not less than the rated primary current of the welding machines.
5. For groups of welding machines, the rated current-carrying capacity of conductors may be less than the sum of the rated primary currents of the welding machines supplied. The conductor rating shall be determined according to the machine loading based on the use to be made of each welding machine and the allowance permissible in the event that all the welding machines supplied by the conductors will not be in use at the same time.
6. In operations involving several welders on one structure, d.c. welding process requirements may require the use of both polarities; or supply circuit limitations for a.c.welding may require distribution of machines among the phases of the supply circuit.
7. In such cases no load voltages between electrode holders will be 2 times normal in d.c. or 1, 1.41, 1.73, or 2 times normal on a.c. machines. Similar voltage differences will exist if both a.c. and d.c. welding are done on the same structure.
8. All d.c. machines shall be connected with the same polarity.
9. All a.c. machines shall be connected to the same phase of the supply circuit and with the same instantaneous polarity.

Operation and Maintenance

1. Before starting operations all connections to the welding machine shall be checked to make certain they are properly made.
2. The work lead shall be firmly attached to the work; magnetic work clamps shall be freed from adherent metal particles of spatter on contact surfaces.
3. Coiled welding cable shall be spread out before use to avoid serious overheating and damage to insulation.
4. Grounding of the welding machine frame shall be checked. Special attention shall be given to safety ground connections of portable machines.
5. It shall be determined that proper switching equipment for shutting down the machine is provided.
6. Printed rules and instructions covering operation of equipment supplied by the manufacturers shall be strictly followed.
7. Electrode holders when not in use shall be so placed that they cannot make electrical contact with persons, conducting objects, fuel or compressed gas tanks.

8. Cables with splices within 10 feet (3 m) of the holder shall not be used. The welder should not coil or loop welding electrode cable around parts of his body.
9. The operator should report any equipment defect or safety hazard to his supervisor and the use of the equipment shall be discontinued until its safety has been assured.
10. Repairs shall be made only by qualified personnel.
11. Machines which have become wet shall be thoroughly dried and tested before being used.
12. Cables with damaged insulation or exposed bare conductors shall be replaced.
13. Joining lengths of work and electrode cables shall be done by the use of connecting means specifically intended for the purpose.
14. The connecting means shall have insulation adequate for the service conditions.

Gas Welding and Cutting

1. No attempt to repair or alter cylinder valves shall be made.
2. Pressure gauges and regulators provided for use with a particular welding gas shall not be substituted on cylinders containing a different gas.
3. Oil and grease shall be kept away from oxygen systems. Gauge connections, valves, etc., shall not be lubricated with oil or grease.
4. Leaking or defective welding equipment shall not be used.
5. Special precautions related to the handling and storage of compressed gases shall be strictly observed.
6. Only hose, fittings and tools specially designed for such equipment are used in weldingoperations.
7. Oxygen hoses shall have fittings of a different size and a color different from that of hose used for acetylene connections. Normally oxygen hose lines are green and acetylene hose lines red.
8. Both oxygen and acetylene lines shall be equipped with combination check valve/flash back arrestors that are Underwriter's Laboratories (U.L.) Listed. The combination check valve/flash back arrestor is clearly labeled and shall be installed at the base of the torch. A second combination check valve/flash back arrestor may be installed at the regulator but is not required.
9. When welding equipment is not in use, the cylinder valves shall be closed. Pressure shall not be left on gas regulators or hose when not in use.
10. Do not store torches connected to cylinders in enclosed tool boxes even if pressure is turned off.
11. Acetylene cylinders shall be properly secured and always be used, transported, or stored in a vertical position.
12. Valve protection caps shall always be in place, hand tight, except when cylinders are in use or connected for use.
13. Torches shall be lighted by means of friction lighters, pilot flames or similar sources, and not by use of matches or cigarette lighters.
14. No attempt shall be made to light a gas welding torch unless both the oxygen and gas cylinders have been turned on and the proper pressure for lighting has been attained with the torch valves closed.
15. Valves and tank fittings shall fit tight to prevent gas leaks and tested using soap film or other safe agent.
16. Matches or other open flames shall not be used for testing.
17. Leaky cylinders shall be removed and emptied in a safe outdoor location, tagged and reported to the responsible supervisor.
18. Keys shall be attached to cylinder valve spindles for instant use during operations.
19. Cylinder valves shall be operated only with handwheels or tools specifically dedicated for that purpose and left in place while cylinders are in use. When welding is to be stopped for a few minutes, it is permissible to close the torch valves only; otherwise, the cylinder valves shall be closed. Valves of empty cylinders shall be closed and capped.
20. When welding operations are stopped for more than a brief interval, all cylinder valves shall be closed. Momentary stoppage is controlled at the torch valves.

21. Gas hose lines, air hose lines, and welding cables shall not be dragged over rough surfaces, or through water, oil, or grease, or permitted to lay on wet surfaces. They are placed to avoid causing tripping or falling hazards and to prevent damage to them including damage from hot slag or sparks from the welding operation.
22. Oxygen and acetylene lines shall not be sleeved.
23. Hose lines and welding cables shall be carefully examined at frequent intervals for damage, worn places, and loose connections.
24. Defective equipment shall be repaired or replaced.
25. Repairs shall not be made with tape, wire or copper tubing or by using white lead, oil, grease, or other pipe fitting compounds.
26. Gauges shall be in good operating condition and tested periodically for accuracy.
27. Oxygen cylinder storage shall be separated from fuel gas cylinder storage or combustible materials a minimum distance of twenty (20) feet or by a noncombustible barrier at least five (5) feet high having a fire resistance of at least one-half hour.

Personal Protective Equipment

Employees involved in welding and cutting shall wear the proper eye and face protection according to the selection guide, in TVA Safety Procedure 304, Eye and Face Protection, Appendix B, Eye and Face Protection Selection Guide.

Reference

- 29 Code of Federal Regulations 1910, Subpart Q, “Welding, Cutting, and Brazing”
- TVA Safety Procedure 809, “Hot Work”

Procedure 816 Combustible Dust

TVA Safety Manual

816 Combustible Dust

Procedure Number 816

TVA Safety Procedure

Combustible Dust

Revision 2

May 2, 2011

Purpose

This procedure establishes the requirements for reducing and controlling combustible dust that is likely to cause deflagration, fires, or explosions, and provide employees with a safe working environment by reducing combustible dust hazards. In addition, the procedure offers baseline direction in complying with the Occupational Health and Safety Administration "Combustible Dust National Emphasis Program."

Scope

This procedure applies to all facilities that handle combustible dust and where the generation or accumulation of combustible dusts could cause a fire, deflagration, or explosion hazard.

TVA's primary focus on combustible dust is coal dust in coal handling areas of the fossil generation facilities.

Regulatory Requirements

1. Combustible Dust Regulatory Levels
    1. Combustible Dust Level - Combustible dust accumulations shall be maintained less than 1/32" on the floor, on overhead beams, joists, ducts, vertical surfaces, the tops of equipment, and other surfaces. Refer to Appendix A for explanation of how dust level, and dust accumulation area is determined.
    2. Dust Combustibility - Facilities shall conduct an initial testing of all dust for combustibility and conduct follow-up testing when any new materials or changes occur in existing materials or blend of materials that would affect the combustibility of the dust. Refer to Appendix B for explanation of how dust combustibility is determined. The test results and MSDS sheets for the material shall be maintained on site for 3 years after the test has been conducted.
    3. Respirable Dust - Personnel must not be exposed to respirable dust levels above the most restrictive of 29 CFR 1910.1000, Table Z-3 or the most recent levels set by the American Conference of Governmental Industrial Hygienists (ACGIH). The level of respirable coal dust must be maintained at or below 2.0 mg/m^3.
2. Combustible Dust Program Requirements
    1. Each site must conduct hazard assessments to identify, evaluate and control combustible dust hazards.
    2. Develop a written program which includes plans for hazardous dust inspection, combustibility testing, housekeeping, and controls. The frequency and methods for completion of elements of the written program must be included.
    3. Engineering controls, administrative controls and operating procedures must be established to control fugitive dust emissions and ignition sources. These controls include use of dust collection systems and filters; minimizing horizontal surfaces where dust can accumulate; and sealing of areas inaccessible to housekeeping.

4. Managing change of dust producing materials, technology, equipment, staffing, and procedures to control combustible dust hazards.
5. Establishing housekeeping procedures and practices to control accumulation of combustible dust.
6. Design buildings for combustible dust, such as including separation, segregation of the hazards, and sealing of ledges to eliminate the accumulation of dust.
7. Including explosion protection, i.e. equipping buildings with explosion venting or fire protection systems.
8. Ensuring employee participation in hazard assessment; development of and compliance with the written program; and other elements of hazard management in this procedure.
9. Providing written safety and health information and training to employees, including hazard communication information and labeling.

General Requirements

1. Combustible Dust Control
    1. Equipment that has the potential to produce combustible dust shall be maintained and operated in a manner that minimizes the escape of dust.
    2. Abnormal operating conditions (ex. spills, leaks) that lead to excessive buildup of combustible dust shall be secured upon detection and clean up within 24 hours.
    3. Dust suppression and dust collection systems shall be operated and maintained to control dust.
2. Inspections
    1. Plants shall establish a documented Combustible Dust Inspection program to identify potential accumulations of combustible dust and to initiate corrective actions.
       There shall be daily or per shift inspections performed by the personnel working in the area with copies of the inspection being forwarded to their supervisors.
       There shall be weekly inspections performed by supervisor over the area with copies of the inspection being forwarded on to the MOIC.
       There shall be monthly inspections performed by the plant safety professional and plant management personnel assigned by the MOIC.
    2. Plants shall survey, document, and mitigate all potential ignition sources. A couple ways of documenting these efforts are by using the Maximo work order system or by creating log sheet.
3. Cleaning Frequencies:
   The following guidelines should be used as an indicator to establish cleaning frequency for the facility:
    1. Dust layers 1/32 in. thick can be sufficient to warrant immediate cleaning of the area. A thickness of 1/32 in. is about the diameter of a paper clip wire or the thickness of the lead in a mechanical pencil.
    2. When the combustible dust layer is capable of creating a hazardous condition by exceeding five percent of the area.
    3. When combustible dust accumulation on overhead beams and joists contributes significantly to the secondary dust cloud and is approximately equivalent to five percent of the area.
    4. The five percent factor should not be used if the floor area exceeds 20,000 ft^2. In such cases, a 1000-ft^2 layer of dust is the upper limit.
4. Housekeeping Methods
    1. Each facility shall document housekeeping practices in use for combustible dusts including frequency of cleaning that will maintain accumulations of coal dust to levels less than 1/32-inch for less than five percent of available surface areas within the area.
    2. Surfaces shall be cleaned in a manner that minimizes the generation of dust clouds.
    3. Use non-sparking scoops and soft brooms, brushes with natural fiber bristles
    4. Water washing as specified in the local plan

5. Vacuuming using equipment rated for Class 2 Hazardous Locations that are bonded and grounded to prevent buildup of static charges.
6. Methods used for cleaning shall ensure that the deposited combustible dust is not caused to become airborne.
7. Compressed air shall not be used to clean combustible dust.
8. Equipment that is to be worked on shall be cleaned of deposited coal dust prior to start of work activities.

5. Cutting, Welding, Open Flame, and Spark Production Operations

   TVA Safety Procedure 815, Welding and Cutting and TVA Safety Procedure Number 809, Hot Work shall be followed. A TVA Form 6561A, Cutting, Welding, Open Flame, and Spark Production Permit [1] shall be issued for all related cutting, welding, grinding and hot work in areas that contain combustible dusts.

6. Electrical Equipment
   1. Electrical equipment and installations in combustible dust areas must meet the applicable NEC 70 Article 500 location requirements. At a minimum, all combustible dust areas are Class II Division 2 Locations.
   2. All electrical equipment shall be grounded per NEC requirements.
   3. All electrical tools, extension cords, or portable lights used in coal handling or other combustible dust areas should be approved for Class 2 Hazardous Location Use
7. Ignition Control
   1. The following are required for ignition control:
      - Use appropriate electrical equipment and wiring methods
      - Control static electricity, including bonding of equipment to ground
      - Prohibit smoking, open flames, and sparks
      - Control mechanical sparks and friction
      - Use separator devices to remove foreign materials capable of igniting combustibles from process materials
      - Separate heated surfaces from dusts
      - Separate heating systems from dusts
      - Use proper type of industrial trucks
      - Proper use of cartridge activated tools
      - Use of non-sparking tools in combustible dust atmosphere
      - Use only power tools approved for Class 2 Hazardous Locations
      - Adequately maintain all the above equipment
8. Fire Protection
   1. Fire Protection systems shall be in service at all times.
   2. Operations and maintenance activities that present hazardous conditions in the protected area(s) must be discontinued unless adequate contingency measures, including roving fire watch, are taken to compensate for fire protection system being out of service.
   3. Fire Protection shall be inspected monthly, tested annually, and maintained in reliable operating condition.
   4. Fire Protection Impairments shall be controlled using TVA Clearance Procedure and Business Units Fire Impairment Procedure.
9. Training
   1. All TVA employees and contractors at facilities that have the potential to generate combustible dust must be trained on this procedure and the hazards of combustible dust. Training is accomplished by completion of ATIS 00075616, “Combustible Dust Awareness and TSP 816.” Combustible Dust Awareness and TSP 816 training must be provided initially with refresher training required on an annual basis.
   2. Combustible Dust Hazard Awareness training shall ensure that personnel are knowledgeable of:
      - Health and physical hazards of combustible dusts
      - Protective measures for combustible dusts
      - Safe work practices for combustible dusts

- Site-specific requirements
- Requirements to maintain Combustible Dust Levels
- Their responsibility to report hazardous levels of combustible dust.
- Emergency personnel including the Fire Brigades need to have training on how to control and mitigate coal dust emergencies.

10. Smoking is allowed only in designated smoking areas.

    All designated smoking areas shall be outdoors and located a minimum of 50 ft from all areas subject to combustible dust. Smoking materials and lighters shall not be carried in combustible dust areas.

11. Safety Signs

    Safety instruction signs shall be posted to identify areas as "Combustible Dust Hazard Areas" to warn employees of the protective measures to be taken in coal handling areas with respect to combustible dust.

12. Management Of Change

    Procedures shall be in place to manage change types of fuels; blends of fuels; materials; technology; equipment; and work procedures; in addition to upgrades, additions, or modifications to equipment and facilities.

13. Documentation Requirements:

    1. Areas which have combustible dust present are outlined on a plan view drawing of the areas.
    2. Electrical classification requirements and designations for areas which have combustible dust present (this should be on a plan view of the areas.)
    3. Document the dust management practices in use at the plant. Documentation must include:
        - Frequency of cleaning
        - Assignments for cleaning
        - Assignments for inspection of area
        - Site history of dust related fires or deflagrations, if any
        - Detailed information on the plant's Hot Work Permits and procedure for combustible dust areas.

14. Material Safety Data Sheets for coal shall be readily available to all personnel.

15. Plant Quarterly Combustible Dust Assessments

    1. The plant MOIC, or designated person, shall perform Quarterly Combustible Dust Assessments of all areas that contain combustible dusts at the plant.
    2. The Quarterly Combustible Dust Assessments are conducted to ensure that all areas that contain combustible dusts at the plant are in compliance with this procedure.
    3. The Quarterly Combustible Dust Assessments shall includes the following:
        - A review of all daily housekeeping inspections for combustible dust areas.
        - A review of all Cutting, Welding, Open Flame, and Spark Production Permits issued in the past month for cutting, welding, grinding, and hot work in areas containing combustible dusts.
        - An interview with affected employees whose work activities are or may be in the combustible dust areas to make certain that they are aware of and understand the purpose of the combustible dust procedure.
        - A review of training records for the personnel working in combustible dust areas.
        - A determination that plant combustible dust program is in compliance with the requirements of this procedure.
        - A walk down inspection to verify the following:
            - Combustible dust levels are being maintained in compliance this procedure.
            - Combustible dust area boundaries are adequately posted to identify the area containing hazardous dust.
            - Combustible dust areas are adequately posted with signs informing the need for a Cutting, Welding, Open Flame, and Spark Production Permit" shall be issued for all related cutting, welding, grinding and hot work in areas containing combustible dusts.

- All electrical equipment meets NEC Hazardous Locations Requirements.
- Document any changes made in the combustible materials handling system or processing method to ensure that dust control measures are effective.

4. The Quarterly Combustible Dust Assessments identifies the current status of the plants combustible dust program, the date of the assessment, the employees interviewed during the assessment, any problems/resolutions, and the person performing the assessment.
5. The person performing the assessment shall issue a work order for any deficiency identified by the Quarterly Combustible Dust Assessments to assign responsibility for corrective action."
6. The person performing the assessment shall issue a PER for any deficiency identified by the Quarterly Combustible Dust Assessments in accordance with the Business Units “Corrective Action Program"
7. Any discrepancies identified during the Quarterly Combustible Dust Assessments are corrected and the resolution noted on the Quarterly Assessment Form (See Appendix C). The completed form is retained for at least one year.
8. The person performing the assessment forwards the Quarterly Combustible Dust Assessment to the MOIC. (See Appendix C)
9. The MOIC will ensure that corrective action is taken in a timely manner to resolve identified deficiencies.
10. The MOIC forwards the Quarterly Combustible Dust Assessment to the facility Safety Professional, the responsible organization Vice President, and COO Fire Protection Program Manager.
11. The MOIC’s sign-off on the quarterly assessment (See Appendix C) is approval and indicates the coal handling operations are safe to operate.

16. Combustible Dust Audits
    1. Each Business Unit shall establish a Combustible Dust Advisory Team to perform an annual audit of the Combustible Dust Program. The team will evaluate the effectiveness and compliance with this procedure.
    2. Combustible Dust Advisory Team will present the Combustible Dust Audit to the MOIC with copies being sent to the to the facility Safety Professional, the responsible organization Vice President, and COO Fire Protection Program Manager.
    3. The MOIC will make adjustments as necessary, to improve the facilities combustible dust control program.

Roles & Responsibilities

1. Vice Presidents
    1. Ensure implementation of this combustible dust procedure in their areas of responsibility.
2. Management Official-In Charge (MOIC)
    1. Determines if it is safe to operate coal handling operations.
    2. The MOIC designates a person(s) responsible for informing plant employees of their individual responsibilities specified in this procedure.
    3. The MOIC shall review all monthly Combustible Dust Inspections and quarterly Combustible Dust Assessments of all areas that contain combustible dusts at the plant.
    4. The MOIC is responsible for implementing the requirements of this procedure. The MOIC may elect to designate in writing a manager(s) to perform the function of the “MOIC designee” listed in this procedure.
    5. The MOIC is responsible for implementing the inspection and assessment requirements of this procedure.
    6. The MOIC shall provide a quarterly update on their facilities compliance with this combustible dust standard to appropriate Business Unit level management responsible for the facility and the Business Unit Safety Manager.
3. Training and Development
    1. Assist the Subject Matter Experts in developing Combustible Dust Hazard Awareness training that is in accordance with this procedure.

4. Plant Safety Professional
    1. Assisting with implementation of combustible dust procedures and guidelines.
    2. Perform oversight of functions of combustible dust program on site.
    3. Participate in the monthly Combustible Dust Inspection program.
    4. Review site combustible dust program and advise MOIC of effectiveness of the site program and areas which need improvement.
    5. Assure that the annual IH plan includes combustible dust monitoring and is incorporated into each organization's business plan per TVA Safety Procedure 5 "Implement Industrial Hygiene Activities."
5. Engineering
    1. Assist with technical support for implementation of this procedure.
    2. Assist with technical support equipment design, selection, and maintenance.
    3. Perform routine assessments of plant for combustible dust hazard standard compliance.
    4. Assist with site specific procedures and guidelines.
6. Fire Protection
    1. Conducting Hazard Analysis.
    2. Assist with technical support to control the combustible dust hazard.
    3. Assist with fire protection technical support.
    4. Perform routine assessments of plant for combustible dust hazard standard compliance.
    5. Assist in development and implementation of procedures and guidelines.

7. Supervisor in Charge

1. The supervisor in charge on shift may direct the correction of any deficiency not promptly remedied including removal of tools, parts, and equipment not meeting housekeeping requirements.
2. The supervisor in charge shall take the necessary actions to have excessive amounts of combustible dust cleaned up immediately and the source identified and corrected in accordance with TVA Safety Procedure 607, "Housekeeping."
3. If immediate correction is not feasible, a work request or work order shall be written and conditions actively monitored and controlled until corrective action is complete.

8. Employees

1. Comply with the combustible dust management program.
2. Identify hazards due to the accumulation of combustible dust.
3. Take appropriate actions to mitigate combustible dust hazards.
4. Excessive accumulations of combustible dust, i.e. coal dust, shall be reported immediately to the employee's supervisor.
5. If the employee is not able to eliminate the combustible dust hazards, they shall immediately report it to the supervisor in charge on shift.

9. Designated Agency Safety and Health Official / Corporate Safety

1. Maintains this procedure to include processing proposed revisions and ensuring continued compliance with regulatory requirements.
2. Provides interpretations of this procedure and related regulatory and national consensus requirements.
3. Provides assessments of coal handling operations to determine the compliance with the requirements of this procedure.

Definitions

Class II locations – Class II locations are those that are hazardous because of the presence of combustible dust. Class II, Division 1 – A Class II, Division 1 location is a location:

(1) In which combustible dust is in the air under normal operating conditions in quantities sufficient to produce explosive or ignitible mixtures, or

(2) Where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitible mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electrical equipment, through operation of protection devices, or from other causes, or

(3) In which Group E combustible dusts may be present in quantities sufficient to be hazardous.

Class II, Division 2 – A Class II, Division 2 location is a location:

(1) In which combustible dust is not normally present; however, due to abnormal operations combustible dust may be present in the air in quantities sufficient to produce explosive or ignitable mixtures; or

(2) Where combustible dust accumulations are present but are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus, but could as a result of infrequent malfunctioning of handling or processing equipment become suspended in the air; or

(3) In which combustible dust accumulations on, in, or in the vicinity of the electrical equipment could be sufficient to interfere with the safe dissipation of heat from electrical equipment, or could be ignitable by abnormal operation or failure of electrical equipment.

Combustible Dust – A combustible particulate solid that presents a fire or deflagration hazard when suspended in air or some other oxidizing medium over a range of concentrations, regardless of particle size or shape.

Deflagration – Propagation of a combustion zone at a speed that is less than the speed of sound in the unreacted medium.

Explosion – The bursting or rupture of an enclosure or a container due to the development of internal pressure from deflagration.

Management Official-In-Charge (MOIC) – This means the plant, facility, production, or site manager, or building manager.

References

OSHA 29 CFR 1910.22 – Housekeeping (NFPA 654) Greater than 1/32 inch accumulation of coal dust or greater than five percent floor & overhead area up to 20,000 square feet (1000 sq. ft. max.).

OSHA 29 CFR 1910.1200 – Hazard Communication MSDS Sheets must be distributed for chemicals which in the normal conditions of use could become combustible.

OSHA 29 CFR 1910.269 Electric Power Generation, Transmission and Distribution (coal handling) 29 1910.269(v)(11)(xii) – Where coal-handling operations may produce a combustible atmosphere from fuel sources or from flammable gases or dust, sources of ignition shall be eliminated or safely controlled to prevent ignition of the combustible atmosphere.

OSHA 29 CFR 1910.252, -.253, -.254 – Welding, cutting, brazing prohibited in mixtures of flammable dusts with air.

OSHA 29 CFR1910.145 – Warning signs on equipment or areas where explosive atmospheres may occur.

OSHA 29 CFR 1910.307 & .399 Electrical – When accumulated dust is combustible and near electrical equipment then classified electrical equipment is installed and maintained in proper condition that meets the National Electric Code, Article 502, Class II locations.

OSHA 29 CFR General Duty Clause, Section 5(a) (1) of the Occupational Safety and Health Act:

1. Condition or activity in the employer's workplace presents a hazard to employees i.e., Kst of dust samples > 0, dust accumulations > 1/32 inch, dust explosion hazards within equipment, etc.
2. The employer or the employer's industry recognizes the hazard (i.e. consensus standards such as NFPA are industry's recognition of the hazard.
3. The hazard is likely to cause death or serious physical harm.
4. The hazard can feasibly be eliminated or materially reduced.

OSHA 29 CFR 1910.33, -.37 Egress – Must provide and maintain adequate egress from hazardous areas

OSHA 29 CFR 1910.156, -.157 Fire Protection – Must provide and maintain fire protection for hazardous procedure and materials

OSHA 18-Oct-2007 Issued a National Emphasis Program (NEP) on combustible dust after the occurrence of several industrial combustible dust explosions. Coal-fired power plants are included in this NEP. This National Emphasis Program (NEP) addresses the deflagration and other fire, and explosion hazards that may exist at facilities handling combustible dust. Proposal to change greater than 1/32 inch accumulation of coal dust to 1/32 inch (paper clip thickness) or greater than five percent floor & overhead area up to 20,000 square feet (1000 sq. ft. max.).

OSHA 1994 Citation – TVA KIF Coal Handling was cited by OSHA for Housekeeping and Electrical Classification in Hazardous Areas Violations. Agreement between TVA and OSHA to maintain minimum Class II Electrical and Housekeeping to a maximum of 1/8" of coal dust accumulation in 24 hours.

NFPA 70 National Electrical Code NEC Article 502 – Article 502 covers the requirements for electrical and electronic equipment and wiring for all voltages in Class II, Division 1 and 2 locations where fire or explosion hazards may exist due to combustible dust.

OSHA Regional Notice (Region III), Directive Number: 2006 - 556 (CPL 04), Local Emphasis Program for Dust Explosion Prevention, October 1, 2006.

OSHA Instruction CPL 02-00-103, Field Inspection Reference Manual, September 26, 1994.

OSHA Instruction CPL 02-01-004, Inspection of Grain Handling Facilities, 29 CFR 1910.272, November 8, 1996.

OSHA Instruction CPL 02-01-038, Enforcement of the Electric Power Generation, Transmission, and Distribution Standard, June 18, 2003.

NFPA 70, National Electrical Code (2005).

NFPA 499, Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemicals Process Areas (2004 Edition).

NFPA 654, Standard for the Prevention of Fires and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids (2006 Edition).

United States Chemical Safety and Hazard Investigation Board (CSB) Combustible Dust Explosion Reports and website.

ASTM E1226 – 05, Standard Test Method for Pressure and Rate of Pressure Rise for Combustible Dusts.

ASTM E1515, Standard Test Method for Minimum Explosive Concentration of Combustible Dusts.

FM Global, Data Sheet No. 7-76, Prevention and Mitigation of Combustible Dust Explosions and Fire (2006 Edition).

National Materials Advisory Board (NMAB) 353-3-80, Classification of Combustible Dusts in Accordance with the National Electrical Code.

NFPA 85, Boiler and Combustion Systems Hazards Code (2007 Edition).

Appendix A, Dust Accumulations

Dust Accumulations

Dust Accumulations: Annex D of NFPA 654 contains guidance on dust layer characterization and precautions. It indicates that immediate cleaning is warranted whenever a dust layer of 1/32- inch thickness accumulates over a surface area of at least five percent of the floor area of the facility or any given room. The five percent factor should not be used if the floor area exceeds 20,000 ft^2, in which case a 1,000 ft^2 layer of dust is the upper limit. Accumulations on overhead beams, joists, ducts, the tops of equipment, and other surfaces should be included when determining the dust coverage area. Even vertical surfaces should be included if the dust is adhering to them. Rough calculations show that the available surface area of bar joists is approximately five percent of the floor area and the equivalent surface area for steel beams can be as high as ten percent.

Additionally, FM Data Sheet 7-76 contains a formula to determine the dust thickness that may create an explosion hazard in a room, when some of these variables differ.

Appendix B, Dust Combustibility

Dust Combustibility

The primary factor in an assessment of these hazards is whether the dust is in fact combustible. Any "material that will burn in air" in a solid form can be explosive when in a finely divided form. Combustible dust is defined by NFPA 654 as: "Any finely divided solid material that is 420 microns or smaller in diameter (material passing a U.S. No. 40 Standard Sieve) and presents a fire or explosion hazard when dispersed and ignited in air." The same definition is used for combustible metal dust in NFPA 484, Standard for Combustible Metals, Metal Powders, and Metal Dusts. One possible source for information on combustibility is the Material Safety Data Sheet (MSDS) for the material. In some cases, additional information such as test results will be available from chemical manufacturers.

Different dusts of the same chemical material will have different ignitability and explosibility characteristics, depending upon many variables such as particle size, shape, and moisture content. Additionally, these variables can change while the material is passing through process equipment. For this reason, published tables of dust explosibility data may be of limited practical value. In some cases, dusts will be combustible even if the particle size is larger than that specified in the NFPA definition, especially if the material is fibrous.

Industrial settings may contain high-energy ignition sources such as welding torches. In these situations, test methods for dust ignition and explosion characteristics from ASTM International (originally the American Society for Testing and Materials) are needed to verify the characteristics of the specific combustible dust.

Appendix C, TVA Combustible Dust Program Quarterly Assessment Report

TVA Form 20363, TVA Comustible Dust Program Quarterly Assessment Report [2]

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=080440649

[2] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=101100702

Chapter 2 Section 9 Chemical / Hazardous Material

Procedure 901 Ammonia

TVA Safety Manual

901 Ammonia

Procedure Number 901

TVA Safety Procedure

Ammonia

Revision 1

March 10, 2009

Purpose

1. The purpose of this procedure is to establish requirements for preventing or minimizing the consequences of catastrophic releases of ammonia at TVA plants / facilities.
2. Ammonia is stored and handled in large quantities, at or above the specified threshold quantities listed in Appendix A to 29 Code of Federal Regulations 1910.119, Process Safety Management of Highly Hazardous Chemicals at TVA fossil plants with Selective Catalytic Reduction (SCR) installations.

Roles and Responsibilities

1. The plant / facility manager shall be responsible for the development and implementation of a process safety management program at plants / facilities with SCR.
2. The plant / facility manager shall designate a Process Safety Management Program Coordinator to oversee ammonia operations.

Process Hazard Analysis

A process hazard analysis (hazard evaluation) shall be performed on ammonia processes as established in TVA Safety Procedure 220, “Process Safety Management” and 29 Code of Federal Regulations 1910.119, Process Safety Management of Highly Hazardous Chemicals.

Training

1. Each employee involved in operating ammonia systems and equipment shall be trained in an overview of the process and in the operating procedures.
2. The training shall include emphasis on the specific safety and health hazards, emergency operations including shutdown, and safe work practices applicable to the employee's job tasks.
3. Refresher training shall be provided at least every three years, and more often if necessary, to each employee involved in operating ammonia systems to assure that the employee understands and adheres to the current operating procedures.
4. Ammonia Awareness training, ATIS 00059103 shall be required for all employees or visitors to plants with SCR or any employee who may have exposure to ammonia. **Exception: Visitors who are escorted at all times by trained personnel during their visit to a plant are not required to be trained.**
5. Training records shall be documented in the ATIS system.

Emergency Procedures

Detailed emergency plans shall be established as part of the Process Safety Management Plan.

Reference

- TVA Safety Procedure 219, “Process Safety Management”
- TVA Safety Procedure 405, “ Ammonia Awareness Course Standard”
- 29 Code of Federal Regulations 1910.119, “Process Safety Management of Highly Hazardous Chemicals”

Procedure 902 Arsenic

TVA Safety Manual

902 Arsenic

Procedure Number 902

TVA Safety Procedure

Arsenic

Revision 2

August 15, 2008

Purpose

This procedure establishes requirements and responsibilities for reducing employee exposure to inorganic arsenic.

General Requirements

All work areas contaminated with fly ash will be assumed to contain inorganic arsenic above the action level of 5 $\mu g/m^3$ and this procedure applies. Work areas that may be contaminated by fly ash include:

- Inside and out of any coal fired boiler
- Tube scale
- All associated duct work
- ID and FD fans
- Precipitators
- Air Preheaters

Exposure Assessment

1. All work areas contaminated with fly ash are assumed to contain arsenic above the action level of 5 $\mu g/m^3$. Hot work involving tube scale also assumes the presence of arsenic above the action level,
2. All work in arsenic contaminated locations require an assessment based on employee monitoring data. This data may be historic specific to the site or may be generated during the initial work periods for each task. Monitoring data used for pre-task assessment should be less than 6 months old.
3. During employee exposure monitoring, all workers in the areas of exposure shall wear protective clothing and half face respirators with HEPA filters. This equipment shall be worn until monitoring data demonstrates arsenic levels are below the PEL.

   If employee exposure monitoring (specific to the area where work is to be performed) or objective data indicates:

   - Below 5 $\mu g/m^3$ arsenic - no further sampling required; no protective measures required.
   - At or above 5 $\mu g/m^3$ arsenic but below 10 $\mu g/m3$ - sampling continues a minimum of once a month or until new engineering controls reduce concentrations to below 5 $\mu g/m^3$.
   - Greater than 10 $\mu g/m^3$ arsenic- employee exposure monitoring is required as a minimum every three weeks.
4. Each employee who was monitored shall be notified in writing of their exposure results within five (5) working days after receipt of the sampling results. Monitoring results after receipt shall be posted in a prominent location in the work area so all employees have access to the sampling data.

Engineering Controls

1. When sampling data indicated above 5 μg/m3 arsenic, the responsible supervisor will implement engineering controls to reduce employee exposure.
2. Examples of engineering controls are:
   - Full boiler washdown with high pressure hydro wash.
   - Continue to run FD fans during work.
   - Removal of tube scale from boiler tube cut lines.
   - Local exhaust ventilation that is filtered and vented to an outside location.

Compliance Plan

1. A written compliance plan is required for all work where workers may be exposed to arsenic levels above 5 $\mu g/m^3$. The written compliance plan shall be prepared prior to commencement of work or within twenty four (24) hours after personal exposure sampling data indicates levels above 5 $\mu g/m^3$ arsenic.
2. As a minimum, the written compliance plan shall contain the following:
   - Description of each work activity where exposure is, likely to occur. This will include location, crew size, work to be prepared, and method work will be accomplished.
   - Air monitoring data used to determine if employees will be exposed to arsenic greater than 5 $\mu g/m^3$.
   - Description of engineering controls implemented to reduce employee exposure. Examples would be boiler washdown or local exhaust. If engineering controls can not be achieved, the reason they can't must be stated and what steps are being taken to prevent employee exposure.
   - Detail schedule for the implementation of the compliance plan.
   - Description of method used to notify other employees or contractors of possible exposure to arsenic when they work in the same area.
3. The written compliance plan shall be reviewed by a safety or industrial hygiene professional prior to implementation.

Respiratory Protection

1. Employees exposed to arsenic levels greater than 10 $\mu g/m^3$ shall wear respiratory protection. Note: Respiratory protection is used only when engineering controls are not feasible.
2. The level of respiratory protection shall be determined from employee exposure monitoring data. Respirators shall be selected from the below chart

AIRBORNE CONCENTRATION OF ARSENIC	REQUIRED RESPIRATOR
Not in excess of 100 $\mu g/m^3$.	Any half mask air-purifying respirator with HEPA filters.
Not in excess of 500 $\mu g/m^3$.	Any full face air-purifying respirator with HEPA filters.
Not in excess of 10,000 $\mu g/m^3$.	Powered air-purifying respirator With HEPA filters.
Not in excess of 20,000 $\mu g/m^3$.	Supplied air respirators with full facepiece operated in positive pressure mode.
Unknown or + 20,000 $\mu g/m^3$.	Any full face self-contained breathing apparatus operated In positive pressure mode.

3. All negative pressure respirators shall use high efficiency HEPA filters or the equivalent under current NIOSH regulations.
4. Employees required to wear respirators will be fit tested annually and have a medical review annually.
5. Powered air purifying respirators (PAPR) must be provided to any employee that requests one.
6. As an alternative, a supplied air respirator with a protective factor exceeding the PAPR may be furnished the employee.

Work Practices

1. Employees exposed to arsenic levels of 10 μg/m^3 or greater shall wear as a minimum coveralls, gloves, head covers, and shoe coverlets. Additional protective equipment such as face shields or mono goggles may be required.
2. The responsible supervisor shall provide clean change areas adjacent to the work area for employees to change their clothes. Clean protective clothing shall be provided upon re-entry.
3. The responsible supervisor shall provide adequate washing facilities near the work area for employees use. If the arsenic level is above 10 μg/m^3 shower facilities are required. Consult a safety or industrial hygiene professional for further requirements when the PEL has been exceeded.
4. Employees are prohibited from smoking, eating, or chewing tobacco in work areas where arsenic levels exceed 5 μg/m^3. Employees shall wash their hands and face prior to eating.
5. Employees are prohibited from using compressed air to clean floors and other accessible surfaces contaminated with inorganic arsenic. Shoveling and brushing may be used only where vacuuming or other relevant methods have been tied and found not to be effective.
6. Work areas where exposure to arsenic exceeds 10 μg/m^3 shall be marked as regulated area and access will be controlled. The responsible supervisor shall initiate controls to prevent dust contaminated with arsenic from escaping the regulated area.
7. Regulated areas shall be clearly marked with warning signs to warn other employees of arsenic exposure. The warning signs shall read:
   DANGERInorganic ArsenicCancer HazardAuthorized Personnel OnlyNo Smoking or EatingRespirator Required

Medical Clearance

1. Employees exposed to arsenic levels at or greater than 10 μg/m^3 for thirty (30) days or longer shall pass a medical examination as described in OSHA 29 CFR 1926.1118. Contact the TVA safety professional if any employee meets this requirement.
2. All employees working in a regulated area shall have a current medical clearance to wear a respirator.

Training

1. Any TVA employee that will be exposed to arsenic levels at a greater than 5 μg/m^3 shall receive “Inorganic Arsenic” training, ATIS 00059132, prior to beginning work and annually thereafter.
2. As a minimum the training shall consist of:
   - Content of this procedure.
   - Description of work to be performed.
   - The hazards associated with exposure to arsenic and its effects on health.
   - The contents of the written compliance plan.
   - Safe work practices when exposed to arsenic.
   - Respirator selection and proper use.
   - Medical surveillance program as described in OSHA 29 CFR 1926.1118.
3. Employees shall also be advised where a copy of OSHA 29 CFR 1926.1118 is available for their review.

Recordkeeping

1. TVA Safety, TVA Health Services and the industrial hygiene services provider shall assure that all TVA employee exposure monitoring results and medical records involving an employee exposure to arsenic are properly stored.
2. OSHA regulations require all records be stored for 40 years or the duration of employment plus 20 years, whichever is longer.

Definitions

Inorganic Arsenic - A highly toxic metal that is found in fly ash. Arsenic and most of its compounds are poisonous to the body. When exposed to the skin, arsenic has caused dermatitis and skin lesions. Chronic exposure has been linked to lung cancer.

Action Level (AL) - Concentrations of inorganic arsenic, 5 $\mu g/m^3$ averaged over an eight hour period.

Permissible Exposure Level (PEL) - Concentrations of inorganic arsenic greater than 10 $\mu g/m^3$ averaged over an eight hour period.

Time Weighted Averaged (TWA) - Average concentration for a normal 8-hour workday to which nearly all workers may be repeatedly exposed day after day, without adverse effect.

Reference

- 29 Code of Federal Regulations 1926.1118, “Inorganic Arsenic”

Procedure 903 Asbestos Management Plan

TVA Safety Manual

903 Asbestos Management and Exposure Control

Procedure Number 903

TVA Safety Procedure

Asbestos Management and Exposure Control

Revision 7

September 14, 2011

Purpose

The purpose of the TVA Asbestos Management and Exposure Control policy is to provide program governance and to define management oversight to assure implementation of this procedure such that asbestos is controlled to applicable standards and eliminate or minimize airborne asbestos fiber exposure to all TVA employees and contractors.

This program applies to all locations and operations with friable and non-friable asbestos-containing materials (ACM), suspected ACM, and presumed ACM (PACM). This program also applies to all demolitions, whether or not asbestos is known to be present.

This document is intended to provide instruction for compliance with U.S. Occupational Safety and Health Administration (OSHA) standards, U.S. Environmental Protection Agency (EPA) regulations, state and local asbestos regulations, and Agency Health and Safety Policies.

1. **TVA Policy on Asbestos**

   TVA policy regarding asbestos shall be such that the intent of the program is to effectively eliminate or mitigate exposure of TVA employees and contractors to airborne asbestos fibers in the workplace.

   In order to meet the primary intent of the program, asbestos-containing materials (ACM) will be generally managed proactively by maintaining existing ACM in good condition. Elimination of ACM accomplished through abatement and proper disposal at the time of alteration, demolition, renovation, and/or major modifications/repair. Facilities with suspected ACM shall treat it as PACM and manage it as such, or perform sampling to confirm or refute the presence of ACM.

   The procurement and installation of Asbestos-Containing Material (ACM) is prohibited when non-asbestos products are available and feasible for the given application.

2. **Substance Identification and Associated Health Hazards**

   - "Asbestos" is the name of a class of naturally occurring minerals composed of silicon, oxygen, hydrogen, and various metals. Asbestos is generally made up of fiber bundles which easily separate into long, thin fibers. Positive identification of a specific fiber type requires microscopic analysis and examination. The three most common types of asbestos fibers are chrysotile, crocidolite, and amosite. Other types include anthophyllite, tremolite and actinolite asbestos. All asbestos fibers are hazardous to human health
   - The potential for an asbestos-containing product to release breathable fibers depends largely on its degree of friability. Friable means that the material can be crumbled with hand pressure and is therefore likely to emit fibers. The fibrous, fluffy sprayed-on materials used for fireproofing, insulation, or sound proofing are considered to be friable, and they readily release airborne fibers if disturbed. Materials such as vinyl-asbestos floor tile or roofing felt are considered non-friable if intact and generally do not emit airborne fibers unless

subjected to sanding, sawing and other aggressive operations. Typically nonfriable ACM such as asbestos-cement pipe or sheet can emit airborne fibers if the materials are cut or sawed, or if they are broken.

- Health Hazards

1. Asbestos can cause disabling respiratory disease and various types of cancers if the fibers are inhaled or ingested (can also be inhaled or ingested from contaminated clothing or skin). The symptoms of these diseases generally do not appear for 20 or more years after initial exposure.
2. The most common diseases caused by asbestos exposure are:
   - Malignant Mesothelioma — a rare form of cancer that affects the thin membranes lining the abdomen and chest.
   - Asbestos Lung Cancer — cancer of the lung. The two most common types of lung cancer are small–cell and non–small cell cancer.
   - Asbestosis — a nonmalignant disease that causes scarring of the lung tissue.
   - Asbestos Pleural Disease — a nonmalignant disease that causes scarring of the thin membranes lining the lung and chest.

   Asbestos may also cause cancer of the digestive tract, colon, larynx, esophagus, kidney and some types of lymphoma. These asbestos diseases may be due to swallowing some of the longer asbestos fibers that are caught in the upper airways and that are carried to the throat in mucus.

General Program Requirements

1. The scope of the Asbestos Management and Exposure Control policy includes the management of all types of Asbestos Containing Material (ACM) and actions to mitigate or eliminate personnel exposure to asbestos fibers.
2. Functional roles including the Asbestos Program Manager and Asbestos Program Coordinator must be in place for facilities where one or combination of Class I, II, or III asbestos work related activities take place.
3. Types of ACM have been defined by the three categories of:
   - Thermal System Insulation (TSI),
   - Surfacing Material, and
   - Miscellaneous Materials such as floor and ceiling tiles, fabrics, etc.
4. Thermal system insulation and surfacing material found installed before 1980 must be designated as Presumed Asbestos Containing Materials (PACM) and managed as ACM. These materials will be managed as ACM until it is demonstrated that they are non asbestos containing.
5. **Review Cadence:** This procedure will be reviewed every two years with the review documented in the Revision Log and/or in Maximo via Action Tracking.
6. See Appendix A for classes of Asbestos Work.

Roles and Responsibilities

1. **Site Vice-President / Plant Manager / Senior Facility Manager (Acting Facility Owner)**
   - Appoint a line manager as the Asbestos Program Manager (APM). The APM will appoint an Asbestos Program Coordinator (APC) for day-to-day functional program administration and oversight. Accepted Business Unit APM designations are Fossil Power Group (FPG)/Maintenance Manager; Nuclear Power Group (NPG)/Maintenance Support Manager; River Operations (RO)-Hydro/Plant Manager and Outage/Project Managers; Power System Operations (PSO)/Construction Managers.
   - Ensure the facility Asbestos Program Manager is properly qualified and trained and is knowledgeable of the requirements of the Asbestos Management and Exposure Control Procedure and in particular those elements within their responsibilities.
   - Ensure this policy is implemented effectively at the facility/station for which they preside.
   - Ensure compliance with the TVA Policy Statement on asbestos.

- Ensure employees are provided training as required by this policy and other resources necessary to implement this program.
- Ensure that employees and contractors comply with the requirements of this policy.
- Ensure that either a comprehensive inventory of asbestos-containing materials is performed, or assume all materials that could potentially contain asbestos are treated as PACM until such time that the inventory can be completed. Known ACM is to be appropriately labeled. Labeling of known Non-ACM is recommended.
- Ensure adequate resources are available to properly manage ACM and PACM.
- Ensure that an Asbestos Program Coordinator is identified/appointed to administer the asbestos program.

3. **Asbestos Program Manager (APM)**
4. Asbestos Program Manager (APM) will be required to be a TVA Position and front-line Manager. Training for this functional role is accomplished (minimally) through completion of Asbestos Laws and Regulations ATIS #8631. For FPG this will be the Maintenance Manager, NPG this will be the Maintenance Support Manager; RO will be the Plant Managers and Outage and /or Project Managers as designated. The intent is to affect resources regarding the asbestos program. The APM is the principal oversight authority for all asbestos management activities and while providing ownership for the program, actual tasks associated with oversight and implementation may be delegated. Acting on the authority of TVA in this capacity, the APM will:
   - Provide TVA ownership and oversight of the Asbestos Management and Exposure Control program at his or her facility including oversight of asbestos contractors, all asbestos-related activities taking place at the facility, annual programmatic evaluations and periodic field assessments.
   - Appoint the facility Asbestos Program Coordinator (APC) and ensure the APC is properly qualified and trained in accordance with the requirements of the Asbestos Model Accreditation Plan (Appendix C to Sub-part E of 40 CFR 763) for a Building Inspector and Contractor/Supervisor; or for TN and VA only may be a qualified asbestos project monitor in lieu of Supervisor and Inspector.
   - Ensure APC functions are effectively implemented.
   - Ensure that sufficient resources are allocated to maintain all in-place ACM and PACM in good condition.
6. **NOTE: It is recognized that deficiencies in ACM/PACM conditions may exist, thus it is important that a documented plan exists to address recognized deficiencies such that the plan establishes short and long term repair and/or abatement schemes.**
   - Ensure that either a comprehensive inventory of asbestos-containing materials is performed, or assume all materials that could potentially contain asbestos are treated as PACM until such time that the inventory can be completed. For additional guidance see Section 6 (“Identification of Suspected ACM”). Known ACM is to be appropriately labeled. Labeling of known Non-ACM is recommended. The performance of this task may be delegated to the APC but ownership lies with the APM.
   - Ensure asbestos repair and abatement projects are overseen and appropriately supervised by the Asbestos Program Coordinator and Competent Person, respectively.
   - Ensure the designation of Contract partner and as applicable, the addition of Competent Person(s) as needed for project requirements and ensure their proper qualifications.
   - **Contractor Oversight**
     - Comply with all requirements of TVA Contractor evaluation process, for Contractor Safety, when utilizing contractors.
     - Conduct an Annual Programmatic Evaluation utilizing Appendix C. The annual assessment will be conducted of TVA Partners with responsibilities for Class I, II, or III asbestos work. Include an audit of contractors and subcontractors to ensure that required asbestos training is up to date. See sections 5.1 and 6.1 of this procedure.
     - Ensure contractors selected for abatement and inspection activities hold the appropriate, current certifications and licenses to meet federal and state (for asbestos job location) requirements and that

periodic reviews are conducted to ensure all certifications and licenses are maintained throughout the duration of the work to be performed.

- Ensure appropriate oversight and supervision of all asbestos-related activities taking place at the facility, including annual programmatic evaluations and periodic field assessments.
- Review existing contracts and any new contracts to ensure that the asbestos training responsibilities are contained within the work contracts.
- Review asbestos concerns identified during annual regulatory safety compliance inspections.

- **Records**
  - Ensure records required under the APC responsibilities are maintained for documentation of the station/facility (e.g. K&D Studies), monitoring results, negative exposure assessments, bulk sampling, abatement and repair projects, daily log, permits, long term plans and other information as appropriate. Refer to section 14 of this procedure.

10. **Asbestos Program Coordinator (Formerly the Asbestos Program Manager Designee)**

11. The APC shall be qualified and trained in accordance with the requirements of the Asbestos Model Accreditation Plan (Appendix C to Sub-part E of 40 CFR 763) for a Building Inspector and Contractor/Supervisor. (For TN, the qualification and training requirement can be met with accredited TN Project Monitor training.) In this capacity, the (APC) will:

- **Functional Designations and Training**** Ensure that all persons performing asbestos related work at the facility are appropriately trained (and accredited as required by state rules), including custodial staff and outside contractors.
  - Designate sufficient number of Asbestos Competent Person(s) and ensure their proper qualifications. **NOTE: Since APC's are qualified as an Asbestos Competent Person, the APC may also serve as an Asbestos Competent Person.**** Designate a qualified Inspector to perform an assessment of condition of ACM or PACM in the work location and identify method(s) for preventing disturbance of ACM/PACM.
  - Designate a TN Accredited Asbestos Project Monitor when required, (TN only). **NOTE: Not required for Small Scale, Short Duration (SSSD) asbestos work (See definition).**
  - Designate additional functions as necessary to effectively implement the asbestos management and exposure control program.
- **Implementing Field Activities**
  - Manage and coordinate the facility asbestos program using this policy and related TVA Policies and Procedures and/or guidance documents.
  - Oversee all asbestos-related activities taking place at the facility, including annual programmatic evaluations and periodic field assessments.
  - Ensure that all in-place ACM and PACM is maintained in good condition. **NOTE: The APM is responsible for providing resource support to ensure this role is accommodated.** It is recognized that deficiencies may exist, thus it is important that a documented plan exists to address recognized deficiencies such that the plan establishes short and long term repair and/or abatement schemes.
  - Develop Long Term Repair, Maintenance and Abatement Plans by year for next 3, 5 and 10 years and beyond.
  - Initiate an Inspector assessment of condition of ACM or PACM in the work location and identify method(s) for preventing disturbance of ACM/PACM. **Note: This must be a qualified Asbestos Inspector according to State rules. The inspector must perform surveys to determine the presence, location, and quantity of ACM prior to performing any work that would disturb the asbestos material and assess the condition and/or collect samples of asbestos-containing materials.**
  - As directed by the APM, perform a comprehensive inventory of asbestos-containing materials or assume all materials that could potentially contain asbestos are treated as PACM until such time that the inventory can

be completed. For additional guidance see Section 6 (“Identification of Suspected ACM”).

- Ensure that all warning signs and warning labels are posted. Known ACM with shall be labeled as appropriate. It also recommended that all known Non-ACM be labeled.
- Initiate, define and barricade Asbestos Regulated Areas to control unauthorized access.
- Initiate the proper clean-up of damaged ACM and an investigation to determine the cause of damaged ACM and determine actions required to prevent further damage.
- Take precautions and actions as appropriate to confine airborne asbestos to regulated areas.
- Assess the need for other control measures to mitigate airborne asbestos fiber exposure to employees.
- Work with Outage and Work Control Manager to develop Work Week Schedules for workers supporting the asbestos program, (e.g. T1-T4 weeks for Insulators).
- Initiate periodic inspection and (as required) maintenance of identified ACM.
- Conduct a minimum of two field assessments of ongoing asbestos work activities annually unless no asbestos activities take place during the most recent annual period. This task may be delegated to an Asbestos Competent person. Assessments may be made of any class asbestos work. Periodic field assessments will be done using the checklist in Appendix D.
- Ensure air sampling is conducted as required by OSHA /EPA regulations and by TVA policy/procedures and that the employees are notified of their exposures.
- Ensure TVA Occupational Health Services is notified of all employees who are required to undergo medical surveillance due to potential asbestos exposures. Consult with Safety Programs IH section for guidance.

- **Contractor Oversight**
  - Initiate and approve through use of Appendix F, all planned repair and/or abatement projects that involve Class I or II asbestos work activities. Appendix F is to be completed prior to work - for projects that are Class I or II; asbestos work activities where quantities are greater than 10 square feet or 25 linear feet; whether friable or non-friable; and noting any work dealing with ACM quantities that meet National Emission Standards for Hazardous Air Pollutants (NESHAP) reporting criteria. **EXCEPTION: Emergency response actions to events such as damaged ACM with potential or actual fiber release episodes do not require the use of Appendix F to initiate the response actions. Appendix F is not required for Class III (e.g. SSSD in TN) and Class IV asbestos work activities.**
  - The APC and/or Asbestos Competent Person inspects completed asbestos projects. TVA Asbestos Renovation Final Inspection Checklist is found as Appendix I of this procedure.
  - When performing asbestos activities in TN, (other than SSSD asbestos work), ensure the individuals and firms being used are ‘accredited’ per TN rule.
  - Conduct periodic reviews to ensure all certifications and licenses are maintained throughout the duration of the work to be performed.
  - Review asbestos concerns identified during annual regulatory safety compliance inspections.
- **Records**
  - Maintain the Asbestos documentation for the station/facility (e.g. K&D Studies), develop a System Health Status report to communicate overall asbestos conditions, to include those areas needing repairs, etc.
  - Maintain records for audit purposes, the following documentation:- Inspections (surveys) - Field Level Assessments, Bulk sampling analysis, Air monitoring results, including personal monitoring on TVA employees, negative exposure assessments, Abatement job records (including waste manifests, air monitoring, contractor certifications, daily logs, permit information, etc.); Areas where ACM has been removed or non-ACM materials have been retrofitted.
  - Maintain the comprehensive inventory of asbestos-containing materials. Assume all materials that could potentially contain asbestos are treated as PACM until such time that the inventory can be completed.
  - Refer to section 14 of this procedure.

- **Notifications**
  - Reference Environmental Procedure: EMS TVA-SPP-5.67, Asbestos Management.
  - Ensure appropriate notifications have been made for upcoming asbestos work. This includes (if applicable) the Annual 'blanket' Notification.
  - Contact Environmental representative to ensure time is allocated for making state notifications as deemed required by the Responsible Environmental Person (REP).
- **Communications - (also see Section # 10, Communication of Asbestos Locations)**
  - Ensure that all personnel at the facility (TVA and Contractors) are informed about the location and quantity of ACM and PACM, and about any ongoing asbestos work.
  - Develop Event Communications and work with Environmental/Safety Professionals to publish communiqués.
  - Collaborate with the site leadership and Health and Safety (H&S) Committee to provide appropriate awareness communications regarding the asbestos program and initiatives.

18. **Asbestos Competent Person(s)**

- Manage asbestos workers and specific asbestos work activities on-site.
- Maintain certifications and exercise authority for ensuring worker safety and health.
- Supervise all asbestos abatement activities, including initial exposure assessments, negative exposure assessments, periodic monitoring of exposed employees, personal protective equipment, work practices and controls, and medical surveillance.
- Conduct frequent and regular inspections of the job sites, materials and equipment and document inspections using Appendix D. For additional guidance, see Appendix G, Section 2.
- Establish regulated areas, enclosures, or other containment.
- Verify integrity of the enclosure or containment.
- Establish a process to control entry to and exit from the enclosure and/or area.
- Verify that employees working within enclosures or using glove bags wear respirators and personal protective equipment as required.
- Verify that engineering controls are adequate and functioning properly.
- Verify employees use hygiene facilities and observe decontamination procedures.
- Ensure that employees are notified of the presence of asbestos in their work areas.
- Notify the APC if any adverse conditions occur such as unexpected findings/results regarding asbestos work activities and/or potential or actual fiber release episodes.

20. **Inspectors**

- Maintain licenses in accordance with state accreditation and licensing requirements.
- Perform surveys to determine the presence, location, and quantity of ACM prior to performing any work that would disturb the asbestos material.
- Assess the condition of ACM and/or collect samples for bulk analysis.
- Collect samples as directed of PACM for the purpose to determine the presence or absence of asbestos.
- Provide the Asbestos Job Coordinator with completed survey results.

22. **Accredited Project Monitor**

23. When required under state regulation e.g. TN and VA

24. An Accredited Project Monitor will monitor 'response actions' performed by the supervisors and generally serve as the building/facility owner's representative to ensure compliance with contract/job specifications and regulatory requirements except for projects that are of SSSD. (See definition). The functional role of the Project Monitor is specific to a particular response action and is inclusive of performing visual audits of a job site before, during and after a response action is undertaken. It also includes performing air monitoring as part of or for clearing a response action, determine completion of response actions through visual inspections and collecting

clearance air samples.

25. **Asbestos Project Designers**

26. Determine how the asbestos abatement project will be conducted and develop written specifications.

27. **Technical Contract Manager (TCM) (TVA Position)**

- The APM may serve as the TCM if qualified.
- Ensure that all contractors that are selected for asbestos abatement or waste disposal are approved and are evaluated for these activities in accordance with TVA Contractor evaluation and oversight policies. (See SPP-18.003, Implement Labor Contract Safety Requirements and SPP-04.02, Procurement of Products and Services).

29. Depending on the nature and location of the work to be performed by Contractor, there may also be site specific safety and health requirements, but these shall be identified to Contractor by the TCM prior to the start of such work. In the event of conflict between OSHA and/or state regulations and the TVA requirements, the more stringent, i.e., the more protective of occupational health and safety, shall apply. Additionally, should the contractor require more stringent safety requirements than specified by OSHA or TVA, the TCM can allow the contractor to abide by their procedures and policies with the approval of the TVA SBU Safety Professional.

30. The Contractor and its subcontractor(s) shall initiate and maintain such programs as may be necessary to comply with the foregoing requirements; provide for frequent and regular inspection of the job sites, materials, and equipment; identify and prohibit work in an unsafe or unhealthful work place, including the use of unsafe machinery, tools, materials, or equipment; and permit only those employees qualified by training or experience to operate equipment and machinery.

31. **Safety Programs Governance**

- Support the implementation of, and compliance with, this procedure.
- Assist with exposure monitoring as required for company employees.
- Conduct audits to evaluate the effectiveness of the asbestos program.
- Ensure this document is maintained to reflect current regulatory requirements and company policies with regards to health, safety.

33. **Occupational Health Services**

- Support the implementation of and compliance with this procedure relative to medical surveillance provisions.
- Administer the medical surveillance program for company employees.

35. **Facility/Regional Environmental Specialist - Responsible Environmental Person(s) (REP)**

- Support the implementation of and compliance with this procedure.
- The Responsible Environmental Person(s) (REP) ensures compliance records are maintained. In coordination with other Environmental Permits and Compliance (EP&C) staff, interact with regulatory agencies relative to operation-level activities.
- Prepare notifications or review partner's notifications and ensure notifications are sent to the appropriate agency within the correct time frame.
- Prepare and/or review Waste Shipment Records (WSR) for asbestos wastes. Track and ensure that a WSR is received within the appropriate time. Track and file notification and waste disposal certification forms.
- Review NESHAP permits prior to submittal to state regulatory agencies.
- Compile final Quarterly Reports and submit reports and fees to state regulatory agencies.
- Reference Environmental Procedure: EMS TVA-SPP-5.67, Asbestos Management

37. **TVA Employees**

- Comply with guidance and instruction provided during annual asbestos training. Each employee whose work may bring them into contact with ACM will have Asbestos Awareness training annually (applies to facilities with ACM).
- Obey asbestos signs, postings, and labeling.

- Stop work immediately and notify the Supervisor, Foreman or lead person-in-charge who notifies the APC or Asbestos Competent Person upon encountering unanticipated suspected ACM.
- Report damage of known or suspected ACM as soon as possible to their Supervisor or Foreman, who notifies the APC or Asbestos Competent Person. . Supervisors must also meet site specific protocols for communicating such events. e.g. Notify the Shift Operations Supervisor (SOS).

39. **Employees Performing Work Involving Asbestos**

- Maintain appropriate training, medical, and respirator qualifications.
- Always use good work practices.
- Comply with the requirements of this guideline and all relevant OSHA standards.
- Notify the Asbestos Program Coordinator of any known or suspected damaged ACM.
- Notify management of concerns related to asbestos abatement projects.

41. **CAUTION: TVA PERSONNEL ARE GENERALLY PROHIBITED FROM PERFORMING CLASS I AND II ASBESTOS WORK**

42. Exception would include where applicable, the APC may be a TVA employee overseeing Class I and II activities.

43. **Responsible Engineer / Procurement Engineering Group (PEG) or TCM**

- Ensure that ACM is not specified, purchased, used or applied if suitable non-asbestos substitute materials can be obtained.
- Approve the necessity for application / installation of any ACM.
- Prior to purchase, asbestos procurement documents shall be submitted for approval by Safety Programs.

45. **Support Coordinators / Work Planners**

- Recognize ACM or PACM during work planning.
- Include testing for ACM/PACM in work scope, if required.
- Prior to starting any repair, renovation, demolition, construction or alteration work, review the scope of work to determine the presence of any ACM that may be present or disturbed during the performance of the tasks being implemented.
- Contact Environmental section representative to ensure time is allocated for making state notifications as required by the Responsible Environmental Person (REP).
- Presume all building materials contain asbestos unless proven otherwise. If the existing material cannot be identified as non-asbestos, the work order shall have a caution statement on all daily, outage and any Preventive Maintenance (PM) type jobs, similar to the following-

47. **CAUTION: The component you are working on may contain asbestos. Refer to Procedure TSP 903, "Asbestos Management and Exposure Control", prior to opening system or component. If any material is found to be suspect or containing asbestos, stop work and notify the Asbestos Program Coordinator (APC). If material is found to be non-asbestos proceed with job as planned.**

48. **Contractor(s)**

- Comply with TVA requirements regarding asbestos management while on site.
- Ensure their personnel are properly trained in asbestos awareness and asbestos courses required for their individual work practices commensurate with their job responsibilities have been taken.
- Comply with all applicable TVA, federal, state, and local regulations regarding asbestos.
- Maintain readily retrievable evidence of compliance with all applicable TVA, federal, state, and local regulations regarding asbestos.
- Supply TVA with documents of compliance that all Partner employees, contractor employees, and subcontractor employees have the appropriate asbestos training-Asbestos Awareness, Inspector, or Contractor/Supervisor, or Worker as appropriate for each individual's job responsibilities.

Applicable Standards and Regulations

1. TVA Procedures

   TVA, OSHA and EPA (state and federal) have compliance requirements for asbestos management. These requirements will be complied with at TVA locations. Safety Programs Industrial Hygiene section and/or the organizational environmental staff should be consulted to resolve any compliance issues.

   For Asbestos Waste Management and Notifications, see Environmental Procedure TVA-SPP-05.67, Asbestos Management - The purpose of this procedure is to provide a uniform process for managing the environmental aspects associated with specific asbestos demolition, renovation and disposal activities. It describes requirements for identifying asbestos, training personnel, making required notifications, and ensuring that asbestos waste material is properly handled, shipped and disposed in compliance with TVA policy and all applicable regulations. Both TVA and EPA (state and federal) have compliance requirements for asbestos management. These requirements will be complied with at TVA locations. Your organizational environmental staff should be consulted to resolve any compliance issues.

   CAUTION: Notifications are required for ALL demolition projects regardless of whether or not asbestos is present.

2. Federal and State Regulations

   Appendix B shows the most pertinent Federal, State and Local regulations applicable to TVA. Appendix H provides regulatory responsibilities and Appendix J provides regulatory requirements.

   Where conflict occurs between more than one listed guidance source, the more restrictive guidance will be followed. However, these conflicts are to be discussed with the IH section of Safety Programs and a determination made for the need of further investigation to determine the appropriate actions for conflict resolution. The Corrective Action Program should be used to document such conflicts once it has been confirmed they exist. A Problem Evaluation Report (PER) initiated via a Service Request in Maximo is the best method.

Audit / Inspection / Surveillance

1. Annual Programmatic Evaluations (Appendix C) (APM Function)

   An annual assessment utilizing Appendix C will be conducted of TVA Partners responsibilities for Class I, II, or III asbestos work. The scope is:

   - To determine the degree and adequacy of management control over Partner performed asbestos work and over the Partner's subcontractors that perform asbestos work.
   - To determine the degree and adequacy of asbestos program implementation within TVA performed work activities.

   NOTE:TVA Partners are required to conduct an annual evaluation of the degree and adequacy of implementation of their own asbestos management program covering asbestos work performed at TVA. In the event Partners hire lower tier subcontractors to perform Class I, II, III asbestos work, the Partner is required to include the lower tier subcontractor in the assessment. TVA Partners will provide a copy of the annual assessment report to the facility APM or designee within 10 business days of assessment completion.

2. Periodic Field Level Assessments (APC Function)

   A minimum of two field assessments of ongoing asbestos work activities will be conducted annually unless no asbestos activities take place during the most recent annual period. Assessments may be made of any class asbestos work. Periodic field assessments will be done using the checklist in Appendix D.

Training

1. Contractor Training Requirements
   TVA Partners will ensure their personnel, or the personnel of any hired subcontractors, are properly and currently trained in accordance with the requirements of 29 CFR 1926.1101(k). The TVA Partners must provide to the TVA APM and/or APC appropriate certification documents and records ensuring compliance. In addition, TVA Partners will ensure their designated Competent Person and/or the Competent Person designated by any hired subcontractors meets the requirements of 29 CFR 1926.1101(b) at all times. Contractors must be briefed on the requirements of this procedure that are applicable to them, such as the methods used by TVA to identify ACM and PACM and treating all unlabeled suspect material as ACM.
   NOTE: See Appendix J for state required training, accreditation, licensure, etc.
   For asbestos activities in TN, individuals, firms and training providers must be accredited in accordance with TN Rule Chapter 1200-01-20, Asbestos Accreditation Requirements.
2. TVA Employee Class III Training Requirements
   TVA personnel performing Class III asbestos work will attend Asbestos Operations and Maintenance, Level III & IV, initial training and maintain requalification as required by TVA.
3. TVA Employee Class IV Training Requirements
   TVA personnel performing class IV asbestos work will attend/complete Asbestos Awareness training.

Asbestos Exposure Control Program

1. Consideration for asbestos must be included in specific work activities and long range planning. Considering asbestos in outage /project planning ensures the materials are properly handled and there are no surprises during the outage. Long range planning ensures that the evaluation of the conditions of the materials, preventative maintenance, and protective actions are included in the appropriate budgets.
2. All facilities should develop site-specific plans to ensure the following:
   1. Activities which will disturb ACM or PACM are identified in the planning process. If the activity cannot be controlled to prevent disturbance of the asbestos, corrective action is taken to remove or contain the ACM.
   2. Employees and contractors report any damaged ACM, suspected ACM, or dust or debris from any suspected ACM.
   3. ACM disturbances and potential fiber release episodes are quickly and effectively evaluated.
   4. Responding personnel are properly trained, and emergency procedures are established.
   5. The appropriate tools and personal protective equipment are available to ensure a timely and effective response.
   6. Contractors notify TVA in writing of any equipment/building materials brought on-site which contain known or suspected ACM.
   7. Eating, drinking and smoking are prohibited in regulated areas.
   8. Engineering controls and alternate work controls for Class I, II, and III work are described in Appendix G.

Identification of Suspected ACM

Asbestos-containing materials at the facility must be identified and their presence communicated either by labeling the asbestos-containing materials as asbestos or by labeling non-asbestos-containing materials accordingly, where feasible. *Materials such as thermal system insulation, surfacing materials, vinyl floor tiles, floor coverings, and ceiling tiles must be presumed to contain asbestos.*

Suspected ACM can be in the following:

1. Pipe/component insulation
2. Decorative ceilings (sprayed)
3. Plaster/stucco
4. Gaskets
5. Valve packing
6. Floor tile, sheet vinyl, baseboards, and associated mastics
7. Ceiling tiles
8. Specialty paints and coatings
9. Roofing shingles, flashings, and built up asphalt roofs
10. Wallboard and Joint compound
11. Cord/rope
12. Felts (roofing)
13. Transite panels
14. Ebony boards
15. Mastics (adhesives)
16. Electrical wire coating/filler material
17. Elevator brake shoes and other friction products

NOTE: If suspected ACM is present at any facilities, do one of the following:

1. **Presume the material contains asbestos and manage as ACM.**
2. **Perform sampling to confirm/refute the presence of ACM.**

When identifying suspected ACM, these steps should be followed:

1. Identify the presence, location and quantity of ACM or PACM at any facility or in any equipment.
2. Document the location of known or suspected ACM. If a material is suspected to contain asbestos, collect and analyze bulk samples before disturbing the suspect material.
3. Ensure that all tests, evaluations, and sample collections are conducted by an accredited and/or licensed inspector.
4. Ensure that one of the following methods accepted by OSHA is used to prove suspected ACM does not contain asbestos: identify the presence, location and quantity of ACM or PACM at any facility or in any equipment.
5. Document the location of known or suspected ACM. If a material is suspected to contain asbestos, collect and analyze bulk samples before disturbing the suspect material.
6. Ensure that all tests, evaluations, and sample collections are conducted by an accredited and/or licensed inspector.
7. Ensure that one of the following methods accepted by OSHA is used to prove suspected ACM does not contain asbestos:
    1. Completed surveys in accordance with EPA Asbestos Hazard Emergency Response Act (AHERA) (40 CFR Part 763, Sub-part E) requirements.
    2. Bulk samples which are collected and analyzed in accordance with OSHA asbestos standards (29 CFR Parts 1910.1001 and 1926.1101).
    3. For new construction, the certification form signed by the architect/engineer stating no ACM was used.
    NOTE: OSHA may not accept the reliability of "building documentation" to prove suspected materials do not contain asbestos.

8. Use drawing which have been generated due to inspector sampling or other equally effective means to clearly identify the location of all existing ACM.

TVA facilities that have removed all asbestos-containing material and claim to be “asbestos-free” must maintain documentation to substantiate the claim.

Records of Bulk Sampling

1. Bulk sampling records must contain the following specific information:
    1. Physical location of facility or plant
    2. System/component
    3. Sample location building elevation quadrant room or column
    4. Sample analysis composition
    5. Laboratory number
    6. Inspection date

Communication of Asbestos Locations

1. **Site Information**
   Employees, contractors and visitors must be informed of the presence and location of ACM and PACM. This communication should include instructions not to disturb the material and whom to contact if material is damaged or disturbed. Notices and warning labels are effective ways to communicate the location of known or suspected ACM.
2. **Project Specific Information**
   Employees/contractors working in or adjacent to regulated areas must be notified of the presence, location, and quantity of known or suspected ACM and measures to be taken to ensure employees are not exposed to asbestos. The notification must also include precautions used to contain asbestos fibers.
3. **Janitorial/Housekeeping Staff**
   Janitorial/housekeeping staff and their management must be notified of the presence and location of ACM or PACM which could be contacted during housekeeping activities. For example, asphalt and vinyl flooring materials installed no later than 1980 must be treated as ACM.

Signs, Labels, and Colored Mastic

1. Signs, labels, and colored mastic will be used to communicate the presence of asbestos to facility occupants. However, the absence of a sign, label, or colored mastic on suspect material should never be interpreted to mean that the material is asbestos-free. The only definitive way to know is to conduct bulk sampling analysis.
   CAUTION: UNLABELED SUSPECT MATERIAL WILL ALWAYS BE TREATED AS ASBESTOS CONTAINING MATERIAL.
2. Signs
   Signs shall be used to identify Regulated Areas where Class I, II or III ACM work is being performed.
    1. **Regulated Areas**
       The regulated area shall be demarcated in a manner that minimizes the number of persons within the area and protects persons outside the area from exposure to airborne asbestos. Where warning signs are used, the signs shall be posted at all approaches to regulated areas so that an employee may read the signs and take necessary protective steps before entering the area. The specific required wording is:

DANGER ASBESTOS **CANCER AND LUNG DISEASE** **HAZARD** **AUTHORIZED PERSONNEL ONLY**

In addition, where the use of respirators is required in the regulated area, the warning sign shall include the words "RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA."

3. Mechanical Rooms/Areas

   1. In addition to labeling, signs must be posted at the entrances to mechanical rooms or other areas which contain ACM or PACM and which employees can be expected to enter.
   2. The signs must be such that any employee who comes into contact with the sign(s) can comprehend them (e.g., foreign languages, pictographs, graphics and awareness training).
   3. The signs must identify the material, its location, and appropriate work practices to prevent disturbance of the known or suspected ACM.

      Placing a sign at the entrance of a plant site facility is acceptable as long as it notes the items above. Labeling (where feasible) is required, even if signs are used.

4. Labels

   Where feasible, installed asbestos products shall contain a visible label.

   The OSHA labeling requirements noted below must be followed for ACM where feasible:

   - Label all asbestos products and containers including waste containers known to contain asbestos.
   - Attach warning labels to the products. Color coded bands are not sufficient.
   - Use the following wording on labels/signs:

DANGER **CONTAINS ASBESTOS FIBERS** **AVOID CREATING DUST** **CANCER AND LUNG DISEASE HAZARD**

   - Ensure that asbestos labels/signs:

   1. Are visible to warn personnel of the potential hazard.
   2. Are color-coded red, black, and white in accordance with OSHA standards.
   3. Are constructed of material appropriate for the specific condition.
   4. Consist of bold letters on a contrasting background.
   5. Are posted so that the signs will be clearly noticed by employees in the area.

   Note: If it is not feasible to attach labels, signs must be placed as close as possible to the material. The sign must contain the same information as the label.

5. Colored Mastic

   Light blue colored mastic will be used on re-insulation of non-asbestos containing thermal system insulation not conducive to the use of signs and labels.

Assessing ACM

1. Factors to Consider

   Factors to consider during the ACM assessment include:

   - Location and quantity
   - Overall condition
   - Type of damage
   - Severity of damage
   - Extent of damage localized or throughout material
   - Friability
   - Accessibility
   - Potential for disturbance
   - Causes of damage

2. Work Prioritization and Implementation of Corrective Actions

The following is a model to be used for prioritizing corrective actions.

ACM Assessment Response Matrix

Accessibility: Area Access	Potential for Disturbance[b]	TYPE OF DAMAGE: MINOR[c]	MODERATE[d]	SIGNIFICANT[e]	Priority[a]
Area Not Controlled	High	3	2	1	
	Low	4	3	2	
Controlled Area[f]	High	5	4	3	
	Low	6	5	4	

a. Priority for actions are ranked from high (1) to low (6)
b. Disturbance is vibration, air movement, physical contact, water, etc.
c. Minor damage is < 1% system-wide.
d. Moderate damage is 1-10% system-wide; < 25% localized.
e. Significant damage is > 10% system-wide; > 25% localized.
f. An area is controlled if entry of unauthorized personnel is prohibited (e.g., use of locks and special permission to enter).

The following is a model to determine the time frame for corrective actions.

Corrective Actions Options & Time Frame Based on Priority

	MINOR DAMAGE OR NO DAMAGE / MODERATE DAMAGE / SIGNIFICANT DAMAGE				
TIME[a]	REMOVE	ENCLOSE	REPAIR	ENCAPSULATE	INSPECT MONITOR
Immediate[b]	1 & 2	1 & 2	2		
Short Term[c]	3 & 4	3 & 4	3 & 4	3 & 4	3 & 4
Long Term[d]			5	5 & 6	5 & 6

a. The time frames assume that steps have been taken to immediately protect exposed personnel. Action priority is ranked from high (1) to low (6)
b. Immediate: Immediate Actions Necessary - The Asbestos Competent Person will direct immediate actions to mitigate potential for personnel exposures and may include isolation, wetting, covering, enclosing or removal.
c. Short Term: Days - Months (depending on conditions)
d. Long Term: Budget Cycle (> 1 year)

Fiber Release Episodes

1. With respect to responding to asbestos spills, or other situations where unplanned, inadvertent, actual or potential fiber release episodes have occurred; the following information is provided as guidance to facility owners and responsible parties; in particular the Asbestos Program Manager, Asbestos Program Coordinator, Asbestos Competent Person, site Safety and the site Responsible Environmental Person.

NOTE: The intent is to initiate immediate actions to quickly isolate, evaluate, the ACM and then take prompt action to mitigate actual or potential fiber release. Short and long term action plans for subsequent repair or abatement can then be established.

2. **Responding to Actual or Potential Asbestos Fiber Release Episodes**

   In the event of an actual or potential fiber release episode that is caused from damaged Asbestos Containing Material (ACM) such as:

   - When there has been an event where an unknown quantity of asbestos/presumed asbestos material has been damaged and there is suspicious debris.
   - When any suspicious friable (readily crumbled) material appears to be damaged and/or there is debris; especially if the work area has incurred any damage involving loose dust and debris of unknown materials, for example thermal system insulation (such as steam piping insulation) or spray applied fireproofing.
   - When any operation(s) or task(s) being performed cause damage to asbestos/presumed asbestos or cause fibers to be released into the air.

3. **The following safety precautions shall be followed:**

   1. Employees or individuals who observe suspicious material (e.g. fallen pipe insulation) should immediately stop work, leave the area, and notify their supervisor of the location(s) and nature of the problem.
   2. Untrained individuals shall never attempt to clean the material or make contact with the material in any way. Evacuate the area and notify Supervision.
   3. If the individual or supervisor is unsure of the asbestos status of any damaged materials, the site Asbestos Program Coordinator, (APC) or Asbestos Competent person, and the site Environmental representative should be contacted immediately. If the APC and Environmental representative cannot be reached, contact the site Environmental Emergency Response unit or point of contact for Oil/Chemical Spills.
   4. The APC or designee shall provide direction for clean-up or direct the call-in of an abatement contractor depending on the severity and quantity of the damaged insulation.
   5. In addition to the previous notifications, contact the Shift Operations Supervisor or Manager/Supervisor in charge.

4. **Supervision - Actions**

   1. Barricade the area with Asbestos Hazard Tape. Keep all personnel out. The supervisor may consult with the Asbestos Program Coordinator and/or Asbestos Competent person verbally for instructions on barricade placement with consideration to plant ventilation/air currents.
   2. Notify the Asbestos Program Coordinator (APC) and/or Asbestos Competent Person as soon as possible.

5. **Asbestos Program Coordinator and Asbestos Competent Person**

   - The APC will initiate actions directly or through their designee and/or the Asbestos Competent Person.
   - The APC or designee will make notifications to the site Environmental representative (REP).
   - The Asbestos Competent Person will evaluate the material for potential for ACM, and determine:

   1. Friability and immediate actions to mitigate potential for fiber release, such as wetting using amended water, covering, and use of encapsulant.
   2. Where to establish barricades for controlling access to the area, considering plant ventilation and air currents and other plant elevations.
   3. What actions will be required for clean-up and the asbestos work classification for clean-up, repair or abatement activities.
   4. Any additional actions that may be required.

   - If there is written verification from the APC that the material involved is not ACM, repair and cleanup may be undertaken without notification to the site Environmental professional. This should be kept with the comprehensive ACM inventory.
   - If the asbestos content of the material(s) are unknown, the material(s) are to be treated as presumed asbestos until testing and analysis is completed.
   - An initial exposure assessment shall be conducted by the APC or Asbestos Competent Person and will include a determination of the required PPE for entry into the barricaded area.

NOTE: OSHA 29 CFR 1926.1101(f)(2)(i) requires a "competent person" to conduct an exposure assessment immediately before or at the initiation of the operation to ascertain expected exposures during that operation or workplace. The assessment must be completed in time to comply with requirements which are triggered by exposure data or the lack of a "negative exposure assessment" and to provide information necessary to assure that all control systems planned are appropriate for that operation and will work properly.

- CAUTION: Entry into conditions where the airborne concentrations of asbestos cannot be determined requires the use of full facepiece, powered air purifying respirators (PAPR's).
- If the material to be cleaned up is of a quantity that can be contained in one 60 inch x 60 inch waste bag, a 16 hour trained Class III asbestos worker may respond to the spill. If the spilled material is greater than what will fit in a 60 inch x 60 inch waste bag, then the response must be conducted by Class I asbestos workers and/or licensed asbestos abatement contractors. The spill may be wetted and covered by Class III workers until Class I workers/Licensed asbestos abatement contractors can be obtained.

6. **APC and/or the Environmental Representative**
   - The APC and/or the Environmental Representative (REP) are responsible for arranging for sampling and analysis. They may also consult with Safety Programs IH section and/or Site Safety Professional for guidance/assistance. The Environmental Representative will work with the Environmental Department to determine if Threshold Quantities have been exceeded and what notifications, if any, must be made.
     NOTE: Air monitoring partners shall report monitoring results to the APC so that the information can be shared with potentially affected employees.
   - The site APC will verify that the Environmental Representative (REP) has the data required to work with the Environmental section in order to determine Notification, Permitting and waste disposal requirements.

Medical Surveillance

1. **General**

   The medical surveillance program is implemented by Occupational Health Services. Employee exposure monitoring and notification of employee exposure levels are the responsibility of the Asbestos Program Coordinator. The APC, with the assistance of Safety Programs, specifically the Industrial Hygiene section and the Site Safety Representative, determines which employees should participate in medical surveillance based on employee exposure results and notifies Occupational Health Services of employees whose asbestos exposures meet the requirements for inclusion into the asbestos medical surveillance program. Occupational Health will provide guidance to the employee and his manager or supervisor on completing form TVA 1444 "Request for Medical Evaluation", scheduling an appointment with a contracted TVA medical vendor, and ensuring all required documentation is provided to the medical vendor.

   All employees who are expected to work more than 30 days (combined total) in Class I, II, and III regulated work areas during the next 12 months or are exposed at or above a permissible exposure limit will be included in a medical surveillance program. ref; 29 CFR 1926.1101(m)

   Any day in which a worker is engaged in Class II or III operations or combination thereof on intact material for one hour or less and, while doing so, fully complies with work practices outlined in this policy, must not be counted. Employees not meeting this criterion are not required to be included in the medical surveillance program.

   NOTE: Contract work force employees (including staff augmented contractors) shall not be placed in the TVA Asbestos Medical Surveillance program; individual contractors are responsible for placing their employees into their company's Asbestos Medical Surveillance program when required.

2. **Medical Examinations**

   Examinations and procedures will be conducted by or under the supervision of a licensed physician and will be provided at no cost to the employee.

1. Frequency of Medical Examinations

   Asbestos medical examinations must be performed based on the following schedule:

   - Prior to assignment to an area where negative pressure respirators are required (Employees must comply with requirements for the medical surveillance for use of respirators. See TSP 312, Respiratory Protection);
   - When the employee is assigned to an area where exposure to asbestos may be at or above the permissible exposure limit for 30 days per year, or engaged in Class I, II, or III work for a combined total of 30 days or more per year, a medical examination must be given within 10 working days following the 30th day of exposure; and
   - At least annually thereafter; and
   - Within 30 calendar days before or after the date of termination of employment.
   - Upon removal from the asbestos medical surveillance program.

2. Medical Examination Components

   Asbestos medical examinations must include the following components:

   - Medical and Work History

   Employees must complete the Occupational Medical History form and either an Initial Asbestos Examination Questionnaire or Annual Asbestos Questionnaire.

   These items are also to be provided to the contracted Medical Vendor performing the exam --

   1. Description of job duties as they relate to the exposure
   2. The employee's exposure level or anticipated exposure level
   3. Description of any personal protective equipment used including the type of respiratory equipment

   - Medical Examination by Physician

   Review of pulmonary function test (PFT); examination of respiratory, cardiovascular, and gastrointestinal systems.

   1. History including Occupational History and Physical
   2. Examination with emphasis on cardiovascular, pulmonary, and gastro-intestinal systems
   3. Pulmonary Function Test
   4. Chest x-ray with B-reader (per schedule)

   - Medical and Work History

   A chest x-ray is required initially and must be offered periodically in accordance with following table.

Frequency of CXRs			
Years since	Age of Employee		
first exposure	15 to 35	35+ to 45	45+
0 to 10	Every 5 years	Every 5 years	Every 5 years
10+	Every 5 years	Every 2 years	Every 1 years

   - Other Examinations or Tests

   Additional testing as deemed medically necessary by the Contracted TVA Physician as it relates to the Asbestos Medical Monitoring examination shall be reviewed for approval by the Occupational Health Services Manager.

Recordkeeping

1. Distribution of Annual and Periodic Field Evaluation Reports
   Reports of annual and periodic field evaluations will be forwarded to the APM and APC for on-site retention within ten (10) working days of completing the evaluation.
2. Permanent Record Retention
   Permanent documentation of the facility asbestos management program will include those items listed below and will be managed in accordance with TVA Document Services Records Management Procedures. The Industrial Hygiene Section of Safety Programs and Occupational Health Services will ensure that the information required in the exposure measurement and medical surveillance records meet the requirements of 29 CFR 1926.1101(n).
   - TVA, its Partners, and its Partners' subcontractors shall keep an accurate record of all measurements taken to monitor employee exposure to asbestos. The record shall be maintained for at least thirty (30) years.
   - TVA, its Partners, and its Partners' subcontractors shall maintain all employee asbestos training records for one (1) year beyond the last date of employment by that employer.
   - Data demonstrating that PACM is not asbestos-containing shall be maintained for the life of the plant.
   - Written records identifying location and quantity of ACM and PACM, shall be maintained by TVA and its contractors for the duration of ownership of the buildings/facilities and shall be transferred to successive owners of such buildings/facilities.
   - TVA, its Partners, and its Partners' subcontractors shall establish and maintain an accurate record for each employee subject to medical surveillance in accordance with 29 CFR 1926.1101(m).The record shall be maintained for the duration of employment plus thirty (30) years.

Work Practices

1. Permit
   The APC or designee shall complete an Asbestos Work Permit (Appendix F) prior to starting work on any ACM or PACM. Appendix F is to be completed prior to work, for projects that are Class I or II asbestos work activities where quantities are greater than 10 square feet or 25 linear feet; whether friable or non-friable and noting any work dealing with ACM quantities that meet NESHAP reporting criteria. EXCEPTION: Emergency response actions to events such as damaged ACM with potential or actual fiber release episodes do not require the use of Appendix F to initiate the response actions. Appendix F is not required for Class III (e.g. SSSD in TN) and Class IV asbestos work activities.
2. Contracted Work
   Subcontractors performing asbestos abatement shall perform and retain copies of self assessments. For Class I or II asbestos containments that remain in place for multiple shifts, the subcontractor must perform a containment walkdown on every shift. Acceptable evidence of containment walk-downs includes the checklist provided as Appendix D.
3. Non-Contracted Work
   During pre-job work planning the potential for direct or indirect disturbance of ACM will be evaluated by the support coordinator / job planner. Examples of articles that may contain ACM are given in Appendix E.
4. During pre-job briefings the potential for direct or indirect disturbance of ACM will be discussed.
5. The procedure for unplanned disturbance of known or suspected ACM will be:
   - Workers stop work and leave the area.
   - Workers contact the Supervisor or Foreman. Barricade the area with 'Danger' tape if required.
   - Supervisor or Foreman contacts the APC or their designee.
   - APC or designee provides direction for clean up or direct the call-in of an abatement contractor depending on severity of the damage.

   NOTE: See section on Responding to Fiber Release Episodes.

6. General Work Practices

1. Regulated Areas

All Class I, II and III asbestos work shall be conducted within regulated areas.

The regulated area shall be demarcated in any manner that minimizes the number of persons within the area and protects persons outside the area from exposure to airborne asbestos. Where critical barriers or negative pressure enclosures are used, they may demarcate the regulated area.

Access to regulated areas shall be limited to authorized persons.

2. General Practices

The following asbestos work activities are prohibited regardless of asbestos exposure level:

- High-speed abrasive disk saws without high-efficiency particulate air (HEPA) filtered exhaust.
- Compressed air to remove asbestos.
- Dry sweeping of ACM.
- Employee rotation to reduce asbestos exposures.

The use of wet methods and high-efficiency particulate air (HEPA) equipment are two of the most important work practices. Regardless of asbestos exposure levels always:

- Use HEPA vacuums to collect dust/debris.
- Use wet methods to control exposures unless the methods create a hazard (i.e., high temperature application, electrical hazard, or, in roofing operations, a slipping hazard.
- Promptly clean up ACM.
- Ensure that collected materials which are inside an enclosure (including materials not known to contain asbestos) are decontaminated or treated as regulated ACM.
- Seal waste in leak-tight containers.

3. Wetting Policy

Asbestos must be thoroughly wet with water or amended (surfactant) water before and during removal. The only times that it is not feasible to wet asbestos are when sensitive equipment may be damaged by the water, electrical hazards or high temperature applications exist, or safety hazards may be created. CAUTION: Special permission must be obtained from regulators to remove asbestos dry.

General requirements are:

1. Wetting methods may be performed using water or amended water according to characteristics of asbestos.
2. Using amended water, dampen the outside of any covering surrounding the asbestos.
3. As one employee removes the insulation covering using proper techniques to minimize dust, another employee wets the exposed asbestos material as it is uncovered.
4. After the covering is removed, wet all insulation surfaces so the material appears to be thoroughly wet, but not necessarily saturated (e.g., block insulation).
5. As block insulation is carefully removed, wet the previously unwetted surfaces as the insulation is being placed into disposal bags.
6. Mist all debris on the floor so it remains wet until bagged. Do not bag dry material.
7. After bagging, add extra water to the insulation to ensure insulation stays damp during storage and transportation.
8. Ensure there is little standing water in the disposal bags. Insulation should be wet, not under water.
9. Use amended (surfactant) water whenever possible.
10. Use garden sprayers or airless sprayer with fog nozzle to mist insulation.
11. Never use high water pressure or directed water stream that causes dust during the wetting.
12. Mist the general work area to keep the insulation on the floor wet. Ensure a designated individual remains in the containment area to frequently mist the insulation on the floor and to minimize any airborne fiber levels

13. Have a licensed supervisor periodically enter the containment area to ensure workers are complying. The inspection frequency depends on the size, type, and length of the abatement project.
14. Ensure the contaminated materials inside an asbestos containment area, including materials not known to contain asbestos, are decontaminated or treated as regulated ACM.

4. Work Requirements based on Asbestos Work Classification See Appendix G for class-specific work requirements.

Inspections

The Asbestos Competent Person and/or qualified third party (e.g. Project Monitor in TN) shall perform and document daily and end-of-job audits for all Class I and II asbestos work activities. End of job audits may use the Final Inspection Checklist found in Appendix E of SPP 5.67). (These audits are to ensure the integrity of the enclosure and/or the effectiveness of the control measures used to prevent asbestos fibers from migrating from a removal site. In addition, audits of Class III and IV work should be conducted and documented as follows:

1. Initially, for a new contractor or when a new asbestos task or activity is performed.
2. Whenever a new employee is involved with the established asbestos task or activity, or
3. As often as necessary to establish compliance with the standard. Inspections should be documented using Appendix D or similar documentation.

Respiratory Protection

1. Respirator Use

   A respiratory protection program must be implemented in accordance with OSHA 1910.134 and TVA policy; TSP 312, Respiratory Protection Program. Respirators must be used during any of the following circumstances which potentially expose employees to asbestos:

   1. All Class I asbestos jobs.
   2. All Class II work where the ACM is not removed in a substantially intact state.
   3. All Class II and Class III jobs where the work is not performed using wet methods.
   4. All Class II and Class III jobs unless a “negative exposure assessment” indicates employee exposures will be below the Permissible Exposure Limit (PEL).
   5. All Class III jobs where TSI or surfacing ACM or PACM is being disturbed.
   6. All Class IV work performed in regulated areas where employees performing other work are required to wear respirators.
   7. All work where employees are exposed above the PEL TWA or excursion limit.
   8. In emergencies.

2. Respirator Selection

   1. Select and provide the appropriate respirator from the following table. Only NIOSH approved respirators may be used.

   CAUTION: The following table applies to situations where an NEA has been performed and the maximum airborne concentration of asbestos will not exceed quantity listed.

Respiratory Protection for Asbestos Fibers	
Airborne concentration of asbestos or conditions of use	**Required Respirator**
Not in excess of 1 f/cc (10 × PEL)	Half-mask air-purifying respirator other than a disposable respirator, equipped with high efficiency filters.
Not in excess of 5 f/cc (50 × PEL)	Full facepiece air-purifying respirator equipped with high efficiency filters.
Not in excess of 10 f/cc (100 × PEL)	Any powered air-purifying respirator equipped with high efficiency filters or any supplied air respirator operated in a continuous flow mode.
Not in excess of 100 f/cc (1,000 × PEL)	Full facepiece supplied air respirator operated in pressure demand mode.
Greater than 100 f/cc (1,000 × PEL) or unknown concentration	Full facepiece supplied air respirator operated in pressure demand mode, equipped with an auxiliary positive pressure self-contained breathing apparatus.
Notes: a) Respirators assigned for high environmental concentrations may be used at lower concentrations, or when required respirator use is independent of concentration. b) A high efficiency filter means a filter that is at least 99.97 percent efficient against mono-dispersed particles of 0.3 micrometers in diameter or larger.	

Protective Clothing

1. TVA or its contractor(s) must provide protective work clothing and equipment in the following situations:
   - For all employees exposed above PEL.
   - If negative exposure assessment was required and not performed.
   - For Class I work on Thermal System Insulation (TSI) or surfacing material > 25 linear ft. or 10 sq. ft.

1. Protective clothing will consist of Tyvek® coveralls or similar whole-body clothing, head coverings, gloves, and foot coverings.
2. All contaminated work clothing must be removed only in change rooms provided for this purpose.
3. No employee shall take contaminated clothing out of the change room unless authorized to do so, for the purpose of laundering, maintenance or disposal.
4. Contaminated clothing must be transported in sealed, labeled containers. If reusable Personal Protective Equipment (PPE) is used, laundering must be conducted such that there is no release of airborne asbestos in excess of the time-weighted average (TWA) or excursion limit.
5. The competent person must inspect protective clothing once per shift. Any rips or tears must be immediately mended or the work clothing replaced. Refer to daily inspection sheet (Appendix D) to document such occurrences.
6. Decontamination procedures for Class I activities are provided in Appendix G under “Hygiene Facilities and Practices”.

Exposure Assessments – Air Monitoring

1. A comprehensive air monitoring strategy ensures the asbestos management program is effective. Air monitoring can be used to:
   - Document employees' exposure.
   - Determine the successful completion of a task.
   - Document source of exposure.
   - Supplement the routine visual observation of the ACM condition.

   NOTE: Air monitoring personnel and abatement partners ensure that “clearance sampling”, if required, meets criteria of < 0.01 f/cc or to background levels.

   NOTE: Air monitoring partners shall report monitoring results to the APC so that the information can be shared with potentially affected employees

   1. Project-Specific Sampling

      The need for air monitoring varies by the type, location, and condition of the asbestos material. Air monitoring

must be performed for Class I, Class II, and Class III abatement activities.

2. Class I and II Abatement Activities
    1. An industrial hygienist (TVA or IH consultant) is required to be consulted when Class I and II asbestos work activities quantities exceed 10 SF or 25 LF in the following activities:
        - Pre-abatement planning.
        - Pre-abatement inspection of the containment.
        - Compliance with specifications during abatement.
        - Final visual examination.
        - Aggressive clearance monitoring.
        - Report preparation
    2. If industrial hygiene consultants are used to evaluate the abatement project, the industrial hygiene consultant must be hired by TVA and contracted separately from the abatement contractor.
3. Routine Sampling Strategies

    Routine asbestos air sampling is not required at all facilities. The need for sampling and complexity of the program varies by the type, location, and condition of the ACM. The Asbestos Competent Person should consult with the industrial hygienist providing coverage of the facility to develop a site-specific air monitoring program.
4. Initial Exposure Assessment

    An initial exposure assessment must be conducted by an Asbestos Competent Person before any Class I, II, or III work is started. The purpose of the assessment is to assure that all asbestos exposure control systems are adequate and working properly. The following should be performed as part of the initial exposure assessment:
    1. Review objective manufacturer's data for the product being contacted to determine whether the product can release airborne fibers. The objective data must demonstrate that the product or material containing asbestos minerals or the activity involving the product or material cannot release airborne fibers greater than the TWA or excursion limit under the most extreme conditions.
    2. Review historical data collected from work operations with workplace conditions that closely resemble the:
        - Materials.
        - Controls.
        - Work practices.
        - Worker training and experience.
        - Work place conditions.

        The historical data that is used can be no more than 12 months old and the conditions of the earlier job(s) cannot be more protective than the current job.
    3. Perform initial air monitoring during the abatement activity if objective data or historical data is not adequate to determine exposure. The sampling must be representative of 8-hour TWA and 30-minute, short-term exposures.
5. Negative Exposure Assessment

    A Negative Exposure Assessment (NEA) is the conclusion by the Asbestos Competent Person indicating that exposures are likely to be consistently below the PEL. This assessment is based on initial project monitoring and the criteria included in the initial exposure assessment. If more flexible control methods and work practices are used after a negative exposure assessment, personal air sampling must be conducted to establish a new NEA. If a negative exposure assessment is not produced, the following steps are required:
    1. Class I
        - If visible emissions and/or the exposure assessment indicates that the airborne asbestos fiber count will be above 1.0 f/cc as an 8 hour time weighted average, then use full-face supplied air respirator operated in the pressure demand mode equipped with an auxiliary self contained breathing apparatus (SCBA).

- If NOT visible emissions and/or the exposure assessment indicates that the airborne asbestos fiber count will be at or below 1.0 f/cc as an 8 hour time weighted average, then use full-face Powered Air Purifying Respirator (PAPR) or Full faced supplied air respirator operated in the pressure demand mode and equipped with HEPA egress cartridges; or may use SCBA.

2. Class I and Class II
   - HEPA filtration or collection device
   - Respirators - see requirements under Class I above.
   - Barriers/isolation systems
   - Protective clothing
   - Periodic monitoring
   - Attached equipment room or drop cloth
3. Class III
   - Periodic monitoring

6. Exposure Monitoring
   1. Class I and II Operations
      - Daily personal monitoring that is representative of the exposure of each employee must be conducted unless there is a negative exposure assessment for the entire operation.
   2. All Other Operations
      - Periodic monitoring must be conducted for all work where exposures are expected to exceed a PEL
      - Intervals must be sufficient to document the validity of the exposure prediction.
   3. Termination of Monitoring
      - Monitoring may be terminated when statistically reliable measurements show that exposures are below the PEL or excursion limit. Contact IH Section of Safety Programs for guidance if required.
   4. Additional Monitoring
      - Exposure monitoring is required whenever there is a change in:

      1. Process
      2. Control equipment
      3. Personnel or work practices

      - Additional monitoring may be required regardless of whether a negative exposure assessment has been conducted. This is determined by the Asbestos Competent Person overseeing the task. Contact IH Section of Safety Programs for guidance if required.
   5. Employee Notification of Monitoring Results
      - Affected employees must be notified as soon as possible following receipt of the monitoring results.
      - Affected employees must be notified in writing either individually or by posting at a central location accessible to all employees.

Permits, Licensing, Notifications and Reports

CAUTION: See Environmental Procedure TVA-SPP-05.67, Asbestos Management for requirements and further instructions pertaining to asbestos permitting, licensing, notifications, waste management, shipping, disposal and reporting.

1. Notification for Individual Renovations and Demolition
    1. Required Inspection
       An inspection must be performed by an accredited inspector before a facility is renovated or demolished. This inspection must determine:
       - Whether asbestos is present.
       - Whether ACM will be disturbed by the activity.
       - Quantity of ACM involved.
    2. Renovation
       Notification must be made to the State agency ten working days (including holidays) before any renovation which will disturb more than the NESHAP threshold quantity of ACM (See Definitions).
       Note: The notification must be postmarked or delivered to the State agency ten working days, including holidays, before the removal project is begun.
    3. Demolition
       Notification must be made to the State agency within ten working days, including holidays, before the demolition even if no asbestos is present. **Note:** The notification must be postmarked or delivered ten working days, including holidays, before the demolition project is begun.
2. Notification for Annual Unscheduled Removals
   If a facility estimates that during the upcoming year the total amount of asbestos removed in unscheduled removals will exceed the NESHAP threshold quantity, the facility must submit a request for an Annual Small Scale, Short Duration Asbestos Permit to the appropriate regulatory agency for facility employees to remove asbestos as well as for each contractor the facility may use during the year for small scale, short duration jobs. The estimate must be based on historical information and excludes renovations/demolition for which individual notifications were made.
   The notification must be made ten working days, including holidays, before the end of the calendar year.
3. Emergency Notification
   The responsible State regulatory agency may waive the ten-working-day notification and allow the abatement to begin immediately in an emergency situation. An emergency notification is intended for sudden and unplanned events which:
   - If not immediately attended, create a safety or public health hazard
   - Are necessary to protect equipment from damage
   - Are necessary to avoid an unreasonable financial burden

   CAUTION: DO NOT USE EMERGENCY NOTIFICATION AS A SUBSTITUTE FOR PLANNING.

Regulatory References

- OSHA - 29 CFR 1926.1101
- OSHA - 29 CFR 1910.1001
- EPA - 40 CFR 763
- EPA - NESHAPS - 40 CFR 61
- EPA 560/5-85-024 and 030A
- State of North Carolina Administrative Code Chapter 10A-41C, Chapter 15A
- Georgia Regulation Chapter 391-3-14
- Georgia Asbestos Safety Act
- Tennessee Asbestos Program Regulations, 1200-01-20

Definitions / Acronyms

1. Definitions

Accessible — Material subject to disturbance by occupants, custodial, or maintenance personnel during their normal duties.

Accredited — (TN only) or 'accreditation' when referring to a person, firm or training provider means that the Commissioner has issued an accreditation certificate pursuant to the TN Rules Chapter 1200-01-20 to that person, firm or training provider. Accreditations under the asbestos program rules for TN held by individuals include, Inspector, Project Designer, Project Monitor, Supervisor and Worker.

Adequately Wet — sufficiently mix or penetrate with liquid to prevent the release of particulates. If visible emissions are observed coming from asbestos-containing material, then that material has not been adequately wetted. However, the absence of visible emissions is not sufficient evidence of being adequately wet.

Aggressive Clearance Sampling — An electric leaf blower used to sweep the enclosure interior surface when the project is completed. Aggressive clearance sampling is only performed after a visual examination.

Amended Water — Water to which surfactant (wetting agent) has been added to increase the ability of the liquid to penetrate asbestos containing material (ACM).

Asbestos — Chrysotile, crocidolite, amosite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that has been chemically treated and/or altered. This also includes PACM, defined below.

Asbestos-Containing Material (ACM) — Material composed of asbestos of any type, alone or mixed with other material, and in any amount greater than 1% by weight.

Asbestos project or asbestos abatement project — means an activity involving job setup for containment, removal, encapsulation, enclosure, encasement, renovation, repair, construction or alteration of asbestos-containing materials. An asbestos project or asbestos abatement project shall not include non friable asbestos-containing roofing, flooring and siding material which when installed, encapsulated or removed does not become friable.

Authorized Person — Any person authorized by the employer and required by work duties to be present in regulated areas.

Category I Non-friable ACM — Asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products, containing more than 1 percent asbestos as determined using the methods specified in 40 CFR Part 763, Subpart E, Appendix A, Polarized Light Microscopy.

Category II Non-friable ACM — Any material, excluding Category I non-friable ACM, containing more than 1 percent asbestos, as determined using the methods specified in 40 CFR Part 763, Subpart E, Appendix A, Polarized Light Microscopy, that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

Class I Asbestos Work — Activities involving the removal of known/presumed thermal system insulation (TSI) and surfacing material.

Class II Asbestos Work — Activities involving the removal of known/presumed ACM, not including TSI or

surfacing material. Includes, but is not limited to, removing asbestos-containing wallboard, floor tile, and sheeting; roofing and siding shingles; and construction mastics.

Class III Asbestos Work — Repair and maintenance operations, where known/presumed ACM including TSI or surfacing material is likely to be disturbed. The quantity of disturbed materials cannot exceed that contained in one (60" X 60") standard glovebag or waste bag. If this quantity is exceeded, the removal is Class I or II.

Class IV Asbestos Work — Maintenance and custodial activities during which employees contact known/presumed ACM. Included is clean-up of waste, dust, and debris resulting from Class I, II, and III activities.

Clean Room — An uncontaminated room having facilities for the storage of employee's street clothing and uncontaminated materials and equipment.

Competent Person — One who is capable of identifying existing asbestos hazards in the workplace, selecting the appropriate control strategy for asbestos exposure, and has the authority to take prompt corrective measures to eliminate them. For Class I and II work, the competent person must be specifically trained in a course which meets the supervisor's training requirements (EPA Model Accreditation Plan, 40CFR 763). For Class III and IV work, the competent person must complete the 16-hour maintenance course.

Competent Person (TVA) means one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, In addition, for Class I and Class II work who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for supervisor, or its equivalent and, for Class III and Class IV work, who is trained in a manner consistent with EPA requirements for training of local education agency maintenance and custodial staff as set forth at 40 CFR 763.92 (a)(2).

Critical Barrier — One or more layers of plastic sealed over all work area openings or any other similarly placed physical barrier that prevents airborne asbestos in a work area from migrating to an adjacent area.

Demolition — Wrecking or taking out of any load supporting structural member of a facility together with any related handling operations (removing, or stripping) or the intentional burning of any facility. The Western North Carolina Regional Air Quality Agency classifies moving a structure off of a solid foundation as a demolition.

Disturbance means activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM and PACM, no greater than the amount which can be contained in one standard sized glove bag or waste bag in order to access a building component. In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or waste bag which shall not exceed 60 inches in length and width.

Emergency renovation — A renovation because of sudden, unexpected events. (see Renovation)

Employee Exposure — Exposure to airborne asbestos that would occur if the employee were not using respiratory protective equipment.

Encapsulation — Treating ACM with a material that surrounds or embeds asbestos fibers in an adhesive matrix to prevent fiber release. The encapsulant may create a membrane over the surface (bridging) or penetrate the material and bind the components together.

Enclosure — An airtight, impermeable, permanent barrier around asbestos-containing building materials to prevent the release of asbestos fibers into the air.

Facility Owner — The legal entity, including a lessee, which exercised control over management and record keeping functions relating to a building and/or facility in which activities covered by OSHA asbestos standards take place.

Friable — Any material that when dry can be broken, crumbled, pulverized, or reduced to powder by hand pressure. Includes previously nonfriable material after it becomes damaged so that when dry, it can be crumbled, pulverized, or reduced to powder by hand pressure.

Glovebag — A not more than 60 x 60 inch impervious plastic bag-like enclosure affixed around as asbestos-containing material, with glove-like appendages through which materials and tools may be handled.

HEPA filter — High Efficiency Particulate Filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.

Homogeneous Area — An area of surfacing material, thermal system insulation, or miscellaneous material that is uniform in color and texture.

Inspection — An activity which determines the location of ACM or assesses the condition of known/suspected asbestos-containing building materials. Activities considered "inspection" include visual examinations, physical examinations, collecting samples, and re-inspection of known or assumed asbestos-containing building materials. (Three exemptions to the definition are periodic surveillance, government compliance inspections, and visual examinations to determine whether a response action was complete.)

Inspector — All persons who inspect for asbestos containing building material in public or commercial buildings. Person must be accredited by 3-day training course which meets the criteria in 40 CFR Part 763 (MAPS).

Intact — ACM that has not crumbled, been pulverized or otherwise deteriorated so that the asbestos is not longer likely to be bound within its matrix.

Owner/Operator (of a demolition or renovation activity) — Any person who owns, leases, operates, controls, or supervises the facility being demolished or renovated or the demolition or renovation operation.

PACM — Presumed Asbestos Containing Material; thermal system insulation and surfacing material found in buildings constructed no later than 1980.

PEL — Permissible Exposure Limit of 0.1 fiber per cubic centimeter of air (f/cc) as an eight-hour time-weighted average or 1.0 f/cc as a 30 minute time-weighted average.

Major Fiber Release Episode — The uncontrolled or unintentional disturbance of > 3 sq. ft. or 3 linear ft. of friable ACM.

Minor Fiber Release Episode — The uncontrolled or unintentional disturbance of < 3 sq. ft. or 3 linear ft. of friable ACM.

Miscellaneous Materials — Materials not classified as surfacing material or thermal system insulation. This category includes floor or ceiling tile, asbestos cement products, valve packing, and gaskets.

Negative (Initial) Exposure Assessment — A demonstration by the employer that employees' asbestos exposure during an operation will be consistently below the PELS. This assessment must comply with the criteria in the OSHA standard 29 CFR 1926.1101.

NESHAPS project — Any demolition or renovation project that results in the disturbance of RACM in amounts greater than or equal to 1) 260 linear feet on pipes; b) 160 square feet on other facility components; or 3) 35 cubic feet off facility components where the length or area could not be measured previously.

Non-friable — Any material that when dry cannot be crumbled, pulverized, or reduced to powder by hand pressure.

Planned renovation — One operation or a number of operations in which the total amount of asbestos material to be removed or stripped in a given period of time can be predicted. Nonscheduled operations are included in the estimate.

TVA - **Regulated Area** means: an area established by the employer to demarcate areas where Class I, II, and III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work accumulate; and a work area within which airborne concentrations of asbestos, exceed or there is a reasonable possibility they may exceed the permissible exposure limit.

Regulated Asbestos Containing Material — (RACM) means (a) friable asbestos material, (b) Category I nonfriable ACM that has become friable, (c) Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading, or (d) Category II nonfriable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations regulated by the NESHAP 40 CFR Part 61.

Removal — All operations where ACM and/or PACM is taken out or stripped from structures or substrates, and

includes demolition operations.

Renovation — The removal or stripping of asbestos materials from any pipe, duct, boiler, tank, reactor, turbine, furnace, or structural member. An activity which alters one or more facility components in anyway, including the stripping or removal of ACM.

Repair — Returning damaged ACM to an undamaged condition or to an intact state so as to prevent fiber release.

TVA - Response Action — (per TN Rule) a method including removal, encapsulation, enclosure, repair and operations and maintenance that protects human health and the environment from friable asbestos containing building material.

Responsible Environmental Person(s) (REP) — The EP&C staff responsible for an operation's site specific environmental compliance (e. g., PA-E, environmental scientist).

SSSD – (TN) Small Scale Short Duration activities – defined in the TN State rule Chapter 1200-01-20 as asbestos activity that include but not limited to: repairs, involving encapsulation, enclosure or removal to small amounts of asbestos containing material only if required in the performance of emergency or routine maintenance activity and not intended solely as asbestos abatement. This can include removal of asbestos insulation on piping, beams, minor repair of TSI, repairs to wallboard, gasket replacement on valves, and removal of a small section of drywall. Such activities may not exceed the amounts greater than those which can be contained in a single pre-fabricated mini-enclosure. "SSSD" means task such as, but not limited to: Removal of asbestos-containing insulation on pipes; Removal of small quantities of asbestos-containing insulation on beams or above ceilings; Replacement of an asbestos-containing gasket on a valve; Installation of electrical conduits through or proximate to asbestos-containing materials; Installation or removal of small section of drywall;

SSSD can be further defined by the following considerations: Removal of small quantities of asbestos-containing material only if required in the performance of another maintenance activity not intended as asbestos abatement; Removal of asbestos-containing thermal system insulation not to exceed amounts greater than those which can be contained in a single glove bag; Repairs to a piece of asbestos-containing wallboard; and Repairs, involving encapsulation, enclosure, or removal, to small amounts of friable asbestos-containing material only if required in the performance of emergency or routine maintenance activity and not intended solely as asbestos abatement. Such work may not exceed the amounts greater than those which can be contained in a single prefabricated mini-enclosure. Such an enclosure shall conform spatially and geometrically to the localized work area, in order to perform its intended containment function.

Supervisor/Competent Person — See Competent Person definition.

Surfacing Materials — Materials sprayed or troweled on, or otherwise applied to surfaces. Examples include decorative plaster, paints, and fireproofing.

System-Wide Damage — The damage distributed over an entire homogeneous area.

Thermal System Insulation (TSI) — Insulation designed to prevent heat loss, heat gain, or condensation. TSI can be applied to pipes, boilers, tanks, ducts, or other structural components.

Thermal System Insulation ACM — Thermal system insulation (TSI) which contains more than 1% asbestos.

Waste Generator — Any owner or operator of a source covered by 40 CFR Part 61 (NESHAP) who produces asbestos-containing waste material.

2. Acronyms

ACBM — Asbestos Containing Building Material

ACM — Asbestos Containing Material

AHERA — Asbestos Hazard and Emergency Response Act

APC — Asbestos Program Coordinator

APM Asbestos Program Manager

ACM Asbestos Containing Material

ASHARA — Asbestos School Hazard Abatement Re-Authorization Act

CIH — Certified Industrial Hygienist

DOT — Department of Transportation
EPA — Environmental Protection Agency
ESS — Environmental Services Section
HEPA — High Efficiency Particulate Air
HHCU — Health Hazards Control Unit
MAP — Model Accreditation Plan
MSDS — Material Safety Data Sheet
NESHAP — National Emissions Standards for Hazardous Air Pollutants
OSHA — Occupational Safety and Health Administration
PACM — Presumed Asbestos Containing Material
PAPR — Powered Air Purifying Respirator
PE — Registered Professional Engineer
PEL — Permissible Exposure Limit
PFT — Pulmonary Function Test
RACM — Regulated Asbestos Containing Material
SCBA — Self Contained Breathing Apparatus
SSSD — (TN) Small Scale Short Duration activities
TSI — Thermal System Insulation
WSR — Waste Shipment Records

Appendix A - Classes of Asbestos Work

CLASSES OF ASBESTOS WORK

Class I asbestos work means activities involving the removal of thermal system insulation (TSI) and surfacing asbestos containing material (ACM) and presumed ACM (PACM).

Class II asbestos work means activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastics.

Class III asbestos work means repair and maintenance operations where “ACM”, including, TSI surfacing and miscellaneous ACM and PACM, is likely to be disturbed. The quantity of disturbed materials cannot exceed that contained in one (60” X 60”) standard glovebag or waste bag. If this quantity is exceeded, the removal is Class I or II.

Class IV asbestos work means maintenance and custodial activities during which employees contact but do not disturb ACM or PACM and activities to clean up dust, waste and debris resulting from Class I, II, and III activities.

Appendix B - Applicable Standards and Guidance

Appendix B

APPLICABLE STANDARDS AND GUIDANCE

REGULATION/GUIDANCE	TYPE	STANDARD	REMARKS
NESHAP1, Subpart M	Federal Regulation	CFR 61	Regulates asbestos demolition, construction, and removal activities. Defines friable and non-friable asbestos at 1% by area.
Hazardous Air Contaminants, Asbestos, Asbestos Accreditation Requirements of Persons and Firms Engaged in Asbestos Activities	State/Local Regulation State – TN	TN Annotated Code .02 TN 1200-01-02	Enforces NESHAP requirements. Requires all 'individuals', firms and training providers to be accredited under the TN rule prior to performing asbestos activities including inspections, collecting air samples and conducting response actions (for other than SSSD* asbestos activities). Individual asbestos professionals are: Supervisors, Workers, Project Designers, Inspectors, Management Planners and Project Monitors.
AHERA	Federal Regulation	CFR 763	Sets forth training requirements of asbestos workers under the Model Accreditation Plan.
OSHA	Federal Regulation	CFR 1926.1101 CFR 1910.1001	Defines exposure and excursion limits, general health and safety.
EPA Purple Book	Federal Guidance	EPA 560/5-85-024	Guidance on identification of management planning of in-place asbestos.
OSHA Respiratory Protection	Federal Regulation	CFR 1910.134 CFR 1926.1101	Regulations for respirator use, fit test, training.
EPA Sampling	Federal Guidance	EPA 560/5-85-030A	Definition of homogeneous area.

* SSSD - TN Small-scale, short-duration removal of small quantities of ACM only if the activity is not intended for abatement purposes only. See definition.

Appendix C - Checklist For Annual Programmatic Evaluations and Partner Audit

TVA Form 20621 - Checklist For Annual Programmatic Evaluations and Partner Audit [1]

Appendix D - Checklist For Field Surveillance and Enclosure Walkdown

TVA Form 20613 - Checklist For Field Surveillance and Exclosure Walkdown [2]

Appendix E - Examples of Products That May Contain Asbestos

SUBDIVISION	GENERIC NAME	ASBESTOS (%)	DATES OF USE	BINDER/SIZING
Friable insulation material	Spray-applied insulating			Sodium silicate, portland cement, organic binders
Preformed thermal insulating products	Batts, blocks, and pipe covering magnesia calcium silicate			Magnesium carbonate Calcium silicate
Textiles	Cloth, fire blankets			None
	Felts: Blue stripe Red stripe Green stripe			Cotton/wool
	Sheets			Cotton/wool

	Cord, rope, yarn			Cotton/wool
	Tubing			Cotton/wool
	Tape/strip			Cotton/wool
	Curtains (theatre,welding)			Cotton
Cementitious concrete-like products	Extrusion panels: Corrugated Flat Flexible Flexible perforated Laminated Roof tiles			Portland cement
	Clapboard and shingles Clapboard Siding shingles Roofing shingles		unknown-1980 unknown-1980	Portland cement
	Pipe			Portland cement
Paper products	Corrugated: High temperature Moderate temperature			Sodium silicate Starch
	Indented			Cotton and organic
	Millboard			Starch, lime, clay
Roofing felts	Smooth surface			Asphalt
	Mineral surface			Asphalt
	Shingles			Asphalt
	Pipeline			Asphalt
Compounds	Caulking putties			Linseed oil
	Adhesive (cold applied)			Asphalt
	Joint compound			Asphalt
	Roofing asphalt		Unknown-1980	Asphalt
	Mastics			Asphalt
	Asphalt tile cement			Asphalt
	Roof putty		Unknown-1980	Asphalt
	Plaster/stucco		Unknown-1980	Portland cement
	Spackles			Starch, casein
	Sealants (fire/water)			Castor oil or Polyisobutylene
	Cement, insulation			Clay
	Cement, finishing			Clay
	Cement, magnesia			Magnesium carbonate
Asbestos ebony products				Portland cement
Floor tile and sheet goods	Vinyl/asbestos floor tile Asphalt/asbestos			Polyvinyl chloride Asphalt
	Sheet goods, resilient			Dry oils
Wallcovering	Vinyl wallpaper		Unknown-1980	---

Paints and coatings	Roof coating			Asphalt
	Air tight			Asphalt

Appendix F - Asbestos Removal & Renovation (Class I & II) and Demolition - Tasks / Projects

TVA Form 20614 - Asbestos Removal & Renovation (Class I & II) and Demolition - Tasks / Projects [3]

Appendix G - Specific Steps for Planned Demolition, Alteration and Renovation and Class I, II, III, and IV Activities

The Asbestos Competent Person shall determine the asbestos work classification.

1. **Planned Demolition, Alteration and Renovation**

   Prior to any demolition, alteration or renovation of facilities/buildings regardless of construction date the following must be conducted.

   - Survey the affected area for suspect asbestos containing materials following AHERA inspection guidelines. This can be done by either a TVA or third party contractor who is accredited as an inspector.
   - Notify the facility coordinator or facility manager of intended asbestos removal impact.
   - The asbestos survey results will reported to/reside with the Asbestos Program Coordinator (APC).
   - Initiate Appendix F (if applicable) to document the asbestos removal scope of work, approvals and contractor selection.

2. **Class I, II, III, and IV Required Activities**

Activity	Class IV	Class III	Class II	Class I
Project notification	No	No - covered under Annual Notification	Yes	Yes
Pre-Work Approval - use Appendix F**	No	No	Yes**	Yes**
Post licensure/permit	No	No	Yes	Yes
Worker training	2 hrs	16 hrs	8 hr, 32 hrs	32 hrs
Competent Person Training	16 hrs	16 hrs	40 hrs	40 hrs
Medical evaluation	No	Yes	Yes	Yes
Warning signs	No	Yes	Yes	Yes
Isolated systems HVAC, electrical, other	No	Yes	Yes	Yes
Regulated area	No	Yes	Yes	Yes
Respirators	Yes if required by other work in area	Unless negative exposure assessment	Unless negative exposure assessment	Yes
Protective clothing	Yes if required by other work in area	For TSI	Yes	Yes
Pre-clean area ACM dust/debris	No	As needed	As needed	As needed
Work practices - Increased surveillance using App. G				
Critical barrier	No	For TSI	Yes	Yes
Drop cloths	No	Yes	Yes	Yes
Neg. pressure enclosure or glovebag	No	For TSI	Yes	Yes
HEPA vacuums	As needed	Yes	Yes	Yes
Wet Methods	Yes	Yes	Yes	Yes
Job inspections by Competent Person	Conduct at intervals sufficient to assess whether conditions have changed, and at any reasonable times at employee request			Conduct at least once per work shift and at employee's request
Personal samples:				
Initial assessment	Yes	Yes	Yes	Yes
Periodic monitoring	As needed	Yes	Daily**	Daily**
Seal the Substrate (lock down)	No	As needed	As needed	Yes
Area Decontamination	No	Yes	Yes	Yes
Bagged/labeled waste	As needed	Yes	Yes	Yes
Attached Shower	No	No	No	Yes
HEPA vacuum decontamination	Yes	Yes	Yes	Yes
Visual clearance	No	Yes	Yes	Yes
Air sampling clearance	No	As needed	Yes	Yes
Waste disposal	As needed	Yes	Yes	Yes

** If work involves quantities greater than 10 SF or 25 LF, or unless in supplied air respirator worn

3. **Class I Specific Control Methods**

   1. Ensure all work is supervised by a competent person and performed by licensed Class I workers.
   2. Establish a regulated area.
   3. Isolate HVAC systems by scaling with a double layer of 6 mil plastic or equivalent.
   4. Use impermeable drop cloths beneath all removal activity.
   5. Cover all non-movable objects with impermeable drop cloths or plastic sheeting secured by duct tape or equivalent.
   6. Use HEPA filtration systems in regulated areas to move dust away from employees.
   7. Establish critical barriers or other barrier/isolation systems in combination with perimeter air monitoring if the job involves the following:

- More than 25 linear ft. or 10 sq. ft. surfacing/thermal system insulation (TSI).
- Other Class I work without negative exposure determination.
- Employees are working next to Class I activities.

8. Alternative control methods must be evaluated and certified by an industrial hygienist (IH) or licensed engineer who is qualified as a project designer.
9. One or more of the following specific control methods for Class I must be used:

1. **Negative Pressure Enclosures**

   Specifications

   - Maintain minimum of four air changes/hour.
   - Maintain at least 0.02" water pressure differential relative to outside pressure.
   - Maintain negative pressure throughout the period of its use.
   - Pull dust away from employee breathing zone.

   Work practices

   - Before starting work, inspect enclosure for breaches and smoke test for leaks.
   - Deactivate electrical circuits unless ground fault interrupters (GFI) are present.
   - Use wet methods during removal.
   - Keep work area clean and promptly bag all materials.

2. **Glovebags**

   Specifications

   - Constructed of 6 mil plastic with no seam at bottom.
   - Designed for purpose being used and used without modifications.

   Work practices

   - Install so it completely covers pipe or other structure.
   - Smoke test for leaks before using and seal leaks prior to use.
   - Use only once and do not move it to another section of pipe.
   - Do not use on surfaces > 150□F.
   - Collapse before disposal by removing air with a HEPA vacuum.
   - Before beginning work, wrap and seal loose/friable adjacent material with two layers of 6 mil plastic.
   - Use two people to perform work.
   - Use a valve for hose disconnect between attached waste bag and collection bag. The connecting device must be adequate to withstand the pressure of the ACM

3. **Negative Pressure Glovebag**

   Specifications

   - Constructed of 6 mil plastic with no seam at bottom.
   - Designed for purpose being used and used without modifications.
   - Attach HEPA vacuum system or other device to bag to prevent collapse during removal.

   Work practices

   - Use to remove insulation from pipes.
   - Ensure negative air source does not collapse bag during use.
   - Ensure negative air source runs continuously.

4. **Negative Pressure Glove Box**

   Specifications

   - Constructed with rigid sides.
   - Made from metal or other material to withstand the weight of the AC and PACM and water.
   - Maintain negative pressure.

- Attach air filtration unit to the box.
- Fitted with gloved apertures.
- Use aperture at base of box as water outlet.
- Have a back-up generator on site.
- Use waste bags that consist of 6 mil thick plastic double-bagged, or plastic > 6 mil.

Work practices

- Smoke test for leaks before use and seal leaks prior to use.
- Use two people to perform work.
- Wrap and seal loose or damaged ACM adjacent to the box in two layers of 6 mil plastic prior to beginning job.

5. **Water Spray Process**

Specifications

- Surround piping on three sides with rigid framing.
- Have 360 degree water spray.
- Produce an aerosol barrier between workers and the ACM and PACM.

Work practices

- Run system 10 minutes before removal begins.
- Conduct all removal within water barrier.
- Use a minimum of 3 people to perform work.
- Bag ACM inside the water enclosure.

6. **Small Walk-in (Mini) Enclosure**

Specifications

- 6 mil plastic or equivalent.
- Accommodate no more than 2 people.
- Maintain under negative pressure.

Work practices

- Inspect for leaks and smoke test to detect breaches before use; seal breaches.
- Completely wash interior with amended water and HEPA vacuum before reuse.
- Direct air movement away from employee breathing zone.

7. **Alternate Control Methods**

- Alternate control methods must enclose, contain or isolate the process or source of airborne asbestos dust or otherwise capture or redirect the dust before it enters breathing zone.
- CIH or registered PE who is qualified as a project designer must certify in writing the control method as adequate.
- Clearance sampling must be performed according to AHERA or perimeter sampling conducted in accordance with Subpart E of 40 CFR 763.
- Alternate Control Methods may be evaluated by a competent person for quantities 25 linear or 10 square feet.
- A copy of the evaluation must be approved by competent person and a Certified Industrial Hygienist (CIH) before using alternate controls for any project that affects more than 25 linear feet or 10 square feet of asbestos.

For Class I

- A certified industrial hygienist or licensed professional engineer who is also qualified as a project designer as defined in paragraph (b) of this section, shall evaluate the work area, the projected work practices and the engineering controls and shall certify in writing that the planned control method is adequate to reduce direct and indirect employee exposure to below the PELs under worst-case conditions of use, and that the planned

control method will prevent asbestos contamination outside the regulated area, as measured by clearance sampling which meets the requirements of EPA's Asbestos in Schools rule issued under AHERA, or perimeter monitoring which meets the criteria in paragraph (g)(4)(ii)(B) of this section

- For Class I - The employer shall use another barrier or isolation method which prevents the migration of airborne asbestos from the regulated area, as verified by perimeter area surveillance during each work shift at each boundary of the regulated area, showing no visible asbestos dust; and perimeter area monitoring showing that clearance levels contained in 40 CFR Part 763, Subpart E, of the EPA Asbestos in Schools Rule are met, or that perimeter area levels, measured by Phase Contrast Microscopy (PCM) are no more than background levels representing the same area before the asbestos work began. The results of such monitoring shall be made known to the employer no later than 24 hours from the end of the work shift represented by such monitoring.
- Where the TSI or surfacing material to be removed is 25 linear or 10 square feet or less , the evaluation required in paragraph (g)(6) of this section may be performed by a "competent person", and may omit consideration of perimeter or clearance monitoring otherwise required.

For Class II

- The Asbestos Contractor performing the work shall demonstrate by data representing employee exposure during the use of such method under conditions which closely resemble the conditions under which the method is to be used, that employee exposure will not exceed the PELs under any anticipated circumstances.
- A competent person shall evaluate the work area, the projected work practices and the engineering controls, and shall certify in writing, that the different or modified controls are adequate to reduce direct and indirect employee exposure to below the PELs under all expected conditions of use and that the method meets the requirements of this standard. The evaluation shall include and be based on data representing employee exposure during the use of such method under conditions which closely resemble the conditions under which the method is to be used for the current job, and by employees whose training and experience are equivalent to employees who are to perform the current job

8. **Hygiene Facilities and Practices**

This requirement applies to employees performing Class I asbestos jobs involving >25 linear or 10 square feet of TSI or surfacing ACM and PACM.

Decontamination area:

- Must be adjacent and connected to the regulated area.
- Must consist of an equipment room, shower area, and clean room in series.
- Employees must enter and exit the regulated area through the decontamination area.

All hygiene facilities associates with Class I asbestos work must be performed in accordance with 29 CFR 1926.1101(j), and must be performed under the guidance of a Class I trained asbestos worker/supervisor.

Contaminated clothing must be transported in sealed impermeable bags or containers and be labeled as containing asbestos.

Laundering of contaminated clothing must be done so as to prevent the release of airborne asbestos fibers. Persons receiving the clothing for laundering shall be informed of this requirement.

9. **Decontaminating Asbestos Equipment**

When working in asbestos contaminated areas, the following steps shall be taken to decontaminate the vacuum cleaner and all accessories used.

The recovery tank of the vacuum shall be lined with a removable conductive plastic bag liner.

The recovery tank removable conductive plastic bag liner shall be carefully removed from the recovery tank and handled as asbestos containing material. Said material shall be disposed of in an approved manner.

The recovery tank and the immediate adjacent areas of the vacuum shall be wiped down to remove contamination.

If the vacuum was not in the immediate area of the work being performed in a contamination zone, then it is unnecessary to wipe the entire machine down. If the vacuum was in the immediate area of the work being performed in a contamination zone, then the exterior of the vacuum shall be wiped down to remove contamination.

Wipe down the exterior of the suction hose used in cleaning the contaminated area. If necessary, wipe down or flush the interior of the hose as well.

Wipe down the exterior of all other accessories used in cleaning the contaminated area.

NOTE: It is not necessary to clean the primary filters and the HEPA Filters and their adjacent housings in the vacuum during normal work in the power plant. However, when the primary and/or HEPA Filters are to be replaced, the old filter shall be considered contaminated and decontamination of the filter housing and adjacent areas shall be required.

4. **Minimum Work Practices/Controls for Class II Materials**

1. Ensure work is supervised by a competent person.
2. Ensure indoor removals without a negative exposure assessment use:
   - Critical barriers
   - Other feasible barrier/isolation methods which prohibits migration of airborne asbestos from the regulated area
   - Work practices for specific materials listed in Minimum Work Practices/Controls for Class II Materials
3. Requirements for specific tasks are as follows:
   - **Vinyl and Asbestos Flooring**

1. Do not sand flooring or backing.
2. Use vacuums equipped with HEPA filter, disposable dust bag, and metal floor tool (no brush).
3. Remove resilient sheeting by cutting at snip point while cuffing and wetting during delamination. Rip up of resilient sheet floor material is prohibited.
4. Scrape residual adhesive and/or backing using wet methods only.
5. Do not dry sweep.
6. Do not perform mechanical chipping unless in a negative pressure enclosure.
7. Remove floor tiles intact.
8. If tiles are removed by heating and are intact, wetting may be omitted.
9. Assume resilient flooring material including mastic and backing contain asbestos unless an industrial hygienist determines it is asbestos-free using recognized analytical techniques.

   - **Roofing**

1. Remove ACM intact to the extent feasible.
2. Use wet methods when materials cannot be removed intact unless wetting is not feasible or will create safety hazards.
3. Mist cutting machines continually during use.
4. Vacuum all loose dust created by cutting operations.
5. When unwrapped material is lowered to the ground, it must be transferred to sealed receptacle to prevent dispersion of dust.
6. Isolate roof HVAC intakes or shut off the HVAC system.
7. Do not drop or throw ACM to the ground.
8. Unless the material is carried or passed to the ground by hand, lower to the ground in a covered, dust-tight chute crane or hoist.
9. Lower waste to the ground as soon as practical but, in any event, by the end of the shift.
10. Waste materials remaining on the roof must be kept wet, placed in an impermeable waste bag, or wrapped in plastic sheeting.

- **Asbestos Siding, Shingles, or Transite**

1. Do not abrade or break unless no other options are feasible.
2. Spray each panel before removal.
3. Immediately lower unwrapped materials to ground via dust-type chute and seal, OR place in an impermeable waste bag or wrap in plastic sheeting, and lower it to the ground by the end of the day.
4. Cut nails with flat, sharp instruments.

- **Large Gaskets**

1. Use glove bag if the gasket is visibly deteriorated and unlikely to be removed intact.
2. Before removal, thoroughly wet with amended water.
3. Immediately place gasket in a disposal bag.
4. Perform any scraping wet.

- **Other Class II Removals**

1. Thoroughly wet ACM with amended water prior to and during use.
2. Remove ACM intact unless not feasible.
3. Do not cut, abrade, or break unless other alternatives are not feasible.
4. Immediately bag ACM or keep it wet until transferred to a closed receptacle. ACM must be transferred to a closed receptacle no later than the end of the shift.

- **Alternative Work Controls**

1. Data representing employee exposure must demonstrate that exposures do not exceed the PEL.
2. The alternative practice must be evaluated and certified by a competent person.

5. **Minimum Work Practices/Controls for Class III Materials**

1. Minimize exposure to individual performing work and bystanders.
2. Use wet methods.
3. Use local exhaust to the extent feasible.
4. Use impermeable drop cloths, mini-enclosures or glovebag systems when doing one of the following on thermal insulation and/or surfacing materials:
   - Cutting
   - Drilling
   - Abrading
   - Sanding
   - Chipping
   - Breaking
   - Sawing

   Note: Glove bags must be used for individual job locations and not to be relocated once set up in original position. It is not acceptable to "slide" the glove bag into another location.
5. If exposures are above PEL or a negative exposure evaluation was not performed, do one of the following:
   - Contain area using drop cloths and plastic barriers.
   - Isolate the operation using negative pressure enclosure, glovebag, etc.
   - Use respirators and protective clothing.

   Note: Respirators must always be used if TSI or surfacing material is disturbed.
6. Requirements for specific tasks are as follows:

Glovebags

Specifications

- Constructed of 6 mil plastic with no seam at bottom.
- Designed for purpose being used and used without modifications.

Work practices

- Install so it completely covers pipe or other structure.
- Smoke test for leaks before using and seal leaks prior to use.
- Use only once and do not move it to another section of pipe.
- Do not use on surfaces > 150□F.
- Collapse before disposal by removing air with a HEPA vacuum.
- Before beginning work, wrap and seal loose/friable adjacent material with two layers of 6 mil plastic.
- Use two people to perform work.
- Use a valve for hose disconnect between attached waste bag and collection bag. The connecting device must be adequate to withstand the pressure of the ACM

Negative Pressure Glovebag

Specifications

- Constructed of 6 mil plastic with no seam at bottom.
- Designed for purpose being used and used without modifications.
- Attach HEPA vacuum system or other device to bag to prevent collapse during removal.

Work practices

- Use negative pressure glovebag to remove insulation from pipes.
- Ensure negative air source does not collapse bag during use.
- Ensure negative air source runs continuously.

Negative Pressure Glove Box

Specifications

- Constructed with rigid sides.
- Made from metal or other material to withstand the weight of the ACM and PACM and water.
- Maintain negative pressure.
- Attach air filtration unit to the box.
- Fitted with gloved apertures.
- Use aperture at base of box as water outlet.
- Have a back-up generator on site.
- Use waste bags that consist of 6 mil thick plastic double-bagged or plastic > 6 mil.

Work practices

- Smoke test for leaks before use and seal leaks prior to use.
- Use two people to perform work.
- Wrap and seal loose or damaged ACM adjacent to the box in two layers of 6 mil plastic prior to beginning job.

Small Gaskets

- If deteriorated and unable to be removed intact, use glovebag.
- Before removal, thoroughly wet with amended water.
- Immediately place gasket in a disposal bag.
- Perform any scraping wet.

6. **Minimum Work Practices/Controls for Class IV Materials**
    1. See Work Practices.
    2. Wear a respirator in those areas where respirators are required for workers.
    3. Assume that all waste is ACM in areas where friable TSI and surfacing material is accessible.

Appendix H - Regulatory Responsibilities

Applicability

These guidelines apply to any TVA personnel who plan to demolish or renovate any building that contains any pipe, duct, boiler, reactor, turbine, furnace, flooring, wall covering, ceiling tile, fire retardant, or any other surface covered or potentially covered with asbestos material. Some examples are:

- Planning or inspecting a potential renovation or demolition project.
- Removing pipe, boiler, or duct work insulation.
- Actually renovating or demolishing a building.
- Transporting ACM to a designated landfill.
- Land-filling asbestos or closing a landfill containing asbestos.

Asbestos Regulatory Agencies

This program incorporates OSHA, EPA, DOT and state regulations. If detailed regulatory questions occur, consult the appropriate Safety Programs or Environmental section representatives.

Regulatory Agency Objectives

Agency	Objective
OSHA - Occupational Safety and Health Administration	Protect workers' safety and health. Develop regulations and conduct workplace inspections.
EPA - Environmental Protection Agency	Prevent emissions outside the contained area. Control waste disposal. Develop regulations and conduct inspections.
State Agencies	Establish requirements for abatement projects. License personnel and businesses involved with asbestos training, consulting and abatement. Require removal permits and fees.

EPA: National Emission Standards for Hazardous Air Pollutants: Asbestos Standard

The NESHAP regulation is designed to protect the environment and public from non-occupational exposure to asbestos [40 CFR 61, Asbestos National Emission Standards for Hazardous Air Pollutants (NESHAP) and 40 CFR 763, Asbestos Model Accreditation Plan]. Although the intent is different from OSHA, the methods (work practices and training) to accomplish the goal are similar. The regulation focuses on:

- Identifying asbestos materials before renovations or demolitions.
- Notifying EPA or the delegated state agency before removal.
- Providing disposal procedures for asbestos-containing materials.
- Using the asbestos content of ACM asbestos as a trigger.
- Requiring owner/operator to make the following notifications.

Appendix I - TVA Asbestos Renovation Final Inspection Checklist

TVA Form 20615 - TVA Asbestos Renovation Final Inspection Checklist [4]

Appendix J - Asbestos Training Requirements by State

State	Required Individual Certifications	Required Contractor Licenses	TVA APC Required Training
Alabama	Asbestos Worker Asbestos Supervisor Asbestos Management Planner Asbestos Inspector Asbestos Project Designer	Asbestos Contractor (firms and individuals)	Asbestos Supervisor/Inspector
Georgia	Asbestos Worker Asbestos Supervisor	Asbestos Contractor (firms and individuals)	Asbestos Supervisor/Inspector
Mississippi	Asbestos Contractor (individuals) Asbestos Worker Asbestos Supervisor Asbestos Air Monitor Asbestos Management Planner Asbestos Inspector Asbestos Project Designer	Asbestos Contractor (firms and individuals)	Asbestos Supervisor/Inspector
North Carolina*	Asbestos Worker Asbestos Supervisor Asbestos Supervising Air Monitor Asbestos Air Monitor Asbestos Management Planner Asbestos Inspector Asbestos Project Designer Asbestos Roofing Supervisor Asbestos Roofing Worker	Asbestos Contractor (firms and individuals)	Asbestos Supervisor/Inspector or, Asbestos Air Monitor (or Supervising Air Monitor, and NC licensed)

Kentucky	Asbestos Worker Asbestos Supervisor Asbestos Management Planner Asbestos Inspector Asbestos Project Designer	Asbestos Contractor (firms and individuals)	Asbestos Supervisor/Inspector
Virginia*	Asbestos Worker Asbestos Supervisor Asbestos Project Monitor Asbestos Management Planner Asbestos Inspector Asbestos Project Designer	Asbestos Contractor (firms and individuals)	Asbestos Supervisor/Inspector or, Asbestos Project Monitor (and VA licensed)
Tennessee*	Asbestos Worker Asbestos Supervisor Asbestos Project Monitor Asbestos Management Planner Asbestos Inspector Asbestos Project Designer	Asbestos Contractor (firms and individuals)	Asbestos Supervisor/Inspector or, Asbestos Project Monitor (and TN licensed)

*** CAUTION: NC, TN, and VA require State licensing to inspect contractor work. Other states do not.**

References

[1] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=112372581
[2] http://chachaedmw1.cha.tva.gov/idmws/doccontent.asp?library=chaedmp^chachaedmp1&id=112271466
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Procedure 904 Cadmium

TVA Safety Manual

904 Cadmium

Procedure Number 904

TVA Safety Procedure

Cadmium

Revision 0

January 6, 2003

Purpose

1. To establish requirements for reducing employee exposure to cadmium.
2. Plant / facility managers shall implement this procedure when any of the following work assignments exist:
   - Wrecking, demolition or salvage structures containing cadmium
   - Cutting, welding, burning, brazing, or grinding on painted surfaces containing cadmium
   - Cadmium welding, and brazing or welding with cadmium alloys
   - Installation of products containing or coated with cadmium
   - Transportation of materials containing cadmium
   - Cadmium contamination/emergency cleanup

Health Hazards

1. Cadmium is a highly toxic substance that is absorbed into the body by inhalation and ingestion.
2. Exposure to cadmium may result in lung and kidney damage.
3. Chronic exposure to cadmium can cause cancer and a large dose could cause death.

Procedure

1. If potential exposure to cadmium exists based on the scope of work and / or a review of material safety data sheets, historic plant records, or sampling, this procedure shall be followed.
2. When objective data exists to demonstrate employee exposure to be below 2.5 μg/m3, employee exposure monitoring is not required.
3. The plant / facility manager along with the safety consultant shall make a written record stating how the exposure determination was made, the date the exposure determination was made, and the name and social security number of each exposed employee.
4. If objective data is not available, two separate employee exposure monitoring samples will be performed to determine if exposure levels exceed 2.5 μg/m3 of an 8-hour TWA. These exposure samples must be 7 days apart. Exposure monitoring will be performed on a representative sample of each work crew for an 8-hour period by an industrial hygienist. If both personal sample tests are below 2.5 μg/m3 cadmium, no further tests are required and this procedure does not apply.
5. During initial exposure monitoring all employees will wear protective clothing and HEPA filtered respirators.
6. Within 5 working days after receipt of personal sampling results, employees shall be notified in writing of their monitoring results.

7. Work areas where exposure to cadmium is possible shall be barricaded and warning signs posted to warn other employees. The work area shall have controlled points of access.
8. Controls will be taken to prevent cadmium contaminated dusts and fumes from escaping the work area and exposing other employees. Area exposure monitoring will be required to verify controls are adequate.
9. Danger signs shall be in accordance with OSHA 29 CFR 1926.200 and will say: “Danger”, “Cadmium”, “Cancer Hazard”, “Can Cause Lung and Kidney Disease”, “Authorized Personnel Only”, “Respirators Required in This Area”.
10. When exposure levels exceed 5 μg/m3 , engineering and work practice controls are required if employee exposure is for more than 30 days a year.
11. A written compliance plan is required for all work that exposure levels exceed 5 μg/m3. The written compliance plan shall contain the following:
    - Description of each activity which produces cadmium exposure. This shall include crew size, equipment used, and material involved.
    - Description of engineering or administrative controls
    - Air monitoring data
12. Respirators shall be required:
    - When installing or implementing engineering controls
    - When engineering controls cannot reduce cadmium exposure to below 5 μg/m3
    - When an employee is exposed to levels at or above 5 μg/m3
13. Respirators will be selected from appendix A, determined by exposure sample level. All negative pressure respirators shall use HEPA filters.
14. Employees exposed to cadmium 5 μg/m3 or greater will wear protective clothing to include disposal coveralls, head covers, shoe coverlets, and goggles.
15. Employees will not wear any clothing exposed to cadmium at or above 5 μg/m3 home at the end of each shift. Clean change areas will be provided adjacent to the work area. Clean protective clothing will be provided daily to each employee.
16. All employees exposed to cadmium levels at or above 5 μg/m3 shall shower at end of each shift. Employees shall wash their hands and face before eating, smoking, chewing tobacco, or chewing gum.
17. An eating area with soap and water available, will be provided adjacent to the work area.
18. A full medical examination is required for all employees exposed to cadmium levels at or above 2.5 μg/m3 for 30 days or more a year. Contact the TVA plant / facility nurse or TVA Health Services for medical examination requirements. If an employee was exposed to cadmium levels at or above 2.5 μg/m3 for six months or longer, a medical examination is also required at termination of employment.
19. All employees shall receive hazard communication training prior to any exposure to cadmium. Each employee that may be exposed to cadmium will also receive additional training on :
    - Contents of this procedure
    - Nature of the work
    - The hazards of cadmium and its effect to employee health
    - Proper use of respirator
    - Medical surveillance program
20. Proper documentation will be made each time this training is given.
21. A copy of OSHA Standard 1926.63 must be made available upon employee request.

Recordkeeping

All TVA employee exposure monitoring and medical records shall be maintained for the duration of employment plus 30 years.

Environmental Controls

Dust, waste scrap metal, and product containers containing cadmium may be considered hazardous. Consult with your TVA environmental support personnel well in advance to make certain your disposal plan meets all TVA / EPA / OSHA requirements.

Reference

- 29 Code of Federal Regulations 1910.1027, “Cadmium”

Appendix A - Respiratory Protection for Cadmium Exposure

Appendix A - Respiratory Protection for Cadmium Exposure

Airborne Concentration of Cadmium	Required Protection
50 μg/m3 or less	Any half mask air-purifying respirator with HEPA filter
125 μg/m3 or less	A powered air-purifying respirator with a loosefitting hood and HEPA filter
250 μg/m3 or less	A full face air-purifying respirator with HEPA filter
1,250 μg/m3 or less	A powered air-purifying respirator with a tightfitting full face piece with HEPA filter
5,000 μg/m3 or less	Supplied-air respirator
> 5,000 μg/m3 or unknown concentrations	Self contained breathing apparatus

Procedure 905 Caustics

TVA Safety Manual

905 Caustics

Procedure Number 905

TVA Safety Procedure

Caustics

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish requirements for the safe handling, use and storage of caustics.

Hazards

1. Caustic solutions (with 50-percent caustic soda) are noncombustible, but will attack wool and leather clothing, and some metals (aluminum, tin, zinc, and alloys containing these metals). They generate heat when water is added, are a strong skin irritant, and cause severe burns.
2. Exposure to caustic vapors shall be avoided.

General Requirements for Handling Caustics

1. Each supervisor responsible for transfer activities ensures that his employees are knowledgeable in safety precautions applicable to the transfer of caustic solutions.
2. A Job Safety Analysis shall be developed for transfer operations involving caustics.
3. The transfer area shall be placarded with DANGER - CAUSTIC UNLOADING IN PROGRESS signs. Nonessential employees shall be prohibited within 20 feet of the transfer area.
4. Smoking, welding, cutting, and other flame- or heat-producing operations is prohibited in the transfer area.
5. Personnel engaged in transfer operation, as a minimum, use the following safety equipment:
   - Chemical goggles and a faceshield
   - Rubber gloves
   - Rubber boots
   - Protective rubber aprons or acid-proof clothing
   - Faceshields shall be worn during venting operations or breaking pipe connections
6. An emergency shower and eyewash shall be operational and tested within 30 feet of the transfer area.
7. A washdown capability shall be available in the immediate transfer area for diluting liquid spills and leaks.
8. Transfers shall not be conducted during the hours of darkness unless adequate illumination is provided.
9. For vendor tank truck deliveries, the truck attendant shall be present during the transfer operation. If the truck attendant leaves the transfer area, the operation shall be terminated until the attendant returns.
10. Making or breaking connections while the system is under pressure or contains liquid is prohibited.
11. In the event of a leak during transfer, the operation shall be discontinued. The supply valve shall be closed and the line depressurized and drained of liquid before tightening or loosening the connection.

Safety Precautions for Caustic Solutions

1. Flex hoses used in transfer operations shall be designed for use with caustic solutions and have a manufacturer's rating of at least 50 psi.
2. Flex hoses used in transfer operation shall be appropriately identified TO BE USED FOR CAUSTICS ONLY and identified by some marking that indicates the pressure rating of the hose. Hoses shall be hydrostatically tested annually, and the results documented.
3. All fittings and couplings that may be required to adapt the discharge line (flex hose) from the unloading vessel to the receiving vessel are made of iron, nickel, or nickel iron. They are rated at least 50 psi with a 4:1 safety factor, and are identified for CAUSTIC ONLY. No copper, brass, bronze, or aluminum in valves or fittings shall be permitted to come in contact with caustic solutions.
4. Fifty-percent caustic solutions flow freely except during cold weather; however, no difficulty in unloading is experienced if trucks used in caustic service are insulated to reduce cooling and crystallization and when proper precautions are taken.
5. These solutions begin to deposit crystals when cooled to approximately 50°F. The first crystals, formed on the top of the liquid, pass through the liquid forming a crystal layer near the bottom of the truck vessel. If freezing is suspected, open the manhole located on top of the vessel and thrust a rod down through the liquid to the bottom of the vessel. A "feel" of the bottom will indicate whether or not crystallization has taken place. In the event crystallization has occurred, secure the system and do not attempt transfer.

Associated Transfer Systems

1. Caustic solutions are received in liquid form by tank truck and transferred from the truck vessel to the plant receiving vessel by using a pressure transfer mode of operation or a pump transfer mode of operation. Either mode is approved.
2. When compressed air is selected for transferring the liquid, the plant air supply may be used. Plant air is supplied through an industrial-type hose, rubber-lined, having a 100-psig rating. If the hauler's air compressor is used, no more than 20-psig pressure is used. The safety relief valve operates at no more than 25 psig.
3. The plant air line is provided with a regulating-type, pressure-reducing valve set at not more than 20 psig; a safety valve set at 25 psig; a rupture disc at 32 psig; a pressure gauge; and a bleed valve to bleed line pressure.

Liquid Transfer Procedure

1. In the absence of a specific site procedure, the following steps shall be followed during transfer using the plant air supply.
2. As soon as the driver has positioned the truck for unloading, the truck shall be braked and the rear wheels are chocked.
3. The transfer area shall be cleared of all nonessential employees and the appropriate DANGER signs shall be displayed. Essential employees shall suit up in applicable protective clothing.
4. CAUTION: The next step vents the truck vessel. Stay clear of vent line until vessel is depressurized.
5. The driver shall open the truck vent valve and depressurize the truck vessel in preparation for sampling and connecting the truck to the receiving vessel.
6. When plant sampling crew is ready, the driver shall open the dome carefully and a sample is taken for analysis of truck vessel contents.
7. After the sample has been taken, the driver shall close the dome.
8. Set up the plant receiving system. Verify the plant unloading valve is closed, if applicable. Cautiously remove dust plug or cap from the unloading connection.
9. Connect the flex hose between the truck vessel and plant receiving system. This connection should be independently verified as correct.

10. Ensure that the hose is marked for the liquid being transferred.
11. Slowly open the plant air supply line and purge the line of moisture. Lift lever on the system relief valve to ensure it is operative. Connect the supply line to the trailer air supply system, if applicable.
12. Check plant receiving systems. Verify all receiving valves are closed to prevent inadvertent mixing of acid and caustics. Verify that receiving vessel is at ambient pressure and vent valve is open.
    Note: Verify that sample results are acceptable prior to proceeding to the next step.
13. **CAUTION: The next step starts liquid transfer from the truck vessel to the plant receiving vessel at ambient pressure.**
14. Observe the system for leaks.
15. Slowly open the plant receiving valve. Observe for leaks. Slowly open the trailer unloading valve. Observe for leaks. If leaks are detected, tighten connections before pressure is added. (Establish integrity of the system while at ambient pressure).
16. With the plant air supply valve, slowly increase truck vessel pressure to 15 psig. (Do not exceed 20 psig). Check the transfer system for leaks.
17. When truck vessel has been unloaded, close off plant receiving valve and close plant air supply valve. Vent air line or open truck vessel vent valve to depressurize truck vessel and air line.
18. Disconnect flex hose from trailer vessel.
19. Disconnect plant air supply line from truck.
20. Wash down transfer area.
21. Disconnect flex hose from plant receiving system, flush the line, and replace dust plug or cap over unloading connection.

First Aid Treatment

If contact with a caustic solution occurs, irrigate eyes with water for at least 15 minutes. Wash any caustic contaminated areas of body with soap and water. Notify medical personnel immediately.

Equipment Storage Cabinet

An equipment storage cabinet shall be located near any caustic storage tank. The cabinet shall contain the following equipment as a minimum:

- Two "DANGER - CAUSTIC UNLOADING IN PROGRESS" signs
- Four chocks for truck
- Four pairs of rubber gloves
- Two faceshields
- Two pair of chemical goggles
- Two sets of caustic-proof clothing, or two rubber aprons
- Two pair of rubber boots
- One 50-foot water hose for washdown
- 100 feet of "DANGER - KEEP OUT" barricade tape

Procedure 906 Combustible and Flammable Liquids

TVA Safety Manual

906 Combustible and Flammable Liquids

Procedure Number 906

TVA Safety Procedure

Combustible and Flammable Liquids

Revision 3

April 29, 2005

Purpose

The purpose of this procedure is to establish requirements storage, use and handling of combustible and flammable liquids.

Note: TVAN storage, use and handling of combustible and flammable liquids shall also comply with SPP-10.10, "Control of Transient Combustibles". Where requirements conflict, comply with the more restrictive requirements.

General Safe Work Requirements

1. Each employee is responsible for keeping flammable liquids in safety cans, flammable storage cabinets, or storage areas approved by the supervisor.
2. Smoking, open flames, and other potential ignition sources are prohibited in flammable liquid storage, use and transfer areas.
3. Non-sparking tools (explosion proof) electrical equipment is used where hydrogen or other flammable gases or vapors may be reasonably expected to exist or develop.

Storage of Combustible and Flammable Liquids

1. All drums, cans, tanks, bottles, safety cans, and shipping containers used in the storage or handling of combustible and flammable liquids shall be prominently marked, painted, or labeled to identify contents. Labeling shall be in accordance with requirements of TVA Safety Procedure 216, "Hazard Communication".
2. Combustible and flammable liquids shall not be stored in exits, stairways, or areas normally used for the passage of people.
3. Only the minimum quantities of necessary combustible or flammable liquids may be kept in flammable liquid storage cabinets.
4. Storage cabinets shall not be used for storage of items other than combustible or flammable liquids.
5. Quantities of combustible or flammable liquids in excess of 25 gallons shall be stored in an approved storage cabinet, room, reservoir, or tank.
6. A maximum of 60 gallons of liquid is allowed to be stored in any one storage cabinet. The number of storage cabinets in any single fire area shall be limited to groupings of three separated by a minimum distance of 100 feet. **Note: For industrial type occupancies, when an area is protected by an automatic sprinkler system that is designed and installed in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, the**

number of cabinets in any one group may be permitted to be increased to six. Exceptions to this for example, would be putting flammable liquid cabinets under critical cable trays.

7. One clear aisle, at least three feet wide, shall be maintained inside every storage room.
8. Combustible and flammable liquids in containers of over 30-gallon capacity shall not be stacked.
9. One-gallon glass containers may be used for storage of combustible and flammable liquids only if the liquid would attack metal causing potential leakage or make the liquid unfit for its intended use.
10. Combustible and flammable liquids shall be stored in closed containers at all times except during dispensing or actual use.
11. Portable containers for the storage of combustible and flammable liquids shall not exceed five gallons.
12. Portable tanks used for the storage of combustible and flammable liquids shall not exceed 60 gallons.
13. The cover, cap, or bung shall be replaced immediately whenever a container or drum which has held combustible or flammable liquids is empty.
14. Drums of low flashpoint (100°F or less), flammable liquids such as gasoline, acetone, and some solvents shall have the shipping bungs replaced with a pressure relief safety bung.
15. Combustible or flammable paints and other similar substances do not require the use of safety cans while being applied or if stored for less than 30 days.

Transfer and Handling of Combustible and Flammable Liquids

1. Air pressure shall not be used on a drum, portable tank, or small container for transferring combustible or flammable liquids. Hand operated rotary-type pumps or faucets shall be used.
2. Combustible or flammable liquids shall be transferred from safety cans by means of a device drawing through the top, or from a container, or portable tanks, by gravity or pump, through approved self-closing valve.
3. To reduce the fire and explosion potential from static electricity buildup, all equipment (tank cars, trailer tanks, portable containers, etc.) used for the transfer of flammable liquids is bonded together and the dispensing container grounded. When dispensing from drums, if the transfer hose is conductive and good electrical contact is established and maintained, bonding is not required.
4. The velocity of flammable liquids in pipes and hoses shall be kept as low as practicable to reduce static charge production.
5. Appropriate warning signs shall be posted to designate that the use of fires, sparkproducing operations, or other flame producing devices are prohibited in the vicinity of the dispensing area (normally within 50 feet).
6. Use of flammable liquids in confined spaces is prohibited unless adequate ventilation is provided and appropriate vapor monitoring conducted.
7. All combustible or flammable liquid spray cans shall be stored in approved flammable liquids storage cabinets or other heat protected area.
8. Materials which will react with water and create a fire hazard shall not be stored in the same room with flammable or combustible liquids.

Personal Protective Equipment

Appropriate personal protective equipment, eye protection and face protection, hand protection and body protection shall be worn.

Training

Training course “Handling & Storage of Compressed Gases / Flammable / Combustible Liquids”, ATIS 00059125, is provided to employees whose work involves the use of combustible and / or flammable liquids.

Definitions

Combustible Liquid - A term used to classify liquids, gases, or solids that will burn readily. Combustible liquids have flash points at or above 100°F, but below 200°F.

Flammable Liquid - Any liquid that has a flash point below 100°F. Also, any gas or solid which can sustain fire and ignite readily.

Reference

- 29 Code of Federal Regulations 1910.106, “Flammable & Combustible Liquids”
- TVA Safety Procedure 216, “Hazard Communication”

Procedure 907 Cryogenic Materials

TVA Safety Manual

907 Cryogenic Materials

Procedure Number 907

TVA Safety Procedure

Cryogenic Materials

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish safe work requirements for working with cryogenic (very cold) materials

Hazards of Cryogenic Materials

1. Cryogenic equipment and materials pose unique hazards due to extremely low temperatures. These materials also often involve high pressures and may result in the development of very high or very low concentrations of oxygen.
2. Control of the hazards associated with cryogenics requires a comprehensive understanding of the unique conditions that may be present or develop. For example:
   - the extreme cold of liquid nitrogen can make metals and other materials, including tools, brittle.
   - uninsulated equipment can condense oxygen from the air and result in dangerously high concentrations of liquid oxygen which can explosively ignite many flammable and combustible materials.
   - liquid nitrogen released in significant volumes in either enclosed or poorly ventilated areas can result in very low oxygen levels both as a result of oxygen condensing out of the air and from displacement by gaseous nitrogen.
3. Contact with either liquid cryogenic materials or super-cooled containers and equipment with the eyes or skin produces serious burns.
4. Wet or damp skin may also freeze to solid surfaces and accentuate injury.
5. Freeze-plugging using the refrigeration principle of expanding gas cooling may result in some hazards that are similar. This process, while not involving cryogenic liquids, does result in the potential for super-cooled solid surfaces and atmospheres with low oxygen content.
6. Dry ice is also a cryogenic material (solid).

Precautions

1. Adequate ventilation and either periodic or continuous oxygen monitoring are normal precautions for working with liquid nitrogen.
2. Precautions to protect against cold surfaces are needed.
3. To minimize contact with cryogenic materials, wear goggles, face shield, and insulated gloves that fit loosely enough to throw off in case of a spill.
4. The body should also be completely covered with no skin areas exposed. Wear no jewelry and avoid clothing (cryogenic aprons recommended) with cuffs or pockets that could trap and hold cryogenic liquid close to the skin.
5. When putting objects into a cryogenic liquid, do so very slowly.
6. When pouring cryogenic liquids, pour slowly to minimize the inevitable boiling and splashing.
7. Dewar flasks and cold taps containing cryogenic materials should be taped to prevent flying glass in case of breakage.
8. Avoid pouring cold liquid over the edge of a Dewar flask as this may cause breakage or an implosion.
9. Dry ice should be handled following precautions similar to cryogenic liquids.
10. Dry ice should always be added to liquid very slowly and in small amounts to avoid foaming and boilover.
11. Handle dry ice with dry leather or insulated gloves. Never put your head into an ice chest or other container containing dry ice since the oxygen level may be near zero and almost immediate unconsciousness may result.
12. Do not drop warm solids or liquids into cryogenic liquids. Violent boiling will result and liquid can splash onto personnel and equipment.
13. Avoid breathing vapor from any cryogenic liquid source (except for liquid oxygen equipment designed to supply warm breathable oxygen).
14. When cryogenic liquids are being discharged from drain valves or blowdown lines, open the valves slowly to prevent splashing.
15. Smoking is prohibited when working with cryogenic liquids.

First Aid for Contact Injury

1. Damaged tissue should be flooded with a gentle stream of water, not warmer than body temperature (such as an eyewash).
2. The area affected should then be dried very gently (excluding the eyes) and protected until professional medical attention is provided.
3. A similar stream of warm water is also the preferred method to free skin that may freeze together.
4. If cryogenic material contacts or injures an individual, professional medical treatment should be sought immediately.

Procedure 908 Explosives and Blasting

TVA Safety Manual

908 Explosives and Blasting

Procedure Number 908

TVA Safety Procedure

Explosives and Blasting

Revision 0

January 6, 2003

Purpose

This procedure establishes requirements for safe handling for explosives and blasting operations.

Roles and Responsibilities

1. The plant / facility manager / Site Vice President or General Manager is responsible for implementing and enforcing this procedure.
2. The plant / facility engineering manager is responsible for the execution and performance of this procedure.
3. The Blasting Contractor Supervisor shall be responsible for all explosives handling and blasting operations and the use of this procedure.
4. The Contractor Blaster shall be responsible for the safe execution of blasting in accordance with this procedure.
5. The plant / facility / Site Vice President or General Manager shall authorize in writing the storage or handling of over 10,000 lb. of explosives.

General

1. All required permits and licenses shall be maintained on the project by the Contractor Blasting Supervisor.
2. The transportation, handling, storage, and use of explosives and blasting agents shall be directed by a person of proven experience and ability in blasting operations.
3. The blaster shall be qualified by reason of his/her training, knowledge, and experience in the field of working with explosives.
4. He / she shall be licensed when required and shall be familiar with federal, state, and local laws and regulations pertaining to explosives.
5. The driver of a vehicle used to transport explosives and a helper assigned shall be physically fit, and able to read and understand instructions.
6. No person shall be allowed to handle or use explosives while under the influence of alcohol, narcotics, or other substances which may impair / alter his / her judgment.
7. The storage and transportation of detonators and explosives shall be done separately, not in the same magazine or vehicle.
8. Magazines and vehicles shall be constructed for spark-proof protection and kept free of tools, matches, oils, acids, or electric storage batteries.
9. Magazines and vehicles shall be identified on all sides with signs reading “Danger Explosives” in red letters on a white background with 4 inch letters. Magazines shall be bullet-resistant, rodent-resistant, weather -resistant, fireproof, and well ventilated.

10. No vehicles used for the transportation of explosives, including the on-board magazine, shall be left unattended.
11. The area around the magazine shall be kept clear of vegetation and all combustible matter for a distance of 25 feet.
12. A 10 pound type ABC fire extinguisher shall be placed strategically for use on magazines and vehicles used to transport explosives. Loaded vehicles shall not be left unattended or refueled.
13. No flame-producing device shall be permitted within 100 feet of any magazine. Operating equipment shall be kept at least 50 feet away from loaded holes. Spark prevention near explosives shall be maintained through engineering and administration controls.
14. Distances for storage of explosives shall conform to the American Table of Distances For the Storage of Explosives contained in the current Institute of Makers of Explosives Publication.
15. Security surveillance and theft prevention procedures shall be maintained. TVA Police shall be notified in advance of bringing any explosive and/or blasting agents onto TVA property.
16. A pre-blast survey is to be made of nearby property so that damage claims can be verified by a post-blast inspection when necessary.
17. Two receiving and dispensing logs shall be maintained at all times for explosives stored on the project. One log shall be kept in the magazine and the other in the office of the Blasting Supervisor. These logs will be subject to unannounced inspection by the TVA Police and COO Safety.
18. Explosives will not be stored in the work area or in the blasting area. Only the amount needed for a shot will be brought into the work area; any excess shall be returned to the magazine for storage.
19. Prior to loading any holes, a thorough check shall be made for any extraneous currents, such as two-way radios, commercial broadcast transmitters, microwave towers, and forecasted electric storms. Do not allow the cap and lead wire layouts to become receiving antennas for radio frequencies.
20. Protective blast mattresses shall be used on selected shots; and, where used, extend 5 feet beyond the outside hole of each shot and overlap adjacent mats at least 2 feet.

Planning for Blasting Operations

1. The blasting contractor shall originate all Blast Data Sheets and forward them to the Plant / Facility Engineering Manager for approval.
2. A Job Safety Analysis (JSA) should be developed for each blasting operation.
3. The blasting contractor shall determine the method and location for removing personnel and equipment to a safe area.
4. Appropriate signs shall be posted to identify blasting area: 1,000 feet away on adjacent highways with turn-off radio signs, 50 feet perimeter signs for equipment, and warning signs for personnel.
5. A blasting record log shall be initiated and kept up to date.
6. A warning system shall be established, publicized, and posted on the project.
   - Warning Signal - A series of five long horn blasts 5 minutes prior to blast signal.
   - Blast Signal - A series of five short horn blast 1 minute prior to the shot.
   - All Clear Signal - One long horn blast after charges are fired and the area checked.
7. There shall be an interval between separate shots for safety of approximately 30 minutes.

Drilling

1. Drilling shall not be done in an area already blasted until a thorough examination has assured that no unexploded charges remain.
2. Dust control shall be accomplished by wet drilling.
3. Drilling and loading operations generally shall not be carried out simultaneously in the same area.

Loading

1. The loading area shall be kept free of equipment, persons, and operations not essential to loading.
2. The oldest stock of explosives shall be used first, and containers are to be opened or repacked at least 50 feet from any magazine.
3. Tamping shall be done with approved wood rods or plastic tamping poles without exposed metal parts.
4. Primers shall not be tamped.
5. Caps shall be inserted into dynamite only in holes for that purpose and punched with a nonmetallic punch.
6. Loaded holes shall be stemmed to the collar with noncombustible material.
7. When charges are checked and covered with blasting mats, care must be taken to protect electric blasting circuits.
8. Detonating cord trunklines and branchlines shall be handled with care, free of loops, kinks, or angles toward line of detonation.
9. Connections to a blasting cap shall be taped or otherwise secured along the side or end of the detonating cord.

Firing

1. All blasts shall be fired electrically with an electric blasting machine, or approved method, approved by the Contractor Blasting Supervisor.
2. Blasting machines shall be tested prior to use and periodically as recommended by the manufacturer.
3. Blasting machines shall be secured and accessible only to the blaster. He/she shall have the key to the switches in his/her possession and be solely responsible for connecting the lead wire to the machine just before the shot is fired.
4. Blasting power circuits shall not exceed 550 volts and wiring and control circuits shall conform to the following:
   - Blasting Switch - the blasting switch shall be ungrounded, Underwriters Laboratory (UL) listed, enclosed, externally operated double pole-double throw switch which, when locked in the open position, will shunt the firing lines.
   - Underground Operations a grounded safety switch shall be installed between the blasting switch and the power circuit at a distance of at least 5 feet from the blasting switch. Also, a “lighting” gap of at least 5 feet between the two switches shall be connected by cable plug and receptacle. This gap shall be bridged by the jumper cord just before firing.
   - Lightning Protection depending on conditions, static electricity detectors shall be placed from 800 feet to 6,000 feet away from the blast area. The static electricity detectors shall be monitored while blasting operations are being carried out.
5. The Contractor Blasting Supervisor shall be responsible to halt operations if static electricity is detected within 5 miles to 10 miles of the blasting area depending on the conditions. Circuits shall be grounded and switches opened to prevent accidental discharge if the above conditions occur.
6. An alert shall be given when an electrical storm approaches to within 25 miles of the blasting area.
7. Conditions to be considered are history of storms in the area, the nature of the terrain and the speed of the terrain and the speed of the thunderstorms across country.
8. The manufacturer’s shunt shall not be removed from the cap leg wires until the cap is connected to the lead lines.
9. The blasting signals outlined in paragraph 4.5 shall be used; and signs, flags, and flagmen shall be used as needed.

10. Workers and equipment will be removed from the blast area to designated locations.
11. The contractor blaster shall fire the shot and then immediately disconnect the leading wires from the power source and shunt them.
    - All caps in a blast shall be of the same manufacture.
    - The number of electric blasting caps in a circuit shall not exceed the capacity of the blasting machine or power source.
    - The circuit, including all caps, shall be tested with an approved galvanometer before being connected to the firing line.
    - No lead wire shall be connected to the circuit until it has been grounded to dissipate static charges.
    - The firing line shall be checked with an approved galvanometer at the terminals before being connected to the blasting machine or other power source.
    - No firing line shall be connected to a blasting machine or other power source until the shot is to be fired.
    - A power circuit used for firing electric blasting caps shall not be grounded.

Inspection After Blasting

1. Immediately after the blast has been fired, the firing line shall be disconnected from the blasting machine or power source and power switches shall be locked open.
2. The contractor blaster shall inspect to determine that all charges have exploded.
3. No one is to enter the area of the blast until an “All Clear” signal is given.
4. Loose rock and debris subject to falling shall be scaled prior to work proceeding.

Misfires

1. Misfires shall be handled by the contractor blaster. No drilling, digging, or picking shall be permitted until the blaster signals that detonation is completed.
2. If broken wires, faulty connections, or short circuits are the cause, then proper repairs shall be made, the firing line reconnected and tested, and the charge fired.
3. Misfired holes may be cleaned out by water, or new primer attached, and the charge detonated. If under water, the hole will be blown out with air.

Underground Blasting

1. Explosives and detonations shall not be kept in tunnels, shafts, or caissons.
2. Explosives and blasting agents shall be hoisted, lowered, or conveyed in a powder car.
3. No personnel or other materials shall be transported in the powder car at the same time with the explosives.
4. At least two car lengths shall separate the powder car from the locomotive.
5. Loading and unloading shall be accomplished only when the conveyance is stationary.
6. Only the amount of explosives needed for the shot will be permitted in the loading area.
7. Detonators and explosives shall be taken separately into pressure working chambers. The contractor blaster shall be responsible for the receipt, unloading, storage, and transportation of explosives and detonators.
8. Only the personnel needed for blasting tasks will be permitted in an air lock with explosives.
9. All metal pipes, rails, steel liners, and air locks shall be bonded together at not less than 1,000 ft intervals.
10. Tunnel excavations in mixed face shall be performed with light charges and with light burden. Advanced drilling shall be performed to determine the general nature of the rock cover and soft ground.
11. At least 15 min shall elapse after blasting to allow toxic gases, dusts, mists, and fumes to be exhausted by reverse flow of the ventilating system.
12. Instruments shall be used by the Blasting Contractor to determine the presence of carbon monoxide, nitrogen dioxide, methane, hydrogen sulphide, and oxygen content.. Results of tests shall be documented on a log.

Respiratory and rescue equipment shall be available.

13. Drilling will not start until it is determined that no undetonated charges remain. See paragraph 9, Misfires.
14. Explosives suitable for use in wet holes shall be water resistant and Fume Class 1.

Underwater Blasting

1. Loading tubes and casings of dissimilar metals shall not be used because of possible electric transient currents due to galvanic action of the metals and water.
2. Water-resistant blasting caps and detonating cords shall be used for all marine blasting. Loading shall be done through a nonsparking loading tube when a tube is necessary.
3. Blasting flags shall be displayed. When more than one charge is placed under water, a float device shall be attached to each charge so that it will be released by firing.
4. No blast shall be fired while any vessel under way is closer than 1,500 feet to the blasting area. Persons on board vessels moored within 1,500 feet shall be notified prior to the blast being fired.
5. No blast shall be fired while swimming or diving operations are in progress near the area. If such operations are in progress, signals and arrangements shall be agreed upon to assure that no shot will be fired while any person is in the water.
6. Prior to firing, the drill boat or vessel must be moved to a safe distance from the blasting area.
7. Prior to firing, the drill boat shall signal by horn or whistle the usual navigation warning signals and display blasting flags.
8. Whenever a drill boat is moved from the drill setting, all loaded water holes shall be fired.
9. Those engaged in drilling operations on another vessel shall be signaled to leave the drill frame for cover if any holes shall be loaded.

How to Destroy Explosives

1. Excess explosives, boosters, primers, and detonating cords shall be destroyed by burning.
2. Destroy only one type at a time.
3. Quantities of up to 100 pounds can be burned in piles 25 feet apart.
4. Do not burn in cartons or deep piles. Cartridges should be removed, slit, and spread on the ground over paper or excelsior.
5. Detonator caps should be exploded by dynamite. Limit this to ½ pound. of dynamite, 100 caps placed in at least a 1 foot deep hole and covered with paper and then dry sand or dirt.
6. Do not place explosives for destruction as successive shots on sites unless the shot feels cool to the touch.

Theft Reporting

Report any case of theft immediately to the TVA Police.

Reference

- American National Standards Institute (ANSI) A10.7-1987, Safety Requirements for Transportation, Storage, Handling, and Use of Commercial Explosive Materials in the Construction Industry.
- 29 Code of Federal Regulations, Parts 1910 and 1926, Occupational Safety and Health Administration (OSHA), U.S. Department of Labor.

Procedure 909 Lead

TVA Safety Manual

909 Lead

Procedure Number 909

TVA Safety Procedure

Lead

Revision 0

January 6, 2003

Purpose

This procedure establishes safe work practices, personal hygiene, engineering and administrative controls, and medical monitoring for work involving lead or handling of metallic lead or lead-containing coatings including:

- Demolition or salvage of structures where lead or materials containing lead are present;
- Removal or encapsulation of materials containing lead;
- New construction, alteration, repair, or renovation of structures, substrates, or portions thereof, that contain lead, or materials containing lead;
- Installation of products containing lead;
- Transportation, disposal, storage, or containment of lead or materials containing lead.

Lead Hazards

1. Employees may encounter lead by contacting products that contain the substance or are coated with lead-bearing compounds.
2. Employees may be exposed to potentially harmful levels of lead by handling lead bricks, sheeting, lead-acid batteries, etc., or when burning, cutting, grinding, or sanding materials with lead-bearing coatings, cable splicing, soldering, or in certain machine shop applications.
3. Potentially harmful exposure can occur through
   - Inhalation of airborne fumes or dusts
   - Ingestion or inhalation by eating or smoking lead-contaminated products.
   - Inhalation or ingestion of high levels of lead for even a brief period or repeated low level exposure over time may cause serious illness.
4. Lead is a cumulative toxin that can cause the following symptoms: metallic taste in the mouth, fatigue, irritability, inability to sleep, constipation, headache, loss of appetite, stomach cramps, nausea, anemia, kidney failure, impaired muscular, nerve, and brain functions as well as reproduction disorders.
5. Most exposure problems arising from the handling of lead may be eliminated with good work practices and personal hygiene practices.
6. Individuals who make skin contact with exposed lead surfaces shall wash that part of his/her body making skin contact before eating, smoking, or drinking to prevent the ingestion of lead.
7. Care should also be taken to keep the hands away from the mouth and eyes if the presence of lead contamination is suspected on the hands. Gloves shall always be worn when working with or moving lead.

Exposure Assessment

1. Any work which may expose workers at or above the action level (30 μg/m3) will require initial exposure monitoring and evaluation by a competent person.
2. Until the results of the exposure assessment have determined exposure levels below the PEL certain tasks shall assume exposure levels as listed in 29 CFR 1926.62 (d)(2) and protective measures shall be implemented as required at the assumed exposure levels.
3. Prior to starting any job potentially involving lead, the responsible supervisor shall determine if the work will involve materials that contain lead.
4. When in doubt, a sample of an area at least one-half inch square is scraped down to the base material (including all primer coats) and the scrapings placed in a small plastic bag or vial.
5. The sample shall be labeled with the sample location, date, the responsible supervisor's name, pertinent work identification numbers, and sent for laboratory analysis.
6. If it is not possible to obtain a sample prior to the start of the work, as in an emergency, any work with suspected lead-containing materials proceeds under the assumption that lead is present.
7. If a change in the work scope increases the potential for personnel exposure, reevaluate the operations.
8. If there is a possibility of exposure at or above the action level, personal and/or area monitoring shall be conducted.
9. Employees shall be notified of the air sampling results as soon as possible.

Written Compliance Program

A written compliance program shall be implemented prior to the commencement of each job, and shall include:

- A description of work activities.
- Protective measures to be implemented, including work practices, engineering controls, and administrative controls.
- A schedule for implementation of the program.
- Air monitoring data.
- Frequent and regular inspections of the work site.

Exposure Control

1. The responsible supervisor shall implement lead control measures whenever the PEL may be exceeded.
2. Methods used to reduce employee exposure include:
   - engineering controls (HEPA vacuums, filtered exhaust ventilation or negative pressure enclosures),
   - work practices,
   - administrative controls (worker rotation), and
   - respiratory protection.
3. If personnel are exposed to lead above the PEL for more than 30 days per year, engineering and administrative controls shall be implemented.
4. When those controls are not sufficient in reducing airborne levels of lead below the PEL, respiratory protection shall be used along with all other feasible controls.
5. If personnel are exposed to airborne levels of lead above the PEL for 30 days or less per year, engineering controls shall be implemented to reduce exposure levels to below 200 ug/m3. Thereafter, any combination of controls may be used to reduce exposure(s) below the PEL.

Regulated Areas

1. All areas to be worked shall be barricaded at a sufficient distance from the work being performed to ensure unauthorized and/or unprotected persons are not exposed to airborne lead concentrations in excess of the action level.
2. The barricade shall remain in place until the lead paint residues can be collected for proper disposal.
3. Signs shall be posted at the barricaded area . The signs shall read the following:
   WARNINGLEAD WORK AREAPOISONNO SMOKING OR EATING
4. Regulated areas will be established prior to lead paint abatement and clean-up operations. Employees shall not leave a regulated area while wearing protective clothing.
5. Employees are not allowed to drink, eat, smoke, chew tobacco or gum, or apply cosmetics in a regulated area.
6. Employees shall don protective clothing prior to entering a regulated area to perform prep activities or to communicate with employees in the regulated areas when necessary.
7. Employees shall not remove the barricade or alter any regulated area or allow other personnel into a regulated area without obtaining authorization from their supervisor.
8. All employees shall wear proper respiratory protection when performing lead paint abatement and clean-up operations.
9. Employees shall decontaminate themselves by removing protective clothing and washing the exposed portions of skin (face and hands) prior to leaving a regulated area. HEPA-VAC and shower when exposures exceed the PEL.
10. All contaminated protective clothing and decontamination items shall be bagged in 6 mil poly bags in order to prevent contamination of other areas.

Engineering Controls

1. Supplemental mechanical ventilation may be used to reduce airborne lead levels by creating a negative pressure inside the work area. Such ventilation units shall be equipped with HEPA filtration systems.
2. Vacuum cleaners shall be used to maintain all surfaces as free as possible from the accumulation of lead particles and dusts. Vacuums shall be equipped with HEPA filters. HEPA vacs used for such purposes in the Radiological Control Area (RCA) are maintained and serviced in accordance with approved RADCON procedures. HEPA vacs used for lead decontamination outside the RCA are emptied only with the use of respiratory protection and done so in a manner which ensures compliance with all aspects of this procedure. Engineering / administrator shall be contacted regarding the disposal of all lead.
3. Lead-free coatings and vinyl coverings shall be used wherever possible to encapsulate exposed bare lead surfaces.

Work Practices

1. Floor coverings shall be used to catch loose lead particles, shavings, or other dusts.
2. The use of compressed air for cleaning is strictly forbidden, except for lead work done in a lead abatement enclosure kept under negative pressure by use of HEPA filtration through the abatement and decontamination process.
3. Wet mopping of lead work areas shall be used for decontamination for work not performed in a negative pressure enclosure.
4. For most work with lead, the use of hand tools is preferred to powered tools.

Administrative Controls

1. When administrative controls (worker rotation) are used, a work schedule is established which includes:
   - Name(s) and SSN(s) of affected personnel
   - Location of work areas
   - Duration spent at each location
2. Caution: No melting of lead for the purposes of casting or fabrication of shielding is permitted at TVAN facilities without a thorough job safety analysis and written job safety plan to address and control the hazards.

Respiratory Protection

1. Respiratory protection is used:
   - If engineering and/or administrative controls do not or are not expected to reduce the exposure level below the PEL.
   - Whenever an employee working with lead requests respiratory protection.
2. Respiratory protection for lead, when required for compliance purposes, shall be in accordance with TVA Safety Procedure 312, "Respiratory Protection (Non-nuclear).
3. Quantitative face mask fit testing is required at the initial testing and every six months thereafter.
   TVAN This is available from RADCON for full face masks. An S-3 medical approval is a prerequisite for this testing.

Warning Signs

Warning signs with the following message shall be posted in each lead work area where the PEL is exceeded.

WARNING

LEAD WORK AREA

POISON

NO SMOKING OR EATING

Hygiene Facilities and Practices

1. Change areas and hand washing facilities shall be provided. Where exposure monitoring shows lead concentrations in the air above the PEL, showers shall be provided where feasible.
2. All personnel who have worked with lead wash their hands and face prior to eating, chewing, drinking, smoking, or applying cosmetics to prevent the ingestion of lead.
3. Food, beverages, and tobacco products are not permitted in lead work areas. The application of cosmetics is similarly prohibited in lead work areas.
4. Where the airborne concentration of lead exceeds the PEL, a designated change area equipped with separate storage facilities for protective work clothing and for street clothing is provided in order to prevent possible cross-contamination.
5. If the PEL is exceeded, showers are taken at the end of the work shift by all personnel directly involved or working in the area.
6. Upon completion of work in an area where the PEL or the AL was exceeded, all objects and surfaces are HEPA vacuumed and wet wiped thoroughly.

Protective Clothing

1. The responsible supervisor ensures that protective clothing is supplied to personnel exposed to airborne levels of lead above the PEL or when physical contact with lead may cause possible contamination of skin or clothing. The protective clothing includes disposable coveralls, shoe covers, and gloves.
2. All protective clothing is removed prior to leaving the designated work area. Do not remove lead from protective clothing by blowing, shaking, or other means which may disperse lead into the air.
3. All lead-contaminated protective clothing and other discarded items within a lead work area are kept in closed, labeled bags or suitable leakproof containers so that no dispersion of lead dust occurs.
4. Containers of lead-contaminated clothing shall be labeled with the following warning:
   CAUTIONCLOTHING CONTAMINATED WITH LEADDO NOT REMOVE DUST BY BLOWING OR SHAKINGDISPOSE OF LEAD-CONTAMINATED WASH WATERIN ACCORDANCE WITH APPLICABLELOCAL, STATE, OR FEDERAL REGULATIONS
5. Contact environmental engineering / administrator for information regarding disposal.

Training

1. All employees potentially exposed to any level of airborne lead shall be informed of the content of this procedure.
2. All employees who are subject to lead exposure at or above the action level or for whom the possibility of skin or eye irritation exists shall receive training course “Inorganic Lead”, ATIS 00059133, before working with lead and annually thereafter.

Personnel Monitoring

1. Employees shall receive written notification of exposures.
2. Workers shall be monitored utilizing air sampling pumps, to determine accurately the airborne concentration of lead paint at their breathing zone.
3. Initial monitoring shall be done for each classification of work performed. If work practices, processes, or personnel changes occur, initial monitoring will be repeated. If initial or subsequent monitoring determines exposures above the action level, but below the PEL, monitoring shall be performed on a six month basis. If initial or subsequent monitoring determines exposure above the PEL, subsequent monitoring shall be performed on a quarterly basis, as a minimum.

Area Monitoring

Initial and periodic area monitoring shall be done to assure emissions remain below the action level and shall be conducted after commencement of lead dust generating activities.

Medical Surveillance

1. All TVA employees who are exposed to lead at or above the action level 30 micrograms/cubic meter for more than 30 days per year are included in the Medical Surveillance Program.
2. Health Services makes available medical examinations and consultations as follows:
   - Prior to initial work assignment to an area in which the airborne lead concentration is at or above the action level;
   - Immediately for an employee whose blood level is at or above 40 ug/dl;
   - As soon as possible if the employee reports signs or symptoms commonly associated with lead overexposure or intoxication;
   - As medically appropriate for employees removed or limited to lead exposure.
3. Employees seeking medical advice concerning the effects of current or past exposure to lead on his or her ability to procreate a healthy child may receive such consultation at the medical offices.

4. The responsible supervisor contacts Health Services at least 7 days in advance of any job involving a potential lead exposure above the action level for TVA employees to arrange for pre-and post-exposure blood lead monitoring. The responsible job supervisor coordinates with Medical the removal of employees from further lead exposure when their blood levels are at or above 50 ug / deciliter (dl) of whole blood.

Medical Removal

1. An employee who has a blood level of 50 ug / dl or higher is temporarily removed from all work where lead exposure may be encountered. Employees with blood lead levels under 50 ug/dl are also temporarily removed form lead exposure if it is found that the employee has a medical condition which places the employee at an increased risk from lead exposure.
2. An employee may be returned to his former job status when two consecutive blood lead samples show blood lead levels below 40 ug / dl of whole blood.
3. Any employee removed from lead exposure is by law covered by medical removal benefits so that earnings, seniority, and other benefits are maintained as though the employee had not been removed or limited from exposure to lead. Medical removal protection can be granted for up to 18 months.

Blood Lead Monitoring

1. Analysis for blood lead and zinc proto porphyrin (ZPP) levels is conducted at the following frequencies:
   - Before initial assignment for the first time into an area in which concentrations above the action level may be expected;
   - Every six months for those exposed above the action level for more than 30 days per year;
   - Every two months for each employee whose last blood lead level was at or above 40 ug/dl of whole blood until two consecutive blood samples are below 40 ug / dl.
2. The responsible supervisor may request Health Services to perform a blood lead analysis by filling out a TVA Form 1444 and requesting a "blood lead profile."
   - At least monthly during the medical removal period resulting from overexposure to lead;
   - At the termination of employment;
   - If the results indicate blood lead levels which exceed 50 ug / dl, followup sampling must be provided within two weeks after the first results have been received by Health Services;
   - At the end of any job where the PEL was exceeded.

Employee Notification

Health Services notifies the employee, in writing, of the results of blood lead levels at or above 40 ug / dl within 5 days after the receipt of the results and when temporary medical removal is warranted. Notification is made to the employee within 15 days if blood lead levels are shown to be less than 40 ug / dl.

Contractors

Contractors shall comply with the requirements of this procedure and are responsible for all personal monitoring as well as medical examinations, testing, and surveillance of their employees who are exposed to lead. The contract administrator shall ensure these requirements are met.

Recordkeeping

Accurate records shall be kept for a period of not less than 30 years and shall be reasonably available to each affected employee, former employee, their designated representative, and/or the Occupational Safety and Health Administration and shall include the following:

- Exposure Assessment Data (All exposure monitoring records)
- Medical Surveillance Data (All medical records to include physical exams and biological monitoring e.g., blood lead level, and zinc protoporphyrin)
- Medical Removal Data
- Data which may provide an exemption from initial monitoring requirements.

Definitions

Action level (AL) - An airborne concentration of 30 micrograms (ug) per cubic meter (m3) or greater of lead in the air, averaged over an eight-hour period without regard to respirator usage.

Competent Person - means one who is capable if identifying existing and predictable lead hazards in the surroundings or working conditions and who has authorization to take prompt corrective measures to eliminate them.

High efficiency particulate air (HEPA) filter - air filter rated at 99.97 percent efficiency against particles 0.3 microns (u) and larger.

Lead - Metallic lead, all inorganic lead compounds or organic lead soaps. Excluded from this definition (and outside the scope of this procedure) are all other organic lead compounds.

Lead Paint- Paint containing greater the 0.5% lead by weight.

Lead Work Area - Any area in which airborne lead levels exceed or can be expected to exceed the action level.

Permissible Exposure Limits (PEL) - No employee shall be exposed to lead concentrations greater than 50 micrograms per cubic meter of air (50 μg/m3) averaged over an 8 hour period, without the use of respiratory protection.

Reference

- 29 Code of Federal Regulations 1910.1025, "Lead"
- 29 Code of Federal Regulations 1926.62, “Lead”

Procedure 910 Mercury

TVA Safety Manual

910 Mercury

Procedure Number 910

TVA Safety Procedure

Mercury

Revision 3

March 11, 2010

Purpose

1. The purpose of this procedure is to establish a methodology to minimize injury to employees or damage to plant property during mercury spill removal and disposal.
2. The requirements of this procedure apply to all activities involving the procurement, storage, handling, use and recovery of elemental mercury and inorganic mercury compounds.
3. It does not provide control standards for organic mercury compounds, such as methyl mercury or organic mercury pesticides.

Roles and Responsibilities

1. Supervisors of employees handling or using mercury, inorganic mercury compounds, and instruments containing mercury are responsible for ensuring compliance with this procedure.
2. The plant / facility shift supervisor is responsible for overseeing all mercury spill activities.
3. The plant / facility shift supervisor is responsible for barricading mercury spill sites.
4. Hazmat team employees are responsible for mercury spill clean-up.
5. The plant / facility shift supervisor is responsible for contacting the approved clean-up vendor, (check current contract list), for mercury spills exceeding one pound, or if the Hazmat Team is not available.

Hazardous Properties

1. Inhalation - mercury vapor, mists of the metal, and fumes or dust containing mercury compounds when inhaled may cause mercury poisoning. Inhaled mercury can have effects on the central nervous system, the digestive system, the renal system, and the respiratory system. Teeth, gums, mouth, and hair may also be affected. Mercury inhalation may cause a metallic taste after exposure. The threshold limit value (TLV) of mercury vapor, mists, fumes, or dust in air is 0.05mg/m3 of mercury.
2. Absorption - liquid mercury and some inorganic mercury compounds will absorb through the skin with the same results as inhalation.
3. Ingestion - the salts of mercury are toxic when swallowed. Pure metallic mercury is not highly poisonous when swallowed; however, mercury compounds which are normally present in metallic mercury used in industry can cause toxic effects upon ingestion.
4. Eyes - the eyes may be injured by contact with mercury compounds, particularly the salts.

Property Damage and Personal Injury Hazards

1. Mercury amalgamates (combines) with many metals and may cause serious damage in metal systems. Watches, rings, and other jewelry can be ruined by contact with mercury.
    1. Mercury and some compounds of mercury will form explosive compounds with acetylene or in the presence of ammonia or with mixtures of nitric acid and ethyl alcohol (e.g., denatured alcohol or Solox). Chlorine dioxide and liquid mercury explode violently.
    2. Mercury batteries and anode cells may explode if exposed to fire or when short circuited.

Protective Measures

1. Mercury vapor can be generated from metallic mercury if spills are not cleaned-up immediately. Every effort must be made to contain or control the vapor. Particular attention should be given to mercury systems which are to be heated or pressurized. In locations such as the mercury storage room where mercury is routinely handled and potential for exposure exists the industrial hygiene contractor will be requested to perform periodic air sampling to ensure that levels do not exceed OSHA prescribed limits.
2. Mercury containers shall be kept tightly closed when not in use. Containers made of stainless steel or plastic must be used.
3. Mercury containers shall be clearly labeled:
   MERCURYWarning! Vapor HarmfulDon't breathe vapor orget liquid on skin.
4. Containers of mercury compounds shall be clearly labeled with the name of the compound followed by:
   MERCURYWarning! Toxic if inhaled,swallowed, orleft on skin.
5. Mercury and its compounds should be stored in a cool, well-ventilated location remote from heat, fire hazards, ammonia, and acids. Mercury should not be stored in the vicinity of floor drains which empty directly to sewer systems unless provisions are made to contain the total quality of mercury if spilled. Mercury and mercury systems shall not be stored where they will contaminate workroom atmospheres.
6. Adequate local exhaust enclosures shall be provided on systems which might generate vapors, mists, or dust of mercury or its compounds.
7. Good general room ventilation shall be provided in workrooms housing mercury systems. Room air supply grilles should be arranged to provide positive fresh air movement to workbenches and work areas where mercury is normally handled or is likely to be spilled.
8. When possible, manual operations which might generate vapor, mists, or dusts (cleaning, heating, brushing, grinding, welding, soldering etc.) shall be done under a laboratory hood with a fully open average face velocity of no less than 100 feet per minute or with a flexible exhaust pickup as near as possible to the source.
9. If the task cannot be moved to a location where exhaust control can be applied, all workers entering the area shall wear respiratory and skin protection.
10. A fume hood should always be used to collect vapors when mercury or mercury compounds are heated in a manner to release vapors to the atmosphere.
11. Transfer of mercury or clothing contaminated with mercury should be done in total containment systems or under adequate laboratory hoods.
12. Mercury respirators should be worn if control is felt to be inadequate. If mercury is to be poured into containers, a plastic funnel should be provided and used.
13. All transfers shall be made over spill trays.
14. Stainless steel or high-impact plastic spill trays shall be placed under all mercury systems and operations which have a potential to break or spill. The tray area and the rim height shall be sufficient to capture and contain all spills with a comfortable margin of safety. Mercury shall not be allowed to stand in spill trays but shall be collected immediately after spills occur. Water may be kept in spill trays to suppress the escape of vapors from spilled mercury.

15. The floors and lower walls in rooms where mercury is used should be smooth, well-sealed, free of cracks, and nonporous. Rooms with wooden floors should not be used for mercury operations. If large amounts of mercury are routinely handled, the floor should slope toward a mercury sump where mercury can be collected under water and recovered.
16. Bench and table tops where mercury is handled should be made of a nonporous, crack-free material which will not retain spilled mercury droplets after decontamination. Otherwise, spill trays shall be placed under the work to prevent contamination of the workbench or table.
17. Manometers and other such mercury systems shall be equipped with traps and check valves, or both to prevent blowout.
18. Where possible, transparent plastic shields shall be used in front of manometers and other mercury systems as a preventive measure against accidental breakage.
19. Mercury or its compounds shall not be disposed of in any amounts by dumping into any system which may eventually empty into the public watershed or water supplies.
20. Mercury shall not be allowed to contact ammonia, acetylene, or chlorine dioxide nor to mix with nitric acid and ethyl alcohol.
21. Metallic mercury shall not be put into sewer or sink drains.
22. Vacuum pumps serving mercury systems shall be equipped with trapping or filtering systems adequate to capture mercury vapors and droplets which might otherwise be released to the atmosphere in the pump discharge.
23. Mercury should not be used in metal systems where amalgamation might cause damage. Among the metals which form amalgams are zinc, copper, lead, tin, silver, gold, platinum, cadmium, aluminum, bismuth, sodium, and potassium. Contact between mercury and aluminum will result in a rapid corrosive action.

Personal Protection

1. Good housekeeping and personal hygiene are necessities for work forces handling mercury.
2. No food, drinks, tobacco products, pipes, or eating and drinking utensils shall be permitted in areas where mercury contamination may occur.
3. Impervious gloves shall be worn while doing tasks which may contaminate the hands with mercury or its compounds.
4. Employees who handle mercury and mercury compounds shall thoroughly wash their hands before eating, drinking, or smoking. Contaminated cigarettes or smoking with contaminated hands can result in particularly high and dangerous inhalation exposures. The hands should be thoroughly washed at the end of each task involving the handling of mercury or its compounds even if gloves are worn.
5. Persons who handle mercury should rinse their mouth several times before lunch and breaks and at the end of the shift.
6. Clothing should be checked for mercury following a spill or blowout since mercury can be accidentally deposited in cuffs, folds, and interstices of the clothing. If clothing is contaminated, the employee should shower and change to clean clothes. Contaminated clothing should be put in an impervious bag and disposed of through the Environmental staff.
7. Where possible, equipment, apparatus, glassware, and other items contaminated with mercury shall be decontaminated or sealed in rugged, airtight containers and clearly labeled before storage. If such containment is impractical due to size or other complicated factors, the equipment shall be clearly labeled as contaminated and stored in a location where personnel will not be exposed.
8. Before working with mercury, rings and other forms of jewelry which may be damaged should be removed.

Respiratory Protection

1. Approved respiratory protective devices shall be worn for protection against mercury vapors, mists, and dust.
2. Since mercury vapor is odorless and colorless, it gives no warning of its presence in the atmosphere. Special care shall be taken to ensure that cartridges and filters are fresh and that the respirator masks are properly fitted.

Skin, Head, and Foot Protection

Protective clothing, such as aprons, impervious gloves, and rubber boots, shall be worn as needed to prevent skin exposures to mercury and its compounds. If coverall are needed, they should not have cuffs and should fit closely around the wrists, ankles, and neck.

Eye and Face Protection

A faceshield and/or chemical splash goggles shall be worn when handling mercury compounds if mercury mists or droplets may be generated.

Training

Mercury Awareness training, ATIS 00059139, shall be provided to employees who work with or may have exposure to Mercury.

Emergency Procedures

1. When a mercury spill or release of less than a pound occurs, follow the guidelines in Appendix A - Mercury Spill Information and Clean-up Guide. For spills or releases over a pound, the following guidelines shall be followed:
   - Contact the shift supervisor or supervisor / person in charge immediately who in turn shall notify the Hazmat Team. If the spill is in a substation switch house or area controlled by PSO, the Transmission Service Manager over that area should be contacted.
   - Restrict the area of the spill and prohibit unprotected employees from walking on the floor where mercury has been spilled and has accumulated until decontamination is complete.
2. When a spill has occurred, be prepared to give the following information to the responsible supervisor.
   - The approximate amount of mercury spilled and when it occurred.
   - The location of the spill.
   - Approximate temperature of the surfaces and atmosphere where the spill occurred.
   - The presence and location of heat sources.
   - The presence of floor drains.
   - Status of decontamination operations.
   - The names of persons who might have been exposed to mercury.
   - The number of persons working in the area.
3. If spills are less than one pound, the responsible supervisor will call “the TVA industrial hygiene contractor” to conduct air monitoring before clean-up begins.
4. The Haz Mat crew shall wear respiratory protection against mercury vapor, mists, and dusts. They shall wear impervious gloves, boots, and coveralls and additional protective clothing deemed necessary. If needed, they shall wear impervious boots and goggles or a faceshield. Leather-soled shoes shall not be worn for major decontamination tasks unless covered by impervious boots.
5. The shift supervisor will contact the Hazmat clean-up crew and the plant environmental staff.
6. Contaminated clothing shall not be worn outside the restricted area. Mercury barrier creams may be used for supplemental protection of exposed skin area.
7. All possible spill material shall be vacuumed up with a Mer-Vac or equivalent vacuum cleaner.

8. After all possible liquid mercury has been vacuumed up, the surface should be treated with the mercury spill kit. Manufacturer's directions must be followed.
9. For spills over one pound, the approved clean-up vendor, (check current contract list), will be called for clean-up. Removal of barriers from the restricted shall be contingent upon environmental surveys and consultation with the responsible supervisor to assure that decontamination has been effective.
10. Contaminated rags, mops, vacuum cleaner cartridges, etc., shall be sealed in impervious containers and placed in a waste receptacle exclusively reserved and labeled for mercury waste and turned over to the plant environmental staff for disposal.

Technical Data for Mercury

Obtain Material Safety Data Sheet (MSDS) for specific technical data.

Appendix A - Mercury Spill Information and Clean-up Guide

Procedure 911 Pesticides & Herbicides

TVA Safety Manual

911 Pesticides & Herbicides

Procedure Number 911

TVA Safety Procedure

Pesticides & Herbicides

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish requirements for the safe use of pesticides and herbicides.

Control Measures for Use of Pesticides / Herbicides

1. All containers of pesticides and herbicides shall be labeled according to 29 Code of Federal Regulations 1910.1200, “Hazard Communication”.
2. Before working with pesticides or herbicides, the precautionary statements on the label shall be read to ensure proper protective clothing and equipment is being used.
3. Ensure the pest to be controlled is listed on the label. Ensure label directions are read and followed. Ensure the proper pesticide or herbicide is being used and then only the needed amount is used.
4. The hazards associated with pesticides and herbicides are encountered by exposure through handling, mixing, and application.
5. Chemicals shall be applied in a manner that does not cause danger to other people. Chemicals are not to be applied when there is danger of drift that may contaminate water or leave illegal residues.
6. Inhalation and ingestion of chemical sprays or dusts shall be avoided by wearing protective clothing and equipment as specified on the container or by the Material Safety Data Sheet (MSDS).
7. Washing facilities must be available whenever chemicals are in use.
8. Employees shall immediately wash their hands if they have been contaminated with a chemical.
9. Employees shall not eat or drink until washing after pesticide use.
10. In case a pesticide or herbicide is swallowed or gets in the eyes, labels shall be followed and prompt medical attention obtained. If the pesticide or herbicide is spilled on skin or clothing, the clothing is to be removed immediately and skin washed thoroughly. The contaminated clothing is no to be put back on.
11. Review any appropriate Job Safety Analysis prior to pesticide use.
12. Frequently check containers for leaks, tears, or loose lids. If containers are not in good condition, put their contents in a suitable container and properly label them with appropriate precautionary information and instructions.
13. Protect the labels of chemical containers so that they remain legible.

Storage of Chemicals

1. Store chemicals in rooms away from food or water.
2. Since some chemicals are adversely affected by excessive heat, extreme cold and high humidity. Check the label information or the MSDS for special storage requirements. Never store combustible materials in direct sunlight.
3. Store pesticides and herbicides where unauthorized people cannot get to them. Follow the label on pesticide / herbicide containers for correct storage procedures.
4. Sacks, cartons and fiberboard boxes containing pesticides or herbicides should be stored on wooden pallets or on shelves off the floor.
5. An exhaust fan for ventilation should be used in storage rooms to reduce the temperature and high concentration of toxic fumes.
6. Store pesticides and herbicides only in the original container, with the label plainly visible. Never store pesticides in anything used as a food or drink container.
7. Never provide pesticides or herbicides to anyone unless that person has been properly trained. Also, make sure that the entire manufacturer's label appears on the container.
8. If a pesticide or herbicide container becomes damaged, transfer its contents to an appropriate container. Label the new container immediately.

Preparing the Sprayer

1. Before a spraying operation is started, rinse out the sprayer; remove and clean all nozzles, nozzle screens and strainers.
2. For the operator's safety, replace cracked or worn hoses.
3. Adjust the nozzle height and spacing as suggested by the nozzle manufacturer or as specified on the label.
4. Only potable water should be used in the sprayer.

Handling and Mixing

1. Take precautions to avoid exposure when wettable powders, dust or granules are added to the sprayer tank.
2. When you add materials to the sprayer tank, air is forced out and carries some of the pesticide / herbicide particles with it.
3. If the solvent used is toxic or flammable (or both), be sure the mixing operation is performed in an area where ventilation is adequate.
4. The addition of small amounts of materials such as emulsifiers or thickeners will drastically alter the physical properties of the spray solution. Therefore, the applicator should check the product label to be sure she or he is operating according to label instructions.
5. A chemically resistant apron worn during mixing and loading will help prevent full-strength concentrate spills from getting on your clothes and your body.
6. Clean aprons regularly by agitating them in a bucket of hot soapy water. Hang rubberized clothing to air dry; never place in an automatic dryer.
7. Many types of solvents, some of which are chlorinated, are used in the product formulation. Vapors of chlorinated solvents are very dangerous to breathe. They can cause a "high," dizziness, or even unconsciousness. They also can cause permanent damage to the kidney, liver, and nervous system in workers exposed to the vapors for a prolonged time.

Application of Pesticides / Herbicides

1. Always be aware of the weather conditions existing during pesticide / herbicide application.
2. Be alert for nozzle clogging and changes in nozzle patterns. If nozzles clog or other troubles occur, shut the sprayer off and move to an unsprayed area to work on it. If nozzles must be cleaned, use a toothbrush or a toothpick for cleaning — never a metal object. A metal object can damage the orifice in the spray tip and significantly alter the spray pattern. Never try to unclog a nozzle by blowing through it.

Disposal of Pesticides / Herbicides and Containers

1. To avoid having to dispose of unused chemical, check out the job carefully before selecting the pesticide or herbicide. After you have selected the proper chemical, mix only enough for the particular job.
2. Rinse thoroughly, pour into the spray tank.
3. Rinsed containers should not be used for any other purposes except where the label allows the container to be reused or recycled.
4. Disposal of any pesticide / herbicide container or related waste by open dumping or open burning is illegal. Although empty containers that have been properly cleaned can legally be placed in a sanitary landfill.
5. Containers that are not empty cannot be accepted at a sanitary landfill. Some of these waste materials are classified as hazardous.

Spilled Materials

1. After contamination, disposable coveralls should be discarded as hazardous waste in the same way as product containers or bags.
2. Should an accidental spill occur, follow these steps to clean up the spilled pesticide safely:
   - Control the spill by stopping the source of the spill.
   - Contain the spill so that it does not spread and get into water sources.
   - Clean up the spill immediately. Absorbent materials like , pet litter or sawdust should be spread on the spill area to soak up the pesticide. the contaminated material must be shoveled into a leakproof container for proper disposal. Do not flush the area with water or use a cleaning solution, this will help avoid the risks of chemical reaction and groundwater contamination.
   - To help prevent exposure during cleanup, workers should wear the appropriate personal protective equipment. To help prevent exposure in the future, cleanup work clothes and personal protective equipment should be cleaned before work resumes.
   - Finally, take corrective measures to help ensure that another pesticide spill will not occur.

Training

Employees responsible for the storage, handling and application of pesticides and herbicides shall receive raining course “Herbicide / Pesticide Applicator”, ATIS 00059131.

Procedure 912 Refractory Ceramic Fibers

TVA Safety Manual

912 Refractory Ceramic Fibers

Procedure Number 912

TVA Safety Procedure

Refractory Ceramic Fibers

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish guidelines for the safe use and handling of insulation materials containing refractory ceramic fibers (RCF) at all TVA generating stations.

General

1. Cerawool is a non-asbestos containing refractory ceramic fiber (RCF) insulation that is used throughout TVA power plants as an insulation material. It has been used as a replacement material for asbestos for twenty-five (25) years.
2. Cerawool is not currently regulated by OSHA or EPA as a hazardous material and is classified as a nuisance dust. However, recently the International Agency for Research on Cancer (IARC), National Toxicology Program (NTP, Commission of the European Communities (DGXI), State of California, Canadian Environmental Protection Agency (CEPA), and Canadian Workplace Hazardous Information System (WHMIS), all classify RCF's as a known carcinogen, a possible human carcinogen, or reasonably expected to be a carcinogen. This recent information has been used as the basis for this best practices guideline designed to reduce the exposure to and the subsequent health effects to TVA and contract personnel that work with RCFs.
3. In accordance with OSHA's Hazard Communication Standard (HAZCOM), employees that work with RCFs will receive training on the health effects, means of exposure, methods of protection and safe handling of RCF products. The safety training course "Refractory Ceramic Fibers", ATIS Number 00059145, 2 hours, shall be provided to employees exposed to RCFs.

   NOTE: Any employee exposed above the 8 hour Time Weighted Average listed in sections RCF Installation, item #1, After Service RCF Removals, item 1, or Handling RCF Waste Materials item 1 for thirty (30) or more days each year will be required to receive a medical evaluation that is based on the same or similar protocol as asbestos medical examinations. The parameter of exposure to the 8 hour TWA recognized by TVA for 30 or more days each year is consistent with precedence already set by OSHA in other substance specific standards.

Minimize Dust Generation

1. Keep all material in its packaging as long as practicable.
2. Tools and handling techniques that generate the least amount of dust should be used whenever possible. Hand tools should be used whenever possible. To the extent practicable, if power tools are to be used, they should be provided with appropriate dust control systems equipped with HEPA filtration.
3. Practice good housekeeping procedures. To the extent practicable, keep work areas clean and free of scrap RCF material.
4. Employ practicable work practices to minimize the creation of airborne dust. Follow good housekeeping procedures. Vacuum only with HEPA filtered equipment. If sweeping is necessary, use a dust suppressant and place material in closed containers. Do not use compressed air for clean-up purposes.
5. Where repair or maintenance of equipment that is either insulated with RCF or covered with settled RCF dust is necessary, clean the equipment first with a HEPA filtered vacuum (where possible) or wipe the surface clean with a wet rag to remove excess dust and loose fibers.
6. Avoid unnecessary handling of scrap materials to prevent release of RCF. Where practicable, the use of covered or sealed disposal containers is recommended.

Ventilation

1. Prior to recirculation into interior work spaces, air containing RCFs should be filtered by HEPA filtration system designed to capture RCF's. Industrial hygiene monitoring should be utilized to determine the effectiveness of this filtration process.
2. If ventilation systems are used to capture RCFs, they should be routinely checked and maintained in accordance with the instructions and schedule suggested by the equipment manufacturer. It's recommended that such maintenance be scheduled and tracked in EMPAC.

Wear Appropriate Clothing

1. Some individuals develop temporary mechanical skin irritation (which is based on fiber shape - not a chemical interaction) when exposed to RCF. Skin irritation can be avoided by preventing RCFs from coming in contact with the skin. When irritation is of concern, wear long-sleeved, loose-fitting clothing, gloves and head covering to prevent skin irritation.
2. Disposable work clothing (coveralls) will be provided and worn when handling RCFs.
3. Remove RCF dust from work clothes, with a HEPA-filtered vacuum before leaving the work area. In the event a HEPA- filtered vacuum is not available in the work area, the work clothes will be lightly misted with water to prevent release of RCF fibers. The worker will immediately change the RCF contaminated work clothing upon exiting the work area.

Wear Appropriate Personal Protective Equipment

1. To minimize upper respiratory tract irritation and other potential health hazards, measures should be taken to control exposure to airborne fiber. Such measures will be dictated by the work environment and may include appropriate respiratory protective equipment.
2. When respiratory protection is used, the respirators must be certified by NIOSH under 42 CFR Part 84 (see Appendix A Manufacturer's Respiratory Protection Recommendations when Handling RCF Products).
3. Personnel must be medically qualified and fit-tested to wear assigned respiratory protection in accordance with TVA Safety Procedure 312, "Respiratory Protection".
4. Hardhats, gloves, safety glasses with side shields or other forms of eye protection in compliance with the appropriate MSDS or TVA standard must be worn whenever RCF products are being handled.
5. Personal protective equipment must be properly fitted and worn when required.

Removal of Fibers from the Skin and Eyes

1. If fibers accumulate on the skin, do not rub or scratch. Never remove fibers from the skin by blowing with compressed air. Wash exposed skin thoroughly.
2. If a skin rash develops due to mechanical irritation, wash the affected area gently with soap and water and seek medical assistance immediately. The use of skin cream or lotion after washing may be helpful. Do not rub or scratch the exposed skin. Changing into clean clothing is recommended.
3. Should RCFs become deposited within the eye, do not rub the eyes. Flush them with water, or eyewash solution and seek medical assistance immediately.

RCF Installation

1. In the absence of monitoring information which demonstrates that worker exposures are well-controlled (e.g., below 0.5 f/cc, 8 hr. TWA), workers “installing RCFs” shall wear a NIOSH certified, half-face piece, air purifying respirator, to be used in conjunction with P100 particulate filter cartridges. Higher airborne fiber concentrations require different levels of respirator protection (see Appendix A and B).
   Note: Industrial hygiene surveys should be conducted at least annually to determine the concentration of insulation fibers.
2. To minimize exposures, the work area should be established and identified as a “Regulated Area” for individuals involved in the installation project. All workers performing installation activities shall wear disposable work clothing, safety glasses with side shields or other forms of eye protection, hard hat and gloves in compliance with the appropriate MSDS or TVA standard.
3. The installation of RCF “modules” often requires a procedure referred to as “tamping,” to close gaps between modules and to create uniformity of the refractory surface. When feasible, spray the surface of RCF furnace modules lightly with a liquid surface treatment prior to tamping to reduce the generation of airborne dust. When spraying of a surfactant is not feasible, a minimum of a NIOSH certified, half-face piece, air-purifying respirator to be used in conjunction with P100 particulate filter cartridges shall be worn by all workers tamping RCF modules.
4. All scrap RCF cuttings and debris should be placed in closed containers or sealed bags prior to transportation to an approved disposal facility designated by the TVA Environmental Staff.

After Service RCF Removals

1. In the absence of monitoring information which demonstrates that worker exposures are well-controlled (e.g., below 0.5 f/cc, 8 hr. TWA), workers “removing after-service RCF” from an enclosed space shall wear a NIOSH certified, full face piece, air purifying respirator to be used in conjunction with P100 particulate filter cartridges. (see Appendix A and B)
   Note: Industrial hygiene surveys should be conducted at least annually to determine the concentration of insulation fibers.
2. To minimize exposures, the work area should be established and identified as a “Regulated Area” for individuals involved in the removal project. All workers performing removal activities shall wear disposable work clothing, safety glasses with side shields or other forms of eye protection, hard hat and gloves in compliance with the appropriate MSDS or TVA standard.
3. Whenever it is practicable, mist after-service RCF intended for removal, with amended water to reduce the generation of airborne dust during handling. Discretion is required - use limited amounts of water to avoid creating other workplace hazards (e.g., slipping, electrical) and to prevent material from falling due to oversaturation. When wetting is not practicable, respiratory protection selected in accordance with Appendix A will be utilized and HEPA vacuuming will be used to collect dust and debris in the work area.

4. All after-service fiber debris shall be placed in closed containers or sealed bags prior to transportation to an appropriate disposal facility designated by the TVA Environmental Staff.
   NOTE: RCFs' that have been subject to high temperatures above 1000 degrees C (1832 degrees F) can generate crystalline silica dust when the product is handled and removed, (e.g. boiler waterwalls). Crystalline silica is an established health hazard. This removal situation must be planned for in advance, with input from line management, environmental affairs and industrial safety.

Handling RCF Waste Materials

1. In the absence of monitoring information which demonstrates that worker exposures are well-controlled (e.g., below 0.5 f/cc, 8-hr. TWA), workers engaged in RCF removal and disposal shall wear a NIOSH certified, half-face piece, air purifying respirator, to be used in conjunction with P100 particulate filter cartridge. All workers engaged in waste handling activities shall wear safety glasses with side shields or other forms of eye protection, hard hats and gloves in compliance with the appropriate MSDS or TVA standard (see Appendix A and B).
2. Careful handling techniques shall be employed. Vigorous movement or agitation of RCF materials can cause unnecessary amounts of airborne dust. To minimize the generation of airborne dusts, do not throw or drop RCF products, wastes, or scraps. The use of smooth, deliberate motions to move RCF materials is recommended.
3. When feasible, RCF waste materials should be wetted with a mist of water or other wetting agents to reduce the generation of airborne dusts. RCF waste material should be placed in covered containers or bags.

Monitor Workplace Exposures

1. PSC Industrial Hygiene Team is the TVA Industrial Hygiene contract service provider for work-place exposure monitoring. Workplace exposure monitoring is required until a statistically defensible baseline of exposure to RCF associated with different types of work activities can be established.
2. PSC can assist the line organization with work-place control measures, exposure assessments, and can provide assistance in identifying activities to reduce potential exposure to employees.
3. PSC shall provide monitoring data for inclusion in the TVA industrial hygiene data system for historical reference, analysis and future job planning involving RCF.

Appendix A - Manufacturer's Respiratory Protection Recommendations When Handling RCF Products

MANUFACTURER'S RESPIRATORY PROTECTION RECOMMENDATIONS WHEN HANDLING RCF PRODUCTS

Respirable Airborne Fiber Concentration	Respirator Recommendation
When individual workers request respiratory protection as a matter of personal comfort or choice where exposures are "reliably" below 0.5 f/cc	A NIOSH-certified respirator, such as a disposable particulate respirator, or respirators with filter cartridges rated N95 or better
Not yet determined but expected to be below 5.0 f/cc based on operation	Half-Face, air-purifying respirator equipped with a NIOSH-certified P100 filter cartridge
"Reliably" less than 0.5 f/cc	See recommendation below for individual worker requests
0.5 f/cc – 5.0 f/cc	Half-face, air purifying respirator equipped with a NIOSH-certified P100 particulate filter cartridge
5.0 f/cc – 25 f/cc	Full-facepiece, air purifying respirator equipped with a NIOSH-certified P100 particulate filter cartridge or PAPR
25 f/cc - 50 f/cc	PAPR with tight-fitting full facepiece or a supplied air respirator in continuous flow mode

> 50 f/cc	Pressure Demand Supplied Air

Appendix B - RCF Job Categories Guideline

RCF JOB CATEGORIES GUIDELINE

JOB CATEGORY

INSTALLATION (Primarily TVA Contractors) JOB CATEGORY

Discussion

Installation tasks cover the process of applying RCF insulation (primarily blanket and/or modules, and sometimes board) to large industrial furnaces, reactors, high temperature piping systems and other large equipment. Usually, the size of the equipment, location of the work (inside of a furnace), and relatively infrequent nature of these jobs precludes the use of typical engineering controls to reduce airborne RCF concentrations. Specifically, 0.5f/cc may be exceeded frequently only when RCF is being installed and the RCF material is being cut to fit, or tamped (tamping is the process of striking installed RCF modules with a flat surface such as a board in order to seat the modules against the furnace wall, line them up and close gaps). Installation of RCF with no cutting or tamping is excluded from the list of respirator-required jobs. Also excluded are application of RCF cements or topcoats to furnace linings (if no cutting or tamping is being done).

Respirator-Recommended Tasks

Installation tasks for which respiratory protection is recommended include:

RCF Form:	-Blanket
	-Modules
	-Board
Tasks:	-Workers cutting or tamping RCF
	-Hanging blanket or installing modules while other workers are cutting or tamping nearby

Type of Respirator Recommended

- To address fiber exposures, use the respirator specified in the applicable MSDS or, if one is not specified, refer to Appendix A -Manufacturer's Respiratory Protection Recommendations When Handling RCF Products.

JOB CATEGORY

REMOVAL (MAJOR) (Primarily TVA Contractors)

Discussion

The major removal job category covers tasks involved with removal of after-service RCF insulation from industrial furnaces, high temperature piping systems, reactors, etc. Major removals are defined as those removals where entire furnace linings (or large portions such as sides or roofs) are removed.

Because many major removal jobs occur in confined spaces (inside furnaces), and because major removals are infrequent at any given site, engineering controls are generally not applicable. Pre-wetting is sometimes used in an effort to limit dust levels, but monitoring results have shown that this has only limited effectiveness. Major removals are done as quickly as possible (to limit down time) using mechanical tools or a high-pressure water lance; in the process, relatively high airborne RCF concentrations may be generated. Major removals should be expected to have the highest average workplace fiber concentration among all job tasks. Because there is currently no effective

engineering control method for major removals, it is recommended that all workers involved with major removals use respiratory protection.

Respirator-Recommended Tasks

Major removal tasks for which respiratory protection is recommended include:

RCF Form:	-Blanket (after service)
	-Modules (after service)
	-Board (after service)
Tasks:	-All workers removing RCF (including water lance operators)
	-All workers bagging and disposing of removed RCF
	-All workers cleaning or sweeping up after removal

Type of Respirator Recommended

- To address fiber exposures, use the respirator specified in the applicable MSDS or, if one is not specified. refer to Appendix A -Manufacturer's Respiratory Protection Recommendations When Handling RCF Products.

Removal Major:
Removal project will exceed 260 linear feet, 160 square feet or 35 cubic feet

JOB CATEGORY

REMOVAL (MINOR) (Primarily TVA Maintenance and Contractors)

Discussion

Minor removals are defined as removal of after-service RCF from spot removal of damaged modules to repair “hot spots”. These removals are smaller in scale than major removals, and are usually performed in relatively open ventilated areas. Concentrations associated with minor removals can be expected to be significantly lower than those for major removals. Because the RCF concentrations are lower than for major removals, half-face respirators are recommended rather than full-face.

Respirator-Recommended Tasks

Minor removal tasks for which respiratory protection is recommended include:

RCF Form:	-Blanket (after service)
	-Modules (after service)
	-Board (after service)
Tasks:	-All workers removing RCF
	-All workers bagging and disposing of removed RCF
	-All workers cleaning or sweeping up after removal
	-Supervisors and other workers in the vicinity during removal

Type of Respirator Recommended

- To address fiber exposures, use the respirator specified in the applicable MSDS or, if one is not specified. refer to Appendix A -Manufacturer's Respiratory Protection Recommendations When Handling RCF Products.

Removal Minor:
Removal project will not exceed 260 linear feet, 160 square feet or 35 cubic feet

Procedure 913 Silica

TVA Safety Manual

913 Silica

Procedure Number 913

TVA Safety Procedure

Silica

Revision 0

January 6, 2003

Purpose

This procedure establishes the requirements and guidelines for reducing employee exposure to silica.

General Requirements

This procedure shall be followed when an employee performs any of the following work or could be exposed to silica dust from any of the following tasks:

- Operating and maintaining limestone processes
- Chipping, hammering, or mixing of boiler refractory
- Chipping, hammering, or drilling of rock
- Crushing, loading, hauling, or dumping of rock
- Abrasive blasting using silica sand as the abrasive medium
- Abrasive blasting of concrete regardless of the abrasive medium
- Sawing, hammering, drilling, grinding, or chipping of concrete or masonry products
- Shipping, hammering, or mixing of concrete grout
- Demolition of concrete or masonry structures
- Dry sweeping or compressed air blowing of concrete, masonry, rock, or sand dust.

Exposure Assessment

1. Plant / Facility Manager shall assume if work involves any of the above described tasks, that employees will be exposed to silica.
2. If an employee could be exposed to silica dust, the immediate supervisor shall ensure the employee has received specific hazard communication training prior to start of work.
3. When the work will likely produce large amounts of dust which will be difficult to eliminate with normal engineering controls or the work task is repetitive, the immediate supervisor should contact his/her safety consultant and ensure industrial hygiene personal and area sampling is conducted to determine that correct engineering controls and safe work practices are used.
4. If the Industrial Hygiene Survey results are below the Permissible Exposure Limit (PEL), 10 mg/m, this procedure does not apply. If no monitoring was conducted, the immediate supervisor shall assume silica dust to be above the PEL.
5. Each employee who had personal monitoring performed shall be notified in writing of their exposure results within five (5) working days after receipt of the sampling results. Area Monitoring results shall be posted in a prominent location at the work area so all employees have access to the sampling data.

Engineering Controls

1. When sampling results indicate exposure limits above the calculated PEL, engineering controls will be used.
2. Examples of acceptable engineering controls are:
   - Substitute blasting material for less hazardous material less that 1% silica
   - Maintain an effective dust control program
   - Use internal blast-cleaning machines and cabinets
   - Wet saw
   - Use of water through the drill stem when drilling rock
3. After initiating engineering controls, the work area will be evaluated to assure dust levels have been reduced to acceptable levels. If dust can not be totally controlled, area sampling will be required to ensure levels are below the PEL.

Respiratory Protection

1. Employees exposed to silica at or above the PEL shall wear respiratory protection.
2. The employee exposure monitoring shall determine the level of respiratory protection. Respirators will be selected from the chart below:

Airborne Concentration of Silica	Required Respirator
< .5 mg/m3 Protection Factor 10 X PEL	Any half-mask air purifying respirator with HEPA filter
< 1.25 mg/m3 with Protection Factor 25 X PEL	Any Powered, air purifying respirator HEPA filter or supplied air respirator
< 2.5 mg/m3 with Protection Factor 50 X PEL	Any full face air purifying respirator HEPA filter
< 50 mg/m3 Protection Factor 1,000 X PEL	Supplied air respirator
< 100 mg/m3 Protection Factor 2,000 X PEL	Supplied air full face respirator

3. The common dust mask will not be used when exposure limits are at or above the calculated PEL.
4. Supervisors shall refer to TVA Safety Procedure 312, “Respiratory Protection (Non-nuclear) for further guidelines.
5. Personal monitoring is required if respiratory protection is required to determine if the protection factor of the respirator is adequate.

Work Practices

Work areas where engineering controls can not control dust, will be established as a regulated area and employees will adhere to the following work rules:

- No employee exposed to silica shall eat, drink, or use tobacco products in regulated areas.
- All employees will wash hands and face before eating, drinking, or using tobacco products outside regulated areas.
- Any employee that may be exposed to silica at or above the calculated PEL shall wear as a minimum coveralls, gloves, and shoe coverlets. Additional protective equipment such as face shields or mono goggles may be required.
- Plant / facility manager or their designee shall designate employee parking areas such that parked cars will not be contaminated by silica dust.
- Work areas where the silica levels are at or above the calculated PEL shall be regulated and access controlled. Site/Area Manager shall initiated controls to prevent silica contaminated dust from escaping the regulated area.
- Regulated areas shall be clearly marked with warning signs to warn other employees of silica exposure. The warning sign shall read:

WARNING!

Crystalline Silica

Work Area

Improper handling or exposure

to dust may cause silicosis (a

serious lung disease) and death.

REPSIRATOR REQUIRED

Medical Monitoring

1. Medical examinations are not required unless an employee is continually exposed to silica or have received one or more acute exposures to silica.
2. **Consult your local medical provider or the TVA Health Services if an employee meets this criteria.**
3. Employees required to wear respiratory protection require a medical clearance.

Definitions

Silica -The basic component of sand, quartz, and granite rock that has been linked to silicosis, chronic obstructive pulmonary disease, bronchitis, vascular diseases, tuberculosis, and lung cancer when its dust and particulates have been inhaled.

Silicosis - A fibrotic condition of the lung caused from inhaling crystalline silica where breathing becomes difficult and death may result.

Permissible Exposure Limit (PEL) - Unlike other hazardous substances where OSHA has established a fixed PEL, the exposure limit depends on the percent of silica in a product. To determine the PEL, the formula to be used is:

$$\frac{10\text{mg/m}}{(\%\text{of Silica})+2} = \text{PEL}$$

Example on determining PEL

A product contains 15% crystalline silica

10mg/m

$$\frac{}{(15\%)+2} = .59 \text{ mg/m3 (PEL for Product)}$$

Reference

- 29 Code of Federal Regulations 1926.55, “Gases, Vapors, Fumes, Dust, and Mists”

Procedure 914 Sulfuric Acid

TVA Safety Manual

914 Sulfuric Acid

Procedure Number 914

TVA Safety Procedure

Sulfuric Acid

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish requirements for the safe handling and transfer of sulfuric acid.

Hazards of Sulfuric Acid

1. Sulfuric acid is highly corrosive to most metals, generates hydrogen gas in contact with metals, is a strong oxidizing agent, reacts exothermically with water, is a strong skin irritant, and will cause severe burns.
2. Exposure to sulfuric acid vapors shall be avoided.

General Requirements

1. Each supervisor responsible for transfer activities ensures that his employees are knowledgeable in safety precautions applicable to the transfer of sulfuric acid solutions.
2. A Job Safety Analysis shall be developed for transfer operations involving sulfuric acid.
3. The transfer area is placarded with DANGER - ACID/ UNLOADING IN PROGRESS signs.
4. Nonessential employees are prohibited within 20 feet of the transfer area.
5. Smoking, welding, cutting, and other flame or heat-producing operations are prohibited in the transfer area.
6. Personnel engaged in transfer operation, as a minimum, use the following safety equipment:
   - Chemical goggles and a faceshield.
   - Rubber gloves.
   - Rubber boots.
   - Protective rubber aprons or acid-proof clothing.
   - Faceshields or acid hoods are worn during venting operations or breaking pipe connections.
7. An emergency shower and eyewash shall be operational within 30 feet of the transfer area. (The emergency shower and eyewash shall be tested prior to the start of transfer operations.)
8. A washdown capability shall be available in the immediate transfer area for diluting liquid spills and leaks.
9. Transfers shall not conducted during the hours of darkness unless adequate illumination is provided.
10. For vendor tank truck deliveries, the truck attendant is present during the transfer operation.
11. If the truck attendant leaves the transfer area, the operation is terminated until the attendant returns.
12. Making or breaking connections while the system is under pressure or contains liquid is prohibited. In the event of a leak during transfer, the operation is discontinued and the line depressurized and drained of liquid before tightening or loosening the connection. The supply valve shall be closed and the line depressurized and drained of liquid before tightening or loosening the connection.

Safety Precautions for Sulfuric Acid

1. Flex hoses used in transfer operations are designed for use with sulfuric acid and have a manufacturer's rating of at least 50 psi.
2. Flex hoses used in transfer operation are appropriately identified by some marking that states TO BE USED FOR ACID ONLY and are identified by some marking that indicates the pressure rating of the hose. Hoses are hydrostatically tested yearly, and the results of these tests are documented.
3. All fittings, couplings, adapters, and disconnects that may be required to adapt the discharge line (flex hose) to the unloading vessel and facility system are made of 316 stainless, are rated at least 50 psi with a 4:1 safety factor, and are identified for ACID ONLY. Do not use cast iron. Quick couplers, adapters, O-rings, and gaskets, designed for use with sulfuric acid are used.
4. All hand tools used for making and breaking pipe connections and associated fittings and couplings that contain (or have contained) sulfuric acid are made of sparkproof material, preferably bronze.

Associated Transfer Systems

1. Sulfuric acid solutions are received in liquid form by tank truck and transferred from the truck vessel to the plant receiving vessel by using a pressure transfer mode of operation or a pump transfer mode of operation. Either mode is approved for plant use.
2. When compressed air is selected for transferring the liquid, the plant air supply may be used. Plant air is supplied through an industrial-type hose, rubber-lined, having a 100-psig rating. If the hauler's air compressor is used, no more than 20-psig pressure is used. The safety relief valve operates at no more than 25 psig.
3. The plant air line is provided with a regulating-type, pressure-reducing valve set at not more than 20 psig; a safety valve set at 25 psig; a rupture disc at 32 psig; a pressure gauge; and a bleed valve to bleed line pressure.

Liquid Transfer Procedure

1. In the absence of a specific site procedure, the following steps shall be followed during transfer using the plant air supply.
2. As soon as the driver has positioned the truck for unloading, the truck is braked and the rear wheels are chocked.
3. The transfer area is cleared of all nonessential employees and the appropriate DANGER signs are displayed. Essential employees suit up in applicable protective clothing.
4. CAUTION: The next step vents the truck vessel. Stay clear of vent line until vessel is depressurized.
5. The driver opens the truck vent valve and depressurizes the truck vessel in preparation for sampling and connecting the truck to the receiving vessel.
6. When plant sampling crew is ready, the driver opens the dome carefully and a sample is taken for analysis of truck vessel contents.
7. After the sample has been taken, the driver closes the dome.
8. Set up the plant receiving system. Verify the plant unloading valve is closed, if applicable. Cautiously remove dust plug or cap from the unloading connection.
9. Connect the flex hose between the truck vessel and plant receiving system
10. Ensure that the hose is marked for the liquid being transferred.
11. Slowly open the plant air supply line and purge the line of moisture. Lift lever on the system relief valve to ensure it is operative. Connect the supply line to the trailer air supply system, if applicable.
12. Check plant receiving systems. Verify all receiving valves are closed to prevent inadvertent mixing of acid. Verify that receiving vessel is at ambient pressure and vent valve is open.
    Note: Verify that sample results are acceptable prior to proceeding to the next step.
13. CAUTION: The next step starts liquid transfer from the truck vessel to the plant receiving vessel at ambient pressure.

14. Observe the system for leaks.
15. Slowly open the plant receiving valve. Observe for leaks. Slowly open the trailer unloading valve. Observe for leaks. If leaks are detected, tighten connections before pressure is added. (Establish integrity of the system while at ambient pressure.)
16. With the plant air supply valve, slowly increase truck vessel pressure to 15 psig. (Do not exceed 20 psig.) Check the transfer system for leaks.
17. When truck vessel has been unloaded, close off plant receiving valve and close plant air supply valve. Vent air line or open truck vessel vent valve to depressurize truck vessel and air line.
18. Disconnect flex hose from trailer vessel. Disconnect plant air supply line from truck.
19. Wash down transfer area.
20. Disconnect flex hose from plant receiving system, flush the line, and replace dust plug or cap over unloading connection.

First Aid Treatment

Irrigate eyes with water for at least 15 minutes. Wash contaminated areas of body with soap and water. Contact medical personnel immediately.

Equipment Storage Cabinet

An equipment storage cabinet shall be located near any acid storage tank. The cabinet shall contain the following equipment as a minimum:

- Two "DANGER - ACID UNLOADING IN PROGRESS" signs
- Four chocks for truck
- Four pairs of rubber gloves
- Two faceshields
- Two sets of acid-proof clothing, or
- Two rubber aprons
- Two pair of rubber boots
- Two pair of chemical goggles
- One 50-foot water hose for washdown
- 100 feet of "DANGER - KEEP OUT" barricade tape

Procedure 915 Hexavalent Chromium

TVA Safety Manual

915 Hexavalent Chromium

Procedure Number 915

TVA Safety Procedure

Hexavalent Chromium

Revision 3

December 12, 2008

Purpose

This procedure establishes requirements and responsibilities for reducing employee exposure to hexavalent chromium [Cr (VI)].

NOTE: All requirements of this procedure must be implemented by November 27, 2006, with the exception of engineering controls (see paragraph 4.), which must be implemented by May 31, 2010.

General Requirements

All job tasks that can potentially expose employees to hexavalent chromium will be assumed to be above the action level of 2.5 $\mu g/m^3$ unless objective data shows exposures will be below the action level. Work that may expose personnel to hexavalent chromium include but are not limited to:

- Boiler Work with metals containing chromium compounds
- Handling or exposure to fly ash
- All hot work with stainless steel metals and filler metals
- Hot work on coated surfaces containing chromium
- Coating operations using chromium compounds

Exposure Assessment

1. All work with Chromium containing products requires an assessment based on employee monitoring data. This data may be historic, specific to the site or may be generated during the initial work periods for each task.
2. Unless otherwise determined through air monitoring, all work which could expose personnel to hexavalent chromium must be assumed to expose personnel above the action level of 2.5 $\mu g/m^3$.
3. During initial employee exposure monitoring, all workers in the areas of exposure shall wear protective clothing and half face respirators with HEPA filters as a minimum. This equipment shall be worn until monitoring data demonstrates hexavalent chromium levels are below the action level of 2.5 $\mu g/m^3$. If employee exposure monitoring (specific to the area where work is to be performed) or objective data indicates a time weighted average:
   - Below 2.5 $\mu g/m^3$. Cr (VI) - no further sampling required after the result is confirmed by three shifts of sampling. If a negative exposure assessment is confirmed, no protective measures are required.
   - At or above 2.5 $\mu g/m^3$. Cr (VI) but below 5 $\mu g/m^3$. - sampling continues a minimum of once every six months or until new engineering controls reduce concentrations to below 2.5 $\mu g/m^3$.. Protective measures as indicated in the compliance plan shall be utilized.

- Greater than 5 μg/m^3. Cr (VI) - employee exposure monitoring is required as a minimum every three months. Protective measures as indicated in the compliance plan shall be utilized.

4. Each employee monitored shall be notified in writing of their exposure results within fifteen (15) working days after receipt of the sampling results. Monitoring results after receipt shall be posted in a prominent location in the work area so all employees have access to the sampling data.
   Exception: Contractors performing work that falls within the OSHA construction standards (29 CFR 1926) must follow the same requirements except the notification must be made within five (5) working days.
5. New exposure assessments shall be conducted at any time when a change to existing operations occurs. Examples include use of new tools, changes in material usage, or installation of new engineering controls.

Engineering Controls

1. When sampling data indicates levels above 2.5 μg/m^3 as a time-weighted average (TWA) for hexavalent chromium, the responsible supervisor will implement engineering controls to reduce employee exposure.
2. An example of an engineering control is local exhaust ventilation that is filtered and vented to an outside location. Note: filters used in local exhaust ventilation for hexavalent chromium must be disposed of as contaminated waste.

Compliance Plan

1. A written compliance plan is required for all work where workers may be exposed to hexavalent chromium levels above the TWA of 2.5 μg/m^3. The written compliance plan shall be prepared prior to commencement of work or within twenty four (24) hours after personal exposure sampling data indicates levels above 2.5 μg/m^3. TWA hexavalent chromium.
2. As a minimum, the written compliance plan shall contain the following:
   - Description of each work activity where exposure is likely to occur. This will include location, crew size, work to be prepared, and method work will be accomplished.
   - Air monitoring data used to determine if employees will be exposed to Cr (VI) greater than 2.5 μg/m^3. TWA.
   - Description of engineering controls implemented to reduce employee exposure. If engineering controls can not be achieved, the reason they can't must be stated and what steps are being taken to prevent employee exposure (i.e. respiratory protection and protective clothing).
   - Detail schedule for the implementation of the compliance plan.
   - Description of method used to notify other employees or contractors of possible exposure to hexavalent chromium when they work in the areas where exposures may exceed the action level.
3. The written compliance plan shall be reviewed by a safety or industrial hygiene professional prior to implementation.

Respiratory Protection

1. Employees exposed to hexavalent chromium levels greater than 2.5 μg/m^3. TWA shall wear respiratory protection. Note: Respiratory protection is used only when engineering controls are not feasible.
2. The level of respiratory protection shall be determined from employee exposure monitoring data. Respirators shall be selected from the chart below.

AIRBORNE CONCENTRATION OF HEXAVALENT CHROMIUM	REQUIRED RESPIRATOR
Not in excess of 50 μg/m^3.	Any half mask air-purifying respirator with HEPA filters.
Not in excess of 250 μg/m^3.	Any full face air-purifying respirator with HEPA filters.
Not in excess of 5,000 μg/m^3.	Powered air-purifying respirator With HEPA filters, full face.
Not in excess of 50,000 μg/m^3.	Supplied air respirators with full facepiece operated in positive pressure mode.
Unknown or + 50,000 μg/m^3.	Any full face self-contained breathing apparatus operated in positive pressure mode.

3. All negative pressure respirators shall use high efficiency HEPA filters or the equivalent under current NIOSH regulations.
4. Employees required to wear respirators will be fit tested annually and have a current medical approval for respirator use in accordance with requirements found in TVA Safety Procedure 312, [[Safety:Chapter 1 Section 3 Proc 312|“Respiratory Protection”

Work Practices

1. Employees exposed to hexavalent chromium above the action level of 2.5 μg/m^3 or greater shall wear as a minimum coveralls, gloves, head covers, and shoe coverlets (with non-slip soles). Additional protective equipment such as face shields or mono goggles may be required.
2. The responsible supervisor shall provide clean change areas adjacent to the work area for employees to change their clothes. Clean protective clothing shall be provided upon re-entry. Employees shall remove all protective clothing and equipment contaminated with hexavalent chromium at the end of the work shift or at the completion of their task involving hexavalent chromium.
3. Employees shall not be allowed to remove protective clothing or equipment contaminated with hexavalent chromium from the workplace unless for laundering.
4. When contaminated protective clothing or equipment is removed for laundering, cleaning, maintenance, or disposal, ensure that it is stored and transported in sealed, impermeable bags or other closed, impermeable containers.
5. All bags containing contaminated protective clothing or equipment shall be clearly tagged as indicated in Appendix A.
6. TVA shall inform any person who launders, cleans or maintains protective clothing or equipment contaminated with chromium (VI) of the potentially harmful effects of exposure to chromium (VI) and that the clothing and equipment should be laundered or cleaned in a manner that minimizes skin or eye contact with chromium (VI) and effectively prevents the release of airborne chromium (VI) in excess of the PEL.
7. Those personnel who have been appropriately informed of the hazards and controls associated with hexavalent chromium are authorized to open bags.
8. All surfaces are maintained as free as practicable of accumulations of hexavalent chromium. All spills and releases of chromium (VI) containing material are cleaned up promptly.
9. The responsible supervisor shall provide adequate washing facilities readily accessible to the work area for employees use. Consult a safety or industrial hygiene professional for further requirements when the PEL has been exceeded.
10. Employees are prohibited from smoking, eating, or chewing tobacco in work areas where Hexavalent Chromium exceeds the Action Level of 2.5 μg/m^3. Employees shall wash their hands and face prior to eating.
11. Work areas where exposure to hexavalent chromium exceeds the PEL of 5 μg/m^3 shall be marked as a regulated area and access will be controlled. The responsible supervisor shall initiate controls to prevent dust contaminated

with hexavalent chromium from escaping the regulated area.

12. Regulated areas shall be clearly marked with warning signs to warn other employees of hexavalent chromium exposure. The warning signs shall read: **DANGERHEXAVALENT CHROMIUM (VI)CANCER HAZARDCAN DAMAGE SKIN, EYES, NASALPASSAGES AND LUNGSAUTHORIZED PERSONNEL ONLYRESPIRATORS REQUIRED IN THIS AREA**

Medical Clearance

1. Employees who are or may be occupationally exposed to hexavalent chromium at or greater than the action level of 2.5 $\mu g/m^3$ for thirty (30) days or longer shall pass a medical examination as described in OSHA 29 CFR 1910.1026(k). Contact TVA Medical or Safety if any employee meets this requirement. The initial examination for employees meeting these requirements must be performed within 30 days after initial assignment.
2. All employees working in a regulated area shall have a current medical clearance to wear a respirator.

Training

1. Any TVA employee or augmented employee that may be exposed to hexavalent chromium levels greater than the action level of 2.5 $\mu g/m^3$ for 30 or more days a year shall receive “Hexavalent Chromium” training, ATIS 00059205, prior to beginning work and annually thereafter.
2. As a minimum the training shall consist of:
   - Content of this procedure.
   - Location, manner of use and release of Hexavalent Chromium in the workplace
   - The hazards associated with exposure to Hexavalent Chromium and its effects on health.
   - Safe work practices and engineering controls to minimize exposure.
   - Respirator selection and proper use.
   - Medical surveillance program as described in 29 CFR 1910.1026.
   - Measures employees can take to protect themselves, including modification of personal hygiene and habits such as smoking.
   - Emergency procedures.
   - The employee’s right of access to medical and exposure records as described in OSHA 29 CFR 1910.1020.
3. Employees shall also be advised where a copy of 29 CFR 1910.1026 is available for their review.

Recordkeeping

1. TVA Safety, TVA Health Services and the industrial hygiene services provider shall assure that all TVA employee exposure monitoring results and medical records involving an employee exposure to hexavalent chromium are retained and properly stored.
2. OSHA regulations require all records be stored for the duration of employment plus 30 years.

Definitions

Hexavalent Chromium, Chromium (VI), or Cr[VI] – means chromium with a valence of positie six, in any form and in any compound.

Historical monitoring data - data from chromium (VI) monitoring conducted prior to May 30, 2006, obtained during work operations conducted under workplace conditions closely resembling the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations.

Hot Work - Hot work is any activity which requires the use of an open flame, controlled electrical arcing, grinding which produces sparks, or a heat source capable of causing ignition of combustible material. These activities include activities such as welding, cutting, grinding, and soldering.

Action Level (AL) - Concentrations of Hexavalent Chromium, 2.5 μg/m^3 averaged over an eight hour period.

Objective data - means information such as air monitoring data from industry-wide surveys or calculations based on the composition or chemical and physical properties of a substance demonstrating the employee exposure to chromium (VI) associated with a particular product or material or a specific process, operation, or activity. The data must reflect workplace conditions closely resembling the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations.

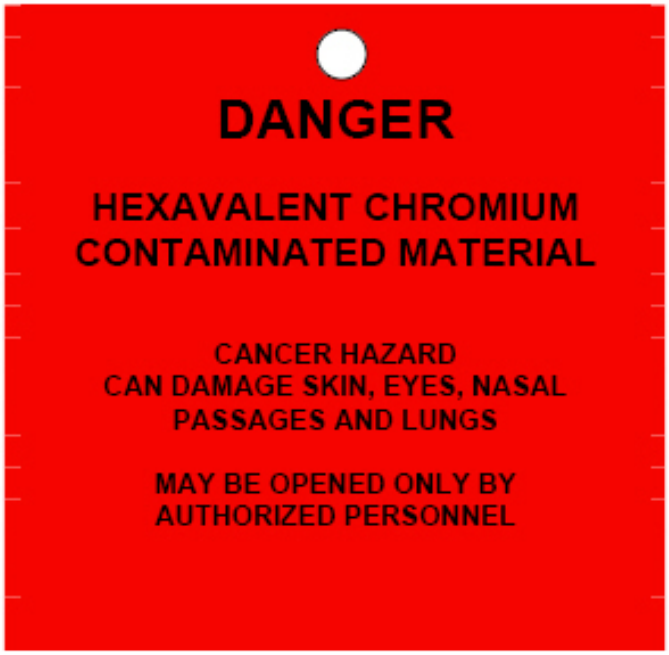
Permissible Exposure Level (PEL) - Concentrations of Hexavalent Chromium, 5 μg/m^3 averaged over an eight hour period.

Time Weighted Averaged (TWA) - Average concentration for a normal 8-hour workday to which nearly all workers may be repeatedly exposed day after day, without adverse effect.

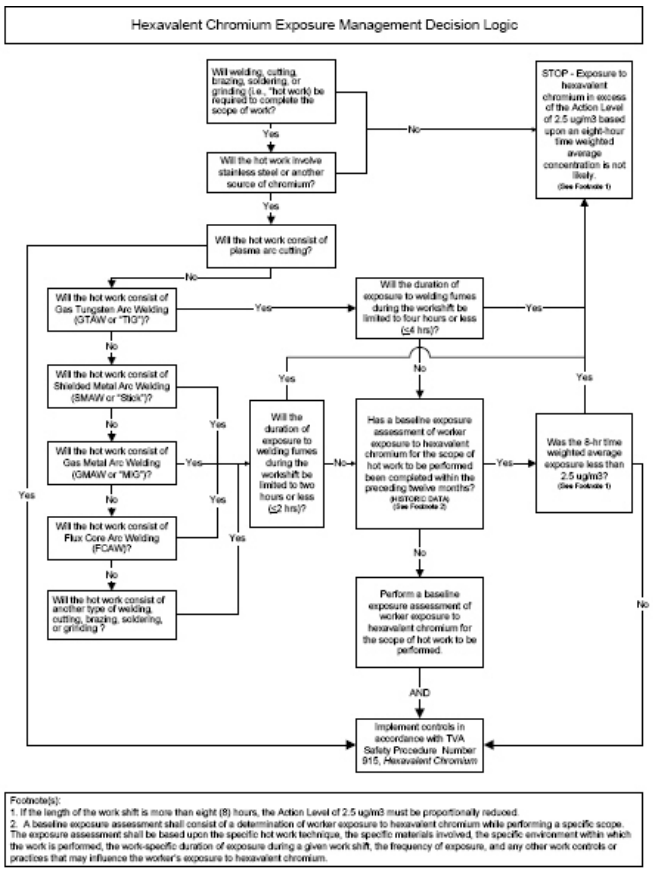
Reference

29 Code of Federal Regulations 1910.1026, "Hexavalent Chromium"

Appendix A Tag, "Danger Hexavalent Chromium Contaminated Material"



Appendix B Hexavalent Chromium Exposure Management Decision Logic



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Chapter 2 Section 10 Electrical-General

Procedure 1001 Conventional Hot Line Work

TVA Safety Manual

1001 Conventional Hot Line Work

Procedure Number 1001

TVA Safety Procedure

Conventional Hot Line Work

Revision 0

January 6, 2003

Purpose

This procedure establishes requirements for conventional hot line work.

Requirements

1. If it is necessary to work on energized lines or equipment for continuity of service, the final decision as to whether the job may be done safely is the responsibility of the supervisor who has direct charge of the work. It is his / her responsibility to know that the crew is properly trained for the work on energized equipment, that the proper tools and equipment are used, and that correct safety measures are taken.
2. Insulating equipment (hot sticks, rubber gloves, etc.) shall not be used unless the equipment has been adequately tested.
3. Electrical circuits and equipment shall be considered energized until they are properly isolated, tested and grounded.
4. A caution order shall be obtained on any transmission line or substation equipment being worked while energized.
5. Employees performing energized work on the same structure shall not work on different phases at the same time.
6. Rubber gloves shall not used with hot sticks for hotline work.
7. While working or climbing nearer than 25 feet to energized 500-kV conductors or parts on transmission line structures, workers shall wear conductive-sole shoes and maintain contact between the soles of the shoes and the grounded portion of the structure. (The use of static grounds is considered to provide the same protection as the use of conductive-sole shoes.)
8. Workers at ground potential shall maintain Table E-1 minimum approach distance from conductors or energized parts.

TABLE E-1
MINIMUM CLEARANCE DISTANCE FOR ALL TYPE OF ENERGIZED WORK

VOLTAGE IN KILOVOLTS PHASE TO PHASE			DISTANCE TO EMPLOYEE			
			PHASE TO GROUND		PHASE TO PHASE	
			(FT - IN)	(METERS)	(FT - IN)	(METERS)
51 VOLTS	TO	300 VOLTS	AVOID CONTACT		AVOID CONTACT	
300 VOLTS	TO	1.0KV	1 - 0	0.31	1 - 0	0.31
1.1 KV	TO	15.0KV	2 - 1	0.64	2 - 2	0.66
15.1 KV	TO	36.0KV	2 - 4	0.72	2 - 7	0.77
36.1 KV	TO	46.0 KV	2 - 7	0.77	2 10	0.85
46.1 KV	TO	72.5 KV	3 - 0	0.9	3 - 6	1.05
72.6 KV	TO	121.0 KV	3 - 2	0.95	4 - 3	1.29
138 KV	TO	145.0 KV	3 - 7	1.09	4 - 11	1.5
161 KV	TO	169.0 KV	4 - 0	1.22	5 - 8	1.71
230 KV	TO	242.0 KV	5 - 3	1.59	7 - 6	2.27
345 KV	TO	362.0 KV	8 - 6	2.59	12 - 6	3.8
500 KV	TO	550.0 KV	11 - 3	3.42	18 - 1	5.5
765 KV	TO	800.0 KV	14 - 11	4.53	26 - 0	7.91

9. While equipment, lines, or buses are energized, no employee at ground potential shall touch insulators, bushings, lightning arresters, or lee pins except with protective equipment.
10. When untying energized conductors from insulators, the workers shall keep the tie wire cut short enough so that it cannot reach any part of the supporting structure.
11. Before any energized equipment is worked on , consideration shall be given to the arc that will result if accidental short circuiting or grounding occurs, and plans shall be made for that eventuality.
12. Ropes that are maintained specifically for hotline work may be used on energized lines or equipment.
13. Live line tools shall never placed directly on the ground. Special tool holders or tarpaulins shall be used for this purpose.
14. Live line tools, when not in use, shall be stored in a “hot stick” box or room or kept in canvas bags or waterproof boxes or trailers designed for that purpose.

Procedure 1002 Electrical Handlamps

TVA Safety Manual

Procedure 1003 Electrical Switching Operations

TVA Safety Manual

1003 Electrical Switching Operations

Procedure Number 1003

TVA Safety Procedure

Electrical Switching Operations

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish requirements for electrical switching operations.

Instructions for Electrical Switching

1. During normal plant operations, permission shall be obtained from appropriate operations personnel before employees may enter the switchyard.
2. The appropriate operations personnel shall approve the entry based on work requirements, operational conditions, and the safety of the work to be done. Proper clearances will be obtained in accordance with the most current clearance procedures, practices and operating letters.
3. Supervisors shall ensure that employees under their supervision work within safe boundaries established by the clearance, and in accordance with the most current clearance procedures, practices and operating letters (if such is applicable).
4. Supervisors shall ensure that employees wear the appropriate flame retardant clothing and required personal protective equipment when conducting switching operations.
5. Supervisors shall ensure that proper barricades and barrier tape procedures are followed in accordance with TVA Safety Procedure 602, “Barricades and Barriers (Temporary)”.
6. During outages or heavy maintenance activities in the switchyard, the supervisor shall notify the appropriate operations personnel of the activity being performed on a daily basis. Supervisors are responsible for ensuring that employees under their supervision establish and work within safe boundaries.
7. If switching becomes necessary while work is being performed in the switchyard, the appropriate operations personnel shall notify the supervisors and crews of the work being performed to evacuate the switchyard.
8. When the appropriate operations personnel becomes aware of adverse weather conditions that could cause breakers to open automatically, they shall notify the responsible supervisor to evacuate the switchyard.

Reference

- 29 Code of Federal Regulations 1910.269, “Electric Power Generation, Transmission and Distribution”.

Procedure 1004 Extension Cords and Attachments

TVA Safety Manual

1004 Extension Cords and Attachments

Procedure Number 1004

TVA Safety Procedure

Extension Cords and Attachments

Revision 4

November 5, 2004

Purpose

This procedure establishes requirements for the use of extension cords and attachments and to ensure that extension cords and attachments are purchased, used and maintained in a safe manner.

Specifications for Extension Cords

1. Only UL or FM listed extension cords or attachments shall be used. Consider use of cord sets equipped with Ground and Continuity Monitors (GCMs) for heavy plant/field applications. These devices indicate adequacy on a continuous basis
2. Extension cords shall be cord types S, SO, STO, extra hard usage, 600-volt copper conductor sizes ranging from No.16 through No. 2 AWG. Type SJ, SJO, SJT and SJTO cords are approved for junior hard service in applications of 120 volts nominal or less. (see Appendix A and B for acceptable sizes for extension cords)
3. Extension cord attachments used on supplying equipment at more than 300 volts shall be of the skirted type or so designed that electrical arcs are confined.
4. Splices and taps in extension cords shall have molded or vulcanized insulation equivalent to that of the cord being spliced. Rosin-core electrical solder or compression connections shall be used to make wire-to-wire splices.
5. Extension cords shall be made of 3 or 4-conductor cables.
6. Extension cords shall be connected to fittings so that tension is not transmitted to joints or terminal screws when the cord is pulled.
7. Receptacles, cord connectors, and attachment plugs shall be constructed so no receptacle or cord connection will accept an attachment plug with a different voltage rating than that for which the device is intended. This requirement is best satisfied by using different configuration plugs for 120, 240, and 480 volt service.

Use of Extension Cords

1. Extension cords, welding leads, etc., shall not be substituted for an electrical safety ground conductor (ESG). An ESG is controlled by the COO Clearance Procedure. Affected personnel should be familiar with safety grounds and know not to handle them outside of clearance procedure scope of work.
2. When used across aisles or walkways, extension cords and welding leads shall be run overhead. If this is not possible, they shall be secured to the floor surface with tape to prevent fraying and creation of tripping hazards.
3. Extension cords shall not used as a substitute for the fixed wiring of a structure, attached to building surfaces, run through wall holes, or concealed behind building walls, ceiling, or floors.
4. Extension and service cords used outdoors shall be protected from the elements. Ground fault circuit interrupters shall be used in wet or conductive environments.
5. Extension cords shall be protected from damage when passing through restricted openings, around sharp corners or projections, near hot surface or chemicals, etc.
6. Employees shall not remove, replace, by-pass fuses, or reset circuit breakers in temporary electrical services which trip. Blown fuses or tripping of circuit breakers are referred to qualified and trained electrical personnel for evaluation and repair as needed.

Inspection Requirements

1. Extension cords shall be inspected prior to use for obvious damage or defects. When Ground Continuity Monitors (GCM) are utilized, the GCM shall have all lamps lit to be considered safe for use. GCM must be used as directed by the manufacturer and must show ground continuity for the cord set on which it is installed.
2. Extension cords shall be removed from service if damaged and a defective equipment tag shall be attached to it.
3. Extension cords shall be tested at least annually for continuity to ground and for short circuits. Exception: An annual test is not required if the cord has a functional Ground Continuity Monitor (GCM) installed that is used in accordance with the manufacturer's instructions.
4. Use the annual color code banding prescribed in TVA Safety Procedure 617 Color Coding Identification - Safety Test / Inspection of Material and Equipment to identify inspected extension cords:
   Note: Color Code banding is not required when utilizing a functional ground continuity Monitor for inspections in accordance with manufacturer's instructions.

Definitions

Ground and Continuity Monitor (GCM) a lamp included as an integral part of the attachment plug in an extension cord that provides visible indication of proper ground continuity.

Fixed Extension Cord extension cords used in a specific location for an extended period of time and not exposed to damage (an extension cord used to power environmental controls in laid-up equipment).

Portable Extension Cord extension cords used in various locations temporarily and/or extension cords exposed to potential damage due to physical location.

Reference

- 29 Code of Federal Regulations 1910.304, “Wiring Design and Protection”.
- 29 Code of Federal Regulations 1910.305, “Wiring Methods, Components, and Equipment for General Use”.
- 29 Code of Federal Regulations 1926.404, “Wiring Design and Protection”.

Appendix A - Minimum Conductor Sizes for Service and Extension Cords

Appendix A

MINIMUM CONDUCTOR SIZES FOR SERVICE AND EXTENSION CORDS

LOAD (Amperes)		**CONDUCTOR SIZE (AWG)**
A	B	
7	10	18
10	13	16
15	18	14
20	25	12
25	30	10
35	40	8
45	55	6
60	70	4
80	95	2

COLUMN A: Cords of three or more conductors are connected so only 3 are current-carrying conductors.

COLUMN B: Cords of two or more conductors are connected so only two are current-carrying conductors.

NOTE: The equipment ground wire is not considered a current-carrying conductor.

Appendix B - Minimum Plug, Connector, and Conductor Sizes for Extension Cords

APPENDIX B

MINIMUM PLUG, CONNECTOR, AND CONDUCTOR SIZES FOR EXTENSION CORDS

PLUG & CONNECTOR		CONDUCTOR SIZE (AWG)			
LOAD (Amperes)	RATING (Amperes)	50 Feet 3-Conductor	OR Less 4-Conductor	More than 3-Conductor	50 Feet 4-Conductor
10 or less	15	16	16	16	14
13	15	16	16	14	14
15	15	14	14	12	12
18	20	14	14	12	12
20	20	12	12	10	10
30	30	8	8	6	6
50	50	4	4	2	2
60	60	4	4	2	2

Specific measures shall be taken to ensure cords used are not subjected to excessive electrical loads which may initiate a fire condition.

Procedure 1005 Fuse Handling

TVA Safety Manual

1005 Fuse Handling

Procedure Number 1005

TVA Safety Procedure

Fuse Handling

Revision 1

October 30, 2003

Purpose

This procedure establishes requirements for protecting employees from the hazards associated with fuse installation, handling, removing or expulsion.

Instructions

1. When installing or removing expulsion type fuses with one or both terminals energized at more than 300 volts, or with exposed parts energized at over 50 volts, tools and/or gloves rated for the voltage shall be used, face shields with 8 calorie per square centimeter protection shall be worn over safety glasses, and the employees shall stay clear of the exhaust path of the fuse barrel.
2. When expulsion-type fuses are installed with one or both terminals energized at more than 300 volts, each employee shall wear eye protection meeting the requirements TVA Safety Procedure 304, “Eye and Face Protection”, uses a tool rated for the voltage, and is clear of the exhaust path of the fuse barrel.
3. Employees who may be exposed to the hazards of electric arcs or electrical flames will not wear clothing that will burn or melt, and thus increase the extent of injury of the employee. See TVA Safety Procedure 1022, “Arc Flash Hazard Calculation and Required Protection”
4. Employees who must work within reach of energized conductors and equipment or operate equipment that is known to produce arcs shall comply with the personal protective equipment requirements as specified by TVA Safety Procedure 1022, “Arc Flash Hazard Calculation and Required Protection”
   NOTE: Clothing made of acetate, nylon, polyester, and rayon, either alone or in blends, is prohibited unless the fabric is treated with an approved fire retardant and documented in the form of test results from a recognized test authority using recognized test procedures that demonstrates that the fabric will withstand the conditions that may be encountered, or it can be demonstrated that the clothing is worn in such a manner as to eliminate the hazard involved

Reference

- 29 Code of Federal Regulations 1910.269, Electric Power Generation, Transmission and Distribution.
- TVA Safety Procedure 1022, “Arc Flash Hazard Calculation and Required Protection”
- TVA Safety Procedure 304, “Eye and Face Protection”

Procedure 1006 Generator Special Precautions

TVA Safety Manual

Procedure 1007 Ground Fault Circuit Interrupters (GFCI)

TVA Safety Manual

1007 Ground Fault Circuit Interrupters (GFCI)

Procedure Number 1007

TVA Safety Procedure

Ground Fault Circuit Interrupters (GFCI)

Revision 1

July 15, 2006

Purpose

This procedure establishes requirements for use of Ground Fault Circuit Interrupters (GFCI).

Requirements

1. Ground Fault Circuit Interrupters (GFCIs) shall be used with all 120-volt ac portable lights and portable electrical tools in conductive environments.
2. GFCIs shall be tested before being placed in service.
3. GFCIs shall be used for permanently installed underwater inspection lights and shall be tested monthly.
4. Defective GFCIs shall be removed from service and a defective equipment tag attached until repaired or discarded.
5. A GFCI shall be UL or FM listed and used in accordance with its manufacturer's instructions.
6. Individual GFCI protection shall be provided for each branch circuit.
7. When an electrical extension cord is used, the extension cord must be plugged into either (1) a power receptacle with an internal GFCI or (2) a portable GFCI that is plugged directly into the power receptacle. A GFCI will not protect the extension cord itself when it is connected to the female receptacle of the extension cord. Extension cords in which the male end is plugged into a GFCI may have additional GFCIs plugged into the end of the cord (female receptacle).
8. If a temporary electrical power pack is used and the power pack has internal GFCI protection on its outlet power receptacles, an extension cord may be plugged directly into the protected receptacle. If the pack does not have internal GFCI protection on its power outlet receptacles, then a portable GFCI is required to be plugged into the receptacle and the extension cord plugged into the GFCI.

Procedure 1008 Temporary Protective Grounding for Generating Stations and Other Non-Transmission Facilities

TVA Safety Manual

1008 Temporary Protective Grounding for Generating Stations and Other Non-Transmission Facilities

Procedure Number 1008

TVA Safety Procedure

Temporary Protective Grounding for Generating Stations and Other Non-Transmission Facilities

Revision 7

August 15, 2008

Purpose

The purpose of this procedure is to establish standardized requirements for temporary protective grounding (protective grounding) on de-energized electrical conductors or equipment[1]. The requirements provide for (1) employee safety when working on deenergized electrical conductors and equipment that could be inadvertently energized, (2) protection against hazardous induced voltage and (3) prevention of the re-accumulation of electrical energy in capacitive devices.

This procedure applies to temporary protective grounding for generating stations and other non-transmission electrical conductors and equipment. Protective grounding requirements for transmission electrical lines and equipment are being developed in safety procedure Temporary Protective Grounding for Transmission Lines and Equipment.

Roles and Responsibilities

1. Operation and maintenance managers are responsible for ensuring that employees who perform protective grounding tasks are trained on this procedure and implement this procedure within their area of responsibility.
2. The Safety Process Ownership Team (POST) is responsible for developing and maintaining this procedure. The Safety POST is an Agency-wide team composed of representatives from COO, CS&M, ADMIN, and Corporate Safety that is responsible for developing and maintaining safety policies/procedures.
3. The supervisor and/or foreman who assign protective grounding tasks is responsible for their employee's compliance with this procedure.
4. The electrical engineering resource staff that supports the plant or facility is responsible for providing the maximum available bolted fault current and circuit clearing time values for the correct selection of ground cable size at the grounding location.
5. Employees who perform grounding tasks are responsible for performing the tasks in accordance with this procedure.

Qualified Persons

1. Only trained and qualified electrical workers or technicians may apply protective grounds in accordance with this procedure. Currently qualified electrical workers who are on local official plant clearance list as designated by management will be retained and may apply protective grounds. All future qualified electrical workers as of June 30, 2006, who apply protective grounds or a supervisor who supervises the application of protective grounds must be trained on the contents of this procedure and the training documented in the Human Resources Information System - Automated Training Information System (HRISATIS). The electrical worker/supervisor must be trained in accordance with TVA Safety Procedure 424 “Grounding Safety Procedures Course Standard”.

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[1] TVA employees working on non-TVA conductors, equipment, facilities, or systems adhere to this procedure.

Identify Electrical Information

Prior to applying protective grounds, identify the electrical characteristics of the electrical conductors and equipment to be worked including the nominal voltage, the maximum available fault current, the time to clear the maximum available fault on the circuit, and any stored electrical energy (capacitive devices)[2]. Obtain a current single line diagram of the electrical circuit to be worked.

Determine the Need for Protective Grounding

1. Low Voltage Circuits (600 V and below) without a capacitive device(s) or induced voltage
2. Protective grounds are not installed. Attempting to use protective grounds on low voltage electrical conductors and equipment creates a greater hazard to employees due to the limited approach distances, close proximity between conductors and grounded parts, and the size of the ground cable. Therefore, place the low voltage circuit in an electrically safe condition by de-energizing the circuit from all sources of electrical energy and testing for the absence of voltage. It is critical to either create an electrically safe condition before touching/contacting the low voltage circuit or use live-line work methods such as rated gloves and/or insulation.
3. Low Voltage Circuits (600 V and below) with a Capacitive or Inductive Voltage
4. In circuits with capacitive device(s) and/or hazardous induced voltage present, protective grounds are to be installed in accordance with this procedure to create an electrically safe condition. Since low voltage grounding sets are used to prevent dangerous levels of voltage developing on the conductor or part, they are not required to be rated to carry the maximum available short circuit current.
5. Medium Voltage Circuits (greater than 600 V to 25kV phase-to-phase)
6. Protective grounds are installed in accordance with this procedure to create an electrically safe condition.

Fabricate or Purchase Protective Grounds

New or repaired protective ground sets must meet the specifications in Appendix B. Existing protective ground sets can remain in service provided that the ampacity of the cable and clamps meet the requirements of Table 1.

Select Protective Ground

1. Minimize Length of Protective Ground
2. Protective ground cables must be as short as possible to reduce hazards created by the physical whipping action of the cables should they be inadvertently energized. Protective grounds longer than 40 feet will not be used.
3. Never use two or more grounds connected together in series to make a longer ground.
4. Do not coil protective ground cables when in use[3].

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[2] This information can be obtained from electrical engineering studies or the responsible electrical engineering staff.

[3] Coiling protective grounds increases the impedance under fault conditions thus decreasing employee protection.

Determine Fault Current and Clearing Time

Protective grounds must be capable of conducting the maximum available fault current for time necessary to clear the fault at the grounding location except in low voltage circuits and equipment[4]. The values of the worst case, maximum available fault current and the time duration to clear that fault are obtained for the grounding location. This information can be obtained from electrical engineering studies or the responsible electrical engineering staff.

Select the Clamp for the Location

Use the appropriate ground cable clamps when connecting to different surface shapes found on bus, conductor, structure, etc.

Size the Protective Ground Cable

1. For medium voltage equipment, select the size of protective grounds based on their ultimate current carrying capacity. Select from Table 1, a cable size which has an ultimate current capacity equal to or greater than the circuit's maximum available fault current, at the clearing time equal to or greater than the circuit's clearing time. If the circuit's fault current and/or clearing time is not within the range of Table 1, consult the electrical engineering resource staff responsible for the generating station or facility.
2. Where the available fault current is greater than a 4/0 cable's ultimate current carrying capacity at the required number of cycles, parallel ground sets must be used. A 90% derating factor is used for multiple ground sets. See Table 2 for the current carrying capacities of parallel ground sets.
3. For low voltage (600 V and below) equipment, a #2 AWG or larger stranded, copper cable having a 600 V rated covering may be used to discharge hazardous stored energy and ground the circuit to prevent re-accumulation of electrical energy in the capacitor or to eliminate hazardous induced voltage on a circuit.

Table 1 Single Grounding Cable Capacities

Cable Size	Ultimate Current Carrying Capacity of Copper Cable (kA, Asymmetrical. RMS, 60 Hz)			
	6 cycles (100 ms)	15 cycles (250 ms)	30 cycles (500 ms)	60 cycles (1 s)
#2 AWG	23	17	13	9
1/0	36	26	20	15
2/0	46	33	26	19
4/0	72	43[5]	41	30
Source: ASTM F855-90, Table 3a. X/R=40, D.C.offset=92%				

[4] In low voltage equipment, the purpose of the ground cable is to discharge stored energy and prevent re-accumulation of electrical energy. Therefore, fault current and clearing time are not factors.

[5] The ampere capacity of the ground set is limited by the ampere rating of the clamp being used: 43 kA at 15 cycles.

Table 2 Parallel Grounding Cable Capacities

Cable Number and Size	Ultimate Current Carrying Capacity of Copper Cable (kA, Asymmetrical. RMS, 60 Hz)			
	6 cycles (100 ms)	15 cycles (250 ms)	30 cycles (500 ms)	60 cycles (1 s)
2-1/0	65	47	36	27
2-2/0	83	59	47	34
2-4/0	130	77	74	54
3-4/0	194	116	111	81

Test Protective Grounds

Protective grounds sets are tested in accordance with Appendix C and must be marked with the current test date. Before using a protective ground set, the current test date must be checked. If the test date is not current, the protective ground set is taken out of service.

Inspect Protective Grounds

A defective protective ground or one that has been subjected to a fault is removed from service[6]. Visually inspect protective grounds for defects as follows:

- Damage to cable, i.e., burned jacket, broken copper strands, especially near the cable termination, damaged or loose cable termination's, evidence of cable corrosion.
- Damage to clamp mechanisms, i.e., sharp edges, cracks, splits, or other defects and for smooth operation and excessive looseness.
- Damage to clamp jaws, eye screws, and T-handle screws, i.e., cleanness and freedom from dirt, oil, grease, or corrosion.

Select Personal Protective Equipment (PPE)

Employees who install protective grounds wear the PPE based on an arc flash hazard analysis for the electrical conductors and equipment. The Arc Flash Hazard Calculation and Protection Analysis (AFHCP) procedure is being developed and will be issued in January 2003. Until the operating organizations implement the AFHCP, existing organizational FR requirements are used.

De-Energize Conductor or Equipment

Ensure that the electrical conductors and equipment are isolated from all energy sources in accordance with the operating organization's clearance procedure before installing the grounds. Electrical conductors and equipment are considered as energized until they have been isolated, tested for absence of nominal voltage, and protective grounds installed (including low voltage equipment where grounds may be required).

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[6] Defective protective grounds are destroyed or repaired in accordance with Appendix B. A ground cable that has been subjected to a fault is always destroyed, but the clamp may be reused if not damaged.

Verify Equipment

Ensure that the correct equipment, bus, part, conductor, etc. to be grounded has been identified at the grounding location. A work plan or package[7] which identifies the grounding location and the conductors and/or equipment to be grounded is prepared in accordance with the organization's work management system. The work plan must include drawings showing the proposed installation points for the grounds and the sequence of operations involved in the grounding work. The plan should anticipate the requirement for more than one equipotential work zone to be established if there is a necessity to open/break the electrical circuit possibly isolating employees from the protective grounds.

NOTE: Prior to installing temporary protective grounds at Fossil Power Group (FPG) plants, a written plan detailing where the temporary protective grounds will be placed must be submitted and approved by the manager responsible for performing the work and the manager at the plant responsible for the grounding. This plan must include a Job Safety Analysis (JSA) prepared in accordance with TVA Safety Procedure 6, "Plan Jobs Safely," a generation sensitive activity sheet (if applicable), electrical diagrams, and a description of the work to be accomplished. A pre-job safety briefing ("Plan Jobs Safely,") on the installation of the temporary protective grounds must be conducted with all involved personnel.

Dissipate Stored Electrical Energy

Electrical conductors and equipment with stored electric energy of 0.25 joules or greater[8] require the capacitance elements (capacitors) to be short-circuited to dissipate the stored energy. All energy sources are placed in an electrically a safe condition. For example, capacitors are discharged and high capacitance elements (10 joules or greater) are short-circuited and grounded. Use live-line tools when short-circuiting capacitors or a ground switch provided for this purpose. If the operating voltage of the capacitor is greater than 50 V, then a five-minute waiting period is required between de-energizing the capacitor and applying the ground connection.

Test for Absence of Voltage

All electrical conductors and equipment are considered energized until they are verified to be de-energized by testing[9] and protective grounds installed. The electrical conductors and equipment are tested with a voltage detection instrument[10] prior to installation of temporary protective grounds. The voltage detector must be rated for the nominal voltage to be measured and set for that voltage before taking a reading. When testing for the presence of voltage, do not use tape or insulation penetrating methods. Test the voltage detector on a known energized source to check proper operation, before and after testing the electrical conductors or equipment to be grounded. When the electrical conductors and equipment to be grounded are tested, the test must show an absence of nominal voltage. If nominal voltage is detected, paragraph 11 has not been properly implemented, contact a supervisor immediately to resolve the problem. The presence of nominal voltage at this step is considered a "near miss" incident and must be reported, investigated, and corrective action developed and implemented.

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[7] The requirement for a work plan or package is considered met if the grounding process is covered as a part of another work order.

[8] Stored energy – A discharge of energy exceeding 0.25 Joules (J) is above the threshold of perception, 10 J is hazardous to body organs; and 50 J is potentially lethal. The amount of stored energy in a capacitor can be calculated by the equation, E=1/2(CV2), where E is the stored energy (J), C is the capacitance (Farads), and V is nominal voltage (volts). The operating voltage and the capacitor's capacitance are usually on the equipment nameplate.

[9] Electrical testing is done in accordance with the operating organization's electrical safety requirements/practices.

[10] For medium voltage systems, use Fluke, Salisbury, White Safety Line or equivalent detector designed for the appropriate voltage.

Account for Installed Protective Grounds

1. When protective grounds are installed, each ground or grounding device is identified with a metal disk or Lamicoid for purposes of tracking the ground and ensuring removal of all grounds before re-energizing the electrical conductors and equipment. The organization's grounding accountability process or clearance procedure is followed for identifying and recording installation of the grounds[11].
2. At generating plants, the electrical representatives authorized by the plant/site management official-in-charge are the only personnel who may receive and return ground discs.

Install Protective Grounds

1. After determining the absence of nominal voltage, proceed with placement of protective grounds. Protective grounds are placed in such a manner as to prevent any employee working on the electrical conductors and equipment from being exposed to hazardous differences in electrical potential, thus establishing an equipotential work zone. Another equipotential work zone must be established by installing a second set of protective grounds any time there is a necessity to open/break the electrical circuit isolating any employee from protective grounds.
2. When parallel ground sets are used for current carrying capacity purposes, they must be of equal size and length and connected to the conductor and ground as close to the same point as possible. The ground cables must be tied together every 90 cm (3 ft) with a non-metallic material to restrain the mechanical movement forces should the cables be energized.
3. Solid metal-to-metal connections are essential between the ground cable clamps and the connection points. Since corrosion and paint can cause a poor electrical connection, the grounding surface connection point must be free of rust, corrosion, non-conductive paint, or other insulating material or otherwise cleaned.
4. Protective grounds are installed on conductors and equipment as follows (See item #9 for the preferred method to ground metal clad switchgear.):
   Connect the ground-end of the ground cables to a facility ground point that is connected to the ground grid. If a cluster block is used it must be secured from movement in case of a fault condition.
   Connect the clamp on the line-end of the ground cable to the nearest phase conductor or equipment part using a live-line tool[12]. Maintain the minimum approach distances in Table 3 to the conductor or equipment being grounded or to any other exposed energized conductors or parts. Do not handle the ground by hand or allow bodily contact with the ground cable while making the line-end connection.
   Repeat the instructions in 1 and 2 above, proceeding outward and upward until all conductors are grounded. All electrical phases of the electrical equipment are required to be grounded. Protective grounds must be kept as short as reasonably possible and installed so as to hang as straight as possible with no folds or sharp bends. Folds or bends increase the mechanical and impedance hazards should a fault occur.

Table 3 – Minimum Approach Distances

Nominal Voltage (Phase-to-Phase)	Minimum Clearance Distances (Phase-to-Ground)
300 V and less	Avoid Contact
Over 300 V to 750 V	30 cm (12 inches)
Over 750 V to 2 kV	46 cm (18 inches)
Over 2 kV to 15 kV	64 cm (25 inches)
Over 15 kV to 36 kV	71cm (28 inches)
Over 36 kV to 46 kV	79 cm (31 inches)
Over 46 kV to 72.5 kV	91 cm (36 inches)

Over 72.5 kV to 121 kV	97 cm (38 inches)
Over 121 kV to 145 kV	107 cm (42 inches)
Over 145 kV to 169 kV	122 cm (48 inches)
Over 169 kV to 242 kV	160 cm (63 inches)
Over 242 kV to 362 kV	259 cm (102 inches)
Over 362 kV to 550 kV	284 cm (119 inches)[13]
Over 550 kV to 800 kV	458 cm (180 inches)

5. A power circuit breaker may not be used to “extend” a protective ground to prevent an employee from being isolated from their protective ground.
6. Locate protective grounds as close as practical to the work area. This is particularly important on long runs of cable where induced voltage is likely to be present.
7. Non-current carrying metal parts of equipment or devices, such as transformer cases and circuit breaker housings, are treated as energized at the highest voltage the equipment operates, unless an inspection of the grounding strap prior to work being performed determines that these parts are grounded.
8. Power circuit breakers with internal capacitors must have the grounds installed and the breaker closed to discharge the capacitors.
9. In metal clad switchgear, the preferred method of grounding is the use of “ground and test device” equipment specifically designed a manufacturer or approved by a PE for this application. Operating organizations must develop a written procedure establishing the proper use of the grounding and test device in accordance with the requirements of this standard. Live-line tools may be used to place protective grounds, if ground and test devices are not available. In either case a written step-by-step procedure is required.

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[11] For generating stations, ground tags are issued in conjunction with a specific clearance number.

[12] Live-line tools must have a current test date. Rated, rubber protective gloves are not considered live-line tools.

[13] A switching over-voltage factor of 2.2 allows the distance to be reduced from 135 inches to 119 inches.

Place Signs and Barricades

1. Orange barricade tape with the legend “DANGER ELECTRICAL HAZARD AUTHORIZED PERSONNEL ONLY” is used to designate an area where an electrical hazard is present. It means “do not cross” for all persons except those qualified and authorized to work on or near the energized equipment. The tape must be used to designate energized, exposed conductors or parts and energized equipment which poses an electrical hazard to the employees working on the grounded conductors or equipment. The tape is installed horizontally (preferably at a height of 120 cm (4 feet) above ground level/work surface) and other locations (vertically) as necessary to fully identify any electrical hazard adjacent to the grounded equipment work area.
2. Danger and caution signs are used to identify hazardous areas in and around the work site. If a protective ground set or grounding device is inside an electrical cubicle/cabinet and the door is closed, a sign that states, “GROUNDS INSTALLED – REMOVE BEFORE ENERGIZING,” is posted on the cubicle/cabinet. All signs must be designed in accordance the requirements contained in ANSI Z535.2, Environmental and Facility Safety Signs.

Remove Protective Grounds Temporarily

If temporary removal of the grounds is required, all employees that will be affected by the removal of the grounds are informed of impending removal. After notification, the grounds are removed in accordance with paragraph Protect Employees during Temporary Ungrounded Periods and in accordance with the operating organizations clearance procedure.

Protect Employees during Temporary Ungrounded Periods

While grounds are temporarily removed, protect all employees from the hazards of exposed energized conductors or parts. Employees will maintain the minimum approach distance of Table 3 or use energized work methods/practices on the exposed energized conductors or parts.

Determine Requirement for Protective Grounds

Protective grounds must be reapplied in accordance with paragraph Dissipate Stored Electrical Energy, if additional work is to be performed. If no additional work is required, remove all protective grounds in accordance with paragraph Remove Protective Grounds.

Remove Tools, Signs, Barricades

Before the protective grounds are removed, move any tools, signs, or barricades to beyond the minimum approach distance in Table 3.

Remove Protective Grounds

The standard for removal of grounds is as follows:

- The line-end of the ground cable furthest away from the employee's work position is disconnected first using a live-line tool[14]. Do not approach closer than the minimum approach distance in Table 3 to the conductor or part being ungrounded or to any energized conductors or part. Do not handle the ground by hand or allow bodily contact with the ground cable while removing the line-end connection.
- The ground-end of the ground cable is then disconnected.

Repeat the instructions in A and B above, proceeding inward and downward until all protective grounds are removed.

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[14] Rated, rubber protective gloves are not considered to be live-line tools.

Account for All Protective Grounds

Account for all protective grounds to ensure that they have been removed to prevent possible breaker or fuse operation. When protective grounds or grounding devices are installed, each ground is identified with a disk for purposes of tracking the ground and ensuring removal of all grounds before re-energizing the conductors or equipment. The organization's grounding accountability process or clearance procedure is followed for identifying and recording removal of the grounds.

Energize Electrical Conductors and Equipment

After releasing the clearance in accordance with organization requirements, energize the electrical conductors and equipment in accordance with the organization's operating or testing procedure.

Inspect and Store Protective Grounds

1. After each use, visually inspect the protective grounds for damage and perform the following:
    1. Wipe the ground cable clean.
    2. Coil the ground cable neatly, beginning from the same end of the cable each time[15], if possible, to avoid kinks the cable.
    3. Store the ground cable so as to avoid damage.

Definitions

AWG - American Wire Gage, also known as the Brown and Sharp Gage. This gage has the feature that a larger number denotes a smaller wire. These numbers are not arbitrarily chosen, but follow the mathematical law upon which the gage is based.

Bolted Fault Current - A short circuit or electrical contact between two conductors at different potentials, in which the impedance or resistance between the conductors is essentially zero. A short circuit condition that assumes zero impedance exists at the point of the fault.

Circuit - A conductor or system of conductors through which an electric current is intended to flow.

Conductor - A material, usually in the form of a wire, cable, or bus bar suitable for carrying an electric current.

De-energized – Disconnected from all sources of electrical supply by open switches, disconnects, jumpers, taps, or other means. Note: De-energized conductors or equipment could be electrically charged or energized through various means, such as induction from energized conductors, portable generators, lightning, etc.

Electric Arc Flash Hazard - A dangerous condition associated with the release of energy caused by an electric arc.

Electrical Hazard - A dangerous condition such that contact or equipment failure can result in electric shock, arc flash burn, or blast injury.

Electrical Worker (Electrically Qualified Person): A person who is knowledgeable of the construction and operation of specific equipment or work method and trained to recognize and avoid the electrical hazards that might be present with respect to that equipment or work method. Such a person is familiar with the proper use of precautionary techniques, personal protective equipment, insulating and shielding materials, insulated tools, and test equipment. A person may be considered qualified with respect to a certain piece of equipment but still be unqualified for others.

Electrically Safe Work Condition - A state in which the conductor or circuit part to be worked on or near has been disconnected from energized parts, locked/tagged in accordance with established standards, tested to ensure absence of voltage, and grounded if determined necessary.

Energized (alive, hot, live) - A circuit that is connected to an electrical source or electrically charged so as to have potential different from that of ground.

Equipment - A general term including material, fittings, devices, appliances, fixtures, apparatus, and the like, as a part of, or in connection with, an electrical installation.

Equipotential - An identical state of electrical potential for two or more items.

Equipotential Worksite- The installation of protective grounds at the worksite in such a manner that the equipment, conductors, and the structure are interconnected by jumpers, grounds, ground rods, and/or grids to maintained safe voltage differences between all parts under worst-case conditions if it becomes energized.

Exposed (as applied to live parts) - Capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to parts that are not suitably guarded, isolated, or insulated.

Fault Current - A current that flows from one conductor to ground or to another conductor owing to an abnormal connection (including an arc) between the two. A fault current flowing to ground may be called a "ground fault" current. See bolted fault current.

Flash Protection Boundary - A flash hazard protection boundary to be crossed by persons (at a distance from a live part) which, due to its proximity to a flash hazard, requires the use of flash protection clothing and equipment when crossed. The flash protection boundary may be greater or less than the limited approach boundary.

Ground (earth, ground system, ground bus) - A conducting connection, whether intentional or accidental, by which an electric circuit or equipment is connected to the earth. It is used for establishing and maintaining the potential of the earth or approximately that potential.

Ground System (Grounding System) - Consists of all interconnecting grounding connections at a work site.

Grounded - Connected to earth, whether the connection is intentional or accidental.

Hazardous Stored Energy - A discharge of stored energy exceeding 50 joules into the human body is potentially lethal, greater than 10 joules can be hazardous, and as little as 0.25 joule is a considered a "heavy" electrical shock. Stored energy (E) can be calculated by $E = ½(CV2)$, where E (Joules), C (Farads) and V (voltage).

Hazardous Induced Voltage – 50 volts or greater

Induction - The process of generating voltages and/or currents in conductive objects or electrical circuits by electric field or magnetic field induction.

Isolated - Physically separated, electrically, hydraulically, and mechanically, from all sources of electrical energy. Such separation may not eliminate the effects of electrical induction or stored electrical energy.

Joule (J) - A measure of energy, work, or quantity of heat: The work done by a force of 1 Newton acting through a distance of 1 meter.

Jumpering - The use of low-impedance conductors to make physical connections within, between, among, and around circuits and their associated equipment for the purpose of bypassing inadvertent currents around the workers and/or the worksite. Both grounding and jumpering are applicable to work on power plant and transmission systems, overhead and underground distribution systems, substations, switchyards, and with mobile equipment used in these work situations.

Minimum Approach Distance - When working at ground potential, it is the distance a qualified electrical worker and any conductive tool/material being maneuvered by the worker must be maintained from any energized exposed part or conductor. When working at an energized potential, it is the distance a qualified worker, the worker's conductive tools/materials must be maintained from all objects or conductors at a difference in electrical potential (Table 3).

Parallel Protective Grounds - The use of two or more sets of protective grounds at the same location when the fault current capability exceeds the current carrying capacity of one set of temporary protective grounds.

Shock Hazard - A dangerous condition associated with the possible release of energy caused by contact or approach to live parts.

Temporary Protective Ground - Conductive devices to limit the voltage difference between any two accessible points at the work site to a safe value, and having a sufficient ultimate current capacity rating. The ground is installed on electrical conductors, buses, or parts of equipment for the protection of employees.

Temporary Protective Ground Set - A combination of cables, cable terminations, and clamps assembled for use in temporary protective grounding. A ground set consists of a ground end, insulated conductor, source/line end. The ground end consists of a clamp (typically the T-handle type) to be connected to a grounded structure or to a ground riser, and a cable termination. The flexible conductor has a suitable insulating jacket. The source end of the

protective ground consists of a clamp (typically with “eye” bolt) to be connected with an insulating stick to a de-energized conductor, bus, or stud; or equipment part.

Temporary Protective Grounding Device (Switchgear) - A draw-out structure, equipped with a terminal set adjustable for both line or load positions, and a grounding connection. Connection to the local equipment ground bus is accomplished by engagement of ground on the draw-out structure, or by manually-installed cables. The grounding ends of the cables are terminated onto a suitable clamping device for connection to the local equipment ground bus within the structure.

Temporary Protective Grounding Device (Medium Voltage Contactors) - In NEMA E2 Medium Voltage (MV) controllers, the preferred method of grounding the load side is to use a “ground device” that “racks” into the equipment specifically designed by a manufacturer or approved by a PE for this application. The preferred ground device must have continuous and fully rated copper bus from the load-side pressure connectors to the ground pressure connector. The absence of voltage on the load-side connectors of the Medium Voltage Controller cubicle to be grounded must be confirmed prior to insertion of the grounding device. The preferred method of grounding the line side of the MV controller is the use of a “ground device” in the associated metal clad switchgear. Operating organizations must develop a written procedure establishing the proper use of the ground device.

Ultimate Rating (Capacity) - A calculated maximum current that a ground cable is capable of carrying for a specified time without fusing or melting. Grounds are generally rated by this value. It is expected that component damage may result. The component are not be reused.

Voltage (Nominal) - A nominal value assigned to a circuit or system for the purpose of conveniently designating its voltage class (as 120/240 volts, 480Y/277 volts, 600 volts). The actual voltage at which a circuit operates can vary from the nominal within a range that permits satisfactory operation of equipment.

Voltage (of a Circuit) -The greatest Root-Mean-Square (RMS) difference of potential between any two conductors of the circuit concerned.

Voltage to Ground - For grounded circuits, the voltage between the given conductor and that point or conductor of the circuit that is grounded; for ungrounded circuits, the greatest voltage between the given conductor and any other conductor of the circuit.

Working On (Live Parts) - Any activity inside the minimum approach distance which may include coming in contact with live parts with the hands, feet, or other body parts, with tools, probes, or with test equipment, regardless of the personal protective equipment a person is wearing.

Reference

- Title 29, CFR Part 1910, Subpart I, Personal Protective Equipment.
- Title 29 CFR Part 1910.269, Electric Power Generation, Transmission, and Distribution.
- Title 29 CFR Part 1910, Subpart S, Electric Utilization Systems.
- Title 29 CFR Part 1910.137, Electrical Protective Equipment
- NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces.
- ASTM F855, Temporary Protective Grounds to be Used on De-Energized Electric Power Lines and Equipment.

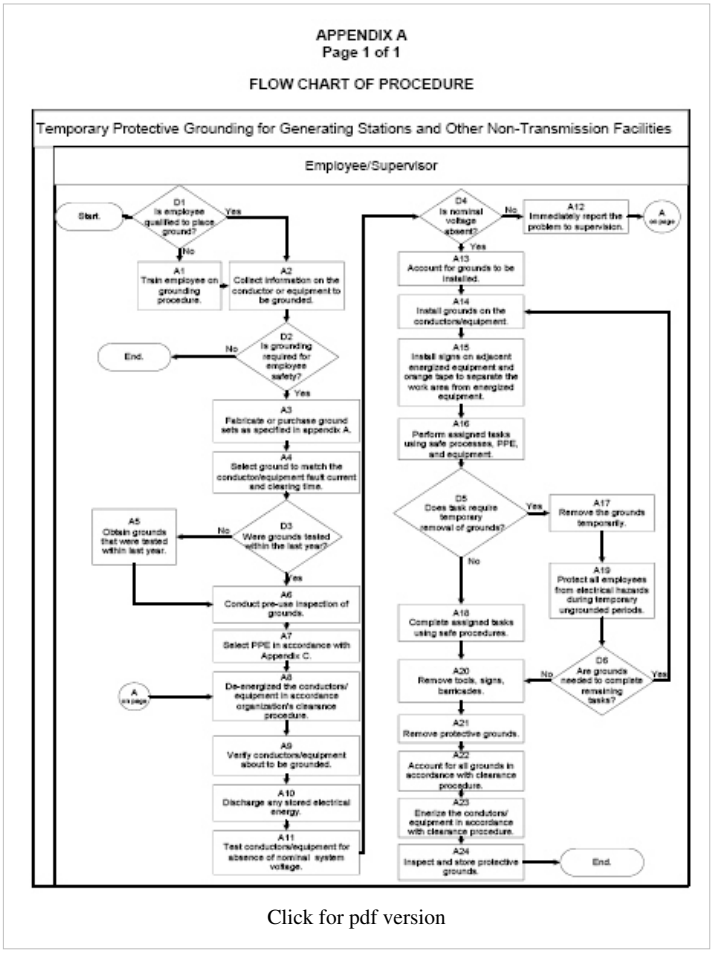
Appendix A - Flow Chart

Appendix B - Grounding Set Specifications

GROUNDING SET SPECIFICATIONS

Medium Voltage Protective Ground Sets

1. Components for construction of medium voltage ground sets must comply with the current edition of ASTM F855. Acceptable components designed for special and/or specific use are available from vendors. Components that are normally used in TVA ground sets are shown in Table B-1. Table B-1



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Item	Source	Cat No.	TVA TIIC No.
Ferrule, Shrouded, plain plug type for 1/0 Cu	A. B. Chance	C600-2631	CGX-101P
Ferrule, Shrouded, plain plug type for 2/0 Cu	A. B. Chance	C600-2632	CGX-102M
Ferrule, Shrouded, plain plug type for 4/0 Cu	A. B. Chance	C600-2633	CGX-104H
Ferrule, Shrouded, threaded stud type for 1/0 Cu	A. B. Chance	C600-2623	CEG-575P
Ferrule, Shrouded, threaded stud type for 2/0 Cu	A. B. Chance	C600-2624	CEG-576M
Ferrule, Shrouded, threaded stud type for 4/0 Cu	A. B. Chance	C600-2625	CGX-105F
Heat Shrink Tube	A. B. Chance	P600-1593	CGX-980A
Clamp, Flat Grounding, T-Handle	A. B. Chance	T600-3009	CFV-952L
Clamp, C-Type Grounding	A. B. Chance	C600-2281	

Cable, Copper, TPE Jacketed, Yellow, 1/0			AJT-559P
Cable, Copper, TPE Jacketed, Yellow, 2/0			CEB-747E
Cable, Copper, TPE Jacketed, Yellow, 4/0	Allied Cable		CGX-189D
Clamp, Grounding, 21/2 inches			ABJ398A
Clamp, Grounding, 41/2 inches			ABJ698X

2. Use grounding clamps which require a copper ferrule to attach the cable. All protective ground set components that makeup a grounding set must have a current carrying capacity equal to or greater than the maximum fault current to which the grounding set may be subjected, i.e., the cable, clamps, and ferrules are rated equal to or greater than the same maximum expected current.
3. Effective on the date of this procedure, new protective grounding cables will not have neoprene jackets. The paper or Mylar lining between the neoprene jacket and the copper strands can cause excessive corrosion in the copper stands. It has been found that these materials may contribute to a dangerous level of resistance in a ground set.
4. Grounds made from braided copper conductor are prohibited.
5. Proper installation of the ground-end clamp is critical to the current carrying capacity of the protective ground set. The shrouded ferrules must be crimped using the approved crimping dies as required by the ferrule manufacturer. The Section B crimp must be on the insulating jacket of the cable. Crimping dies for A. B. Chance ferrules are shown in Tale B-2.

Table B-2

A. B. Chance Ferrule	Cable Size	Section A Die	Section B Die	Cable Specification
C600-2623	1/0	Burndy U165 or Alcoa 73AH	Burndy U168 or Alcoa 11AH	1/0, TPE jacketed, copper cable
C600-2624	2/0	Burndy U165 or Alcoa 73AH	Burndy U-L or Alcoa 75AH	2/0, TPE jacketed, copper cable
C600-2625	4/0	Burndy U166	Burndy U-L	4/0, TPE jacketed copper cable

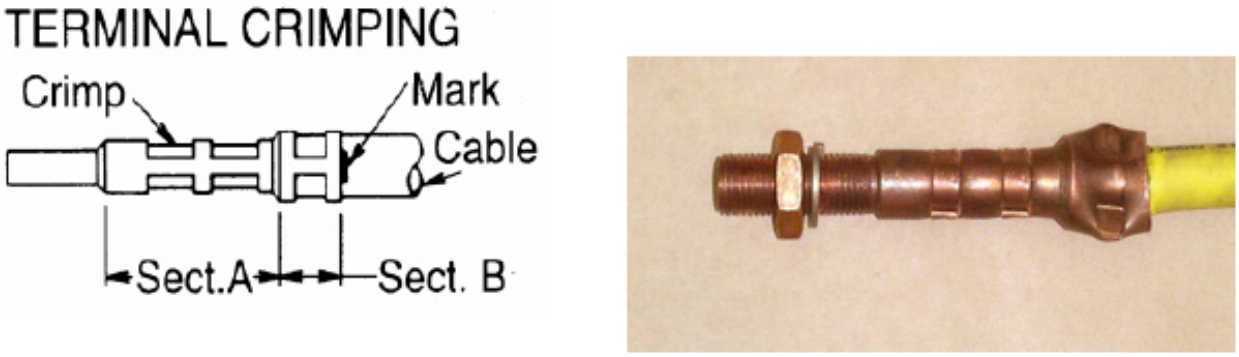

Figure 1

6. After attaching a ferrule, apply A. B. Chance heat shrink tubing number P600-1593 or TIIC number CGX-980A to overlap from a portion of the cable to section B onto section A by ¼ inch. The heat shrink provides additional protection from moisture entering the cable and causing corrosion. Figure 2 shows a completed clamp assembly.
7. When assembling a threaded end ferrule to the clamp. The ferrule must be inserted into the receiving boss as far as possible and the expansion washer and nut applied to the threaded end of the ferrule. For the A. B. Chance ferrule the nut must be tightened to 360 inch-pounds to ensure proper seating of the ferrule to the receiving boss of the clamp.
8. On some manufacturer's clamp, there is a double screw half clamp that secures the ferrule to the clamp at the shoulder end of the ferrule. This "half clamp" is used as a spacer only and is not meant to be a current carrying

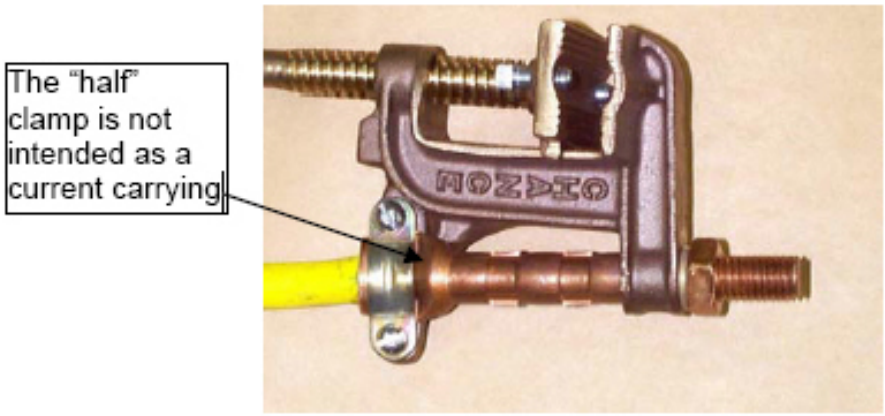

Figure 2

9. The protective ground set must be tested in accordance with Appendix C after the grounding set is competed. After the ground set has passed the required test, the ground set must be marked with the test marking as specified in Appendix C. The two approved test instruments for testing grounds are the A. B. Chance or White Safety Line ground tester.

Low Voltage (600V and below) Protective Ground Sets

1. Purchase commercially available low voltage grounding jumpers to made a grounding set. Grounding jumpers must be #2 AWG or larger. Grounding jumpers can be field fabricated from number 2 AWG or larger insulated (yellow jacketed), extra-flexible, uncoated, stranded, copper cable having a 600 V rated TEC jacketed covering.
2. Since low voltage grounding sets are used to prevent dangerous levels of voltage developing on the conductor or part, they are not required to be rated to carry the maximum available short circuit current.

Appendix C - Grounding Set Test Procedure

GROUNDING SET TEST PROCEDURE

Protective grounds shall be tested annually, not later than February 1 each year, and marked with tape to identify the test year as prescribed in TVA Safety Porcedure 617 Color Coding Identification - Safety Test / Inspection of Material and Equipment to identify inspected power tools and appplicances. In addition to the resistance test, each protective ground shall be inspected to ensure tightness of connections in the clamps and ferrules and to detect physical defects. Protective grounds that are found to have loose connections or defects shall be repaired or discarded.

Temporary protective ground assemblies are tested to ensure that the assemblies limit the current flowing through a worker to a safe level should the ground assembly be subjected to the maximum current that the assembly is rated for the time required to clear the fault.

The maximum safe current through a workers body is calculated using Dalzell's formula:

$$\mathbf{I_{safe}} = \boldsymbol{I} = \boldsymbol{K}\sqrt{\boldsymbol{t}}$$

Where I_{safe} = Current flowing through chest in milliamperes

t = Duration of current in seconds

K= A constant related to electrical shock energy

K= 116 for 110 lb. worker

K= 157 for 154 lb. worker

K= 165 for 165 lb. worker

We use a 154 lb. worker and a maximum fault clearing time of 15 cycles for the safe body current calculation.

t = 15/60 = .25 seconds

I_{safe} = 157/v0.25 = 314 milliamperes

To achieve a safety factor of 2, we use 157 milliamperes as the maximum allowable current through the worker. The accepted industry standard of 1000 (1) ohms as a workers body resistance is used in the calculation of the maximum voltage drop allowed across the worker in the event of a fault.

$V_{max} = I_{max} \times R_w$ $\quad$ I_{max} = 157 ma

V_{max} = .157 x 1,000 $\quad$ R_{worker} = 1,000 Ω

Table C-2 shows the maximum resistance allowed across the protective grounds assemblies – (clamp to clamp) for each size grounding cable. A clamp to clamp resistance equal to or less than the resistance shown in Table C-2 will limit the voltage across a shunted worker to the 157 volts. A “Micro-ohmer” or A. B. Chance Safety Ground Tester is used to test the total resistance of the ground assembly.

Table C-2

Ground Cable Size	15 Cycle Ultimate Current	Max. Assembly Resistance (Micro-ohm)
#2	16 kA	9810
1/0	26 kA	6040
2/0	33 kA	4760
4/0*	43 kA	3650
250*	43 kA	3650
350*	43 kA	3650

* Limit based on clamp ratings.

Any protective safety ground that has a clamp to clamp resistance greater than the resistance shown in Table C-2 should be repaired and tested, or discarded.

References

1. IEEE Guide for Safety in AC Substation Grounding (ANSI/IEEE Std 80 -2000)

Procedure 1009 Guarding Energized Electrical Equipment

TVA Safety Manual

1009 Guarding Energized Electrical Equipment

Procedure Number 1009

TVA Safety Procedure

Guarding Energized Electrical Equipment

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish requirements for work with energized electrical equipment.

Guarding Areas with Electrical Equipment

1. Guarding of spaces and rooms in which electrical supply lines or equipment are installed shall be restricted to authorized persons under any of the following conditions:
   - If, under normal conditions, exposed energized parts at 50 to 150 volts (to ground) are located within 8 feet of the ground or other working surface inside the space or room (this does not include incidental conditions, such as broken or missing light bulbs).
   - If energized parts operating at 151 to 600 volts are, under normal conditions, located within 8 feet of the ground or other working surface inside the space or room are guarded only by physical location.
   - If energized parts operating at more than 600 volts are located within the space or room and are not: (1) enclosed within grounded, metal-enclosed equipment whose only openings are designed so that foreign objects inserted in these openings will be deflected from the energized parts, or (2) the energized parts are installed at a height above the ground or any other working surface that provides protection at the voltage to which they are energized corresponding to the protection provided by an 8 foot height at 50 volts.
2. Where access is restricted to authorized personnel only, access shall be controlled in the following manner:
   - The spaces or rooms shall be enclosed within fences, screens, partitions, or walls to minimize the possibility that unqualified persons will enter.
   - Signs shall be posted at each entrance to warn unqualified persons to keep out.
   - Entrances to rooms and spaces that are not under the observation of an attendant shall be kept locked.

Guarding of Energized Parts

Guarding shall be provided around all energized parts operating at more than 50 volts (to ground) without an insulated covering, unless the location of the energized parts gives sufficient clearance to minimize the possibility of accidental contact. Guidelines for clearances are contained in ANSI C2-1987 (or the edition in effect at the time of the equipment installation).

Guarding of Energized Parts Within Compartments

Except for fuse replacement or other necessary access by qualified persons, the guarding of energized parts within compartments shall be maintained during operations and maintenance functions to prevent accidental contact with energized parts and to prevent tools or other equipment from being dropped on energized parts.

When Guards Are Removed

When guards are removed from energized equipment, barriers shall be installed around the work area to prevent personnel who are not working on the equipment from contacting energized parts.

Procedure 1010 Jumpers

TVA Safety Manual

1010 Jumpers

Procedure Number 1010

TVA Safety Procedure

Jumpers

Revision 1

November 01, 2005

Purpose

The purpose of this procedure is to establish requirements for TVA employees engaging in the use of electrical jumpers.

Requirements

1. Only qualified and authorized employees will troubleshoot energized control circuits.
2. When using jumper cables, follow the rules and procedures listed below.
   - The use of jumper cables for troubleshooting shall be strictly controlled.
   - The responsible employee shall keep a log of jumper cable use to include the circuit or component isolated by the jumper, the jumper identification number or code, the actual location of the jumper's use, the date the jumper was installed, the date it was removed, and the person responsible for attaching and removing the jumper.
3. Each jumper will contain an identification number or code.
4. Jumpers will be designed for the voltage and current to be imposed on them.
5. Alligator clips shall have insulated covers.
6. Do not use jumpers attached by means of alligator clips to bridge the secondaries of inservice energized current transformers. A positive means must be used for attaching the jumper that bridges the secondary terminals.
7. Employees shall use extreme care in attaching and removing jumpers so that short circuits are not created and that the employee does not contact other energized circuits. Wear flame retardant clothing in accordance with TSP 1022, ‘Arc Flash Hazard Calculation and Required Protection” when performing this task.
8. On completion of work, all equipment shall be returned to a safe condition. All enclosures such as panels, outlet covers, conduit covers, etc., shall be replaced with all bolts/screws tightened. All electrical panel doors shall be closed and latched.
9. All grounds and/or jumper cables shall be removed on completion of work.
10. The clearance and hold order shall be removed in accordance with the Conduct Clearance Procedure when the work has been completed and the equipment returned to a safe condition.

Procedure 1011 Portable and Vehicle Mounted Generators

TVA Safety Manual

1011 Portable and Vehicle Mounted Generators

Procedure Number 1011

TVA Safety Procedure

Portable and Vehicle Mounted Generators

Revision 0

January 6, 2003

Purpose

This procedure establishes requirements for the use of portable and vehicle mounted generators.

Requirements

Portable and vehicle-mounted generators, used to supply power to cord and plug-connected equipment, shall meet the following requirements:

- The generator shall only supply equipment located on the generator or the vehicle and cord- and plug-connected equipment through receptacles mounted on the generator or the vehicle.
- The noncurrent-carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles shall be bonded to the generator frame.
- In the case of vehicle-mounted generators, the frame of the generator shall be bonded to the vehicle frame.
- Any neutral conductor shall be bonded to the generator frame.

Procedure 1012 Portable Electrical Tools and Attachments

TVA Safety Manual

1012 Portable Electrical Tools and Attachments

Procedure Number 1012

TVA Safety Procedure

Portable Electrical Tools and Attachments

Revision 3

July 15, 2006

Purpose

The purpose of this procedure is to establish requirements for portable electrical power tools and attachments and to ensure that portable electrical power tools and attachments are used and maintained in a safe manner.

Roles and Responsibilities

All managers, supervisors, foremen and employees are responsible for complying with the requirements of this procedure.

Basic Requirements

1. All portable electrical powered tools shall contain a UL label or other recognized national testing organization.
2. Maximum operating speed (RPM) shall be clearly marked on the tool.
3. Proper personal protective (PPE) equipment shall be worn whenever portable powered tools are used. An assessment of the work, location, and tool used should identify the proper PPE. PPE may include protective eye wear with side shields, goggles, face shields, hard hats, gloves and other body protection. Hearing protection shall be used with all electrical tools which exceed 85 dBA.
4. All employees who use portable electrical powered tools shall be trained. Supplemental training shall be conducted if inspections, observations, or accident studies indicate that these tools are not being properly used or maintained.

   Note TVAN requirement: All operations involving the use of rotating boring machines, rotating welding operations and rotating cutting operations at a TVAN facility must have a Job Safety Analysis (JSA) developed and used in performing the job.

General Precautions for Portable Electrical Power Tools

1. Pay close attention to body position relative to tool cutting edges.
2. Never carry a tool by its service cord. Never yank the cord to disconnect it from the receptacle. Keep cords away from heat, oil, and sharp edges.
3. Disconnect tools when not in use, before servicing, and when changing accessories such as blades, bits and cutters. Follow instructions in the user's manual for lubricating and changing accessories. Do not hold a finger on the switch while carrying a plugged-in tool.
4. Keep observers at a safe distance from the work area.
5. Wear proper apparel. Avoid loose clothing, ties, or jewelry that can become caught in moving parts.
6. Be certain the tool is in good condition and that drill bits, saw blades, etc, are securely mounted in place.
7. Do not use tools without the standard guards installed.
8. Check the power supply cords for damaged areas that could create electrical hazards.
9. Do not use excessive force with power tools as this can result in tool breakage, flying material, and strain/sprain injuries.
10. Constant, repetitive motion with tools can result in strain/sprain injuries. Change positions, change tools or take rest breaks periodically to avoid these types of injuries.
11. If a tool has a "lock on" button, disengage before starting. Do not start the tool until at the work area and ready to begin.

Portable Electrical Power Tools

1. Double insulated portable electrical power tools should be used. Double insulated tools shall be distinctively marked to indicate that the tool is double insulated. Do not assume every tool with 2 prongs on the plug is double insulated unless it is designated on the tool. Electrical powered portable tools that are not double insulated shall have a third wire grounding conductor.
2. Electrical receptacles are tested periodically (quarterly to annually) to ensure each outlet has ground circuit continuity. Receptacles should be inspected for damage and excessive dirt, coal dust, fly ash, or other foreign material.
3. Each receptacle shall be the proper configuration to accommodate the plugs of portable electric tools.
4. Service cords shall be inspected prior to use for damaged insulation, broken outer insulation at the plug/receptacle, and for missing ground prongs.
5. Extension cords when used shall be properly sized for the load likely to be imposed (e.g., larger wire size for higher amperage tools). See TVA Safety Procedure 1004, "Extension Cords and Attachments".
6. Electrical tools should be operated within their design limitations.
7. When not in use, tools shall be stored in a dry place.
8. Never modify the plugs on tools or extension cords.
9. Do not take or use ordinary electrical tools into potentially explosive atmospheres. Special explosion proof tools are required for this type of atmosphere.
10. Route power cords around or over traffic areas and other hazards such as oil or water.
11. When portable generators or vehicle-mounted generators are used to provide power for portable electrical power tools (as in outside locations where fixed electric power facilities are not available), the non-current carrying parts for equipment and the equipment grounding conductor terminals of the receptacles on the generator shall be bonded to the generator or vehicle frame.

Use of Portable Electrical Power Tools in Hazardous Locations

1. Portable electrical power tools capable of producing sparks, or arcing shall not be used in atmospheres containing or likely to contain explosive gases or airborne coal dusts without pre-job planning to include testing for the presence of such hazards. Such hazards, if detected, shall be eliminated prior to beginning operations. Likewise, the presence of coal and coal dust on the floors and horizontal surfaces are subject to ignition from the use of electrical tools.
2. Portable electrical power tools used in wet/damp or conductive environments, such as inside metal tanks, shall be grounded, protected by a GFCI, or be double insulated. An alternative is to use tools rated for 50 volts or less supplied through an isolating transformer with an ungrounded secondary of not over 50 volts.

Switches and Controls

1. Constant pressure switches are used on tools such as powered circular saws, drills, grinders, belt sanders, reciprocating saws, jig saws, and other similarly operating powered tools. They may have a lock-on control, provided that turnoff can be accomplished by a single motion of the same fingers that turn it on.
2. Hand-held powered tools such as, but not limited to, platen sanders, grinders with wheels, and disc sanders with discs two inches in diameter or less, routers, planers, laminate trimmers, nibblers, shears, saber, scroll and jig saws with blade shanks a nominal one-fourth of an inch wide or less must be equipped with a positive “on-off” control.

Portable Electric Drills

1. Do not use bits or attachments which are not designed for a drill. Make certain the bit or attachment is far enough into the chuck and is evenly seated in the chuck.
2. Secure the work in a vise, with a clamp, etc. DO NOT TRY AND HOLD ANY PIECE WHILE DRILLING. When drilling, especially in metal, center punch the hole to keep the drill from skidding on the surface.
3. Do not use excessive pressure when drilling. This can cause material and drill bit breakage and possibly flying parts and material.
4. Use a drill limiting device such as a drill bit stop collar when drilling into objects that contain energized electrical components to prevent contact with the energized components.

Portable Electrical Power Saws

1. All portable electrical powered saws will not be operated if they are not equipped with a constant pressure switch or control that will shut off the power when pressure is released. Saws shall not be used if the switch is malfunctioning.
2. All portable electrical powered saws shall have the operating speed etched or otherwise permanently marked. Saws shall not be operated at a speed other than that marked on the blade.
3. Keep your off-hand well clear of the blade. Do not try to support the work with your hand, knee, or any other part of your body while cutting. Properly support the work or secure it with clamps.
4. Beware of kickback by keeping blades sharp and properly set, by checking the material for nails or other material, and supporting the work properly near the line of the cut. If the material sags it may cause the blade to bind.
5. Keep the guard in place and working properly.
6. Keep electrical cords out of the path of the saw blade.
7. Use blades that are appropriate for the material being cut and replace the blades if damaged or dull. If the material, such as wood, is wet there is a greater possibility of kickback by a saw. Do not saw wet wood.
8. All portable electrical powered circular saws having a blade diameter greater than two inches shall not be used unless equipped with properly functioning guards above and below the base plate or shoe. The guard must

function so that when the saw is withdrawn from the work, the lower guard automatically and instantly returns to a covering position. The guard must cover both the upper and lower portion of the work to the depth of the teeth except for the minimum arc required to permit the base to be tilted for bevel cuts and to allow proper retraction and contact with the work.

Grinding and Cutting

Portable electrical grinding and cutting tools shall be operated and maintained in accordance with the applicable requirements for those types of tools set forth above and the specific requirements for grinding and cutting in TVA Safety Procedure 710, “Grinding and Cutting”.

Inspection / Testing of Portable Electrical Power Tools

1. Each portable electrical power tool shall be visually inspected by the user prior to use.
2. Formal inspections by qualified persons shall be conducted annually for the following:
   - Defective/improper wiring. This would include frayed, broken, or cut outer insulation and outer insulation broken at the keeper to the plug or where the wiring enters the tool.
   - Incorrect plug configuration. All plugs shall meet NEMA configuration for applicable voltage. Crows foot plugs should not be used.
   - Inadequate or absence of continuity of equipment grounding conductor; missing, broken, or cut ground prong is cause to attach a defective equipment tag.
   - Double insulated tools shall be examined for cracked casings and grease or oil on the outer casing. Tools with cracked casings shall not be used until repaired. Tools with excessive oil or grease shall be thoroughly cleaned prior to use. Double insulated tools that have been immersed in water, mud, or other liquid shall not be used until the tool has been disassembled, cleaned, dried, and checked by a qualified person.
   - Defective or improperly configured switch.
   - Excessive accumulation of dirt, oil, grease, or other contaminants which could create a hazard or malfunction.
3. A record of inspections shall be maintained. The record may be maintained in any legible form as long as a unique identifier for the tool, date of inspection, and condition of the tool are noted. This record may be destroyed after one year from the inspection date.
4. Use the annual color code prescribed in TVA Safety Procedure 617 Color Coding Identification - Safety Test / Inspection of Material and Equipment to identify inspected portable electrical tools and attachments.
5. Defective tools shall be removed from service, tagged and repaired or disposed of as applicable.
6. Complying tools shall be marked by a method such as taping that is well communicated to all plant/facility personnel.

Training

All employees who use portable electrical tools shall complete the TVA safety training course “Hand and Portable Power Tools”, ATIS 00059124.

Reference

- 29 Code of Federal Regulations 1910 Subpart P “Hand and Portable Powered Tools and Other Hand-Held Equipment”
- 29Code of Federal Regulations 1926 Subpart I “Tools - Hand and Power”
- 29Code of Federal Regulations 1910.269(I), “Electric Power Generation, Transmission, and Distribution”, Hand and Portable Power Tools”
- TVA Safety Procedure 425, “Hand and Portable Power Tools Course Standard”
- TVA Safety Procedure 710, “Grinding and Cutting”

Procedure 1013 Radio Frequency (RF) Safety

TVA Safety Manual

1013 Radio Frequency (RF) Safety

Procedure Number 1013

TVA Safety Procedure

Radio Frequency (RF) Safety

Revision 1

July 15, 2006

Purpose

The purpose of this procedure is to prevent injury from overheating of body tissue and contact burns caused by Radio Frequency (RF) exposure.

Responsibilities

1. Managers are responsible and accountable for carrying out radiation safety requirements as a part of all activities utilizing radio frequency electromagnetic radiation. This is accomplished by monitoring and evaluating potential hazards and ensuring employees are aware of these hazards and applying appropriate safeguards.
2. Employees will, as a condition of employment, comply with safety requirements and procedures. They are responsible and accountable for performing their work in a manner that will protect themselves, fellow employees, and the general public from unnecessary exposure to radiation.

Hazards

1. RF emissions from communication sites operating within established safety guidelines do not pose an established health risk.
2. However, the RF fields close to antennas, defective RF equipment including waveguides, coaxial cables, or RF equipment configured for maintenance; present a potential for overexposure.
3. The established health risks associated with working in close proximity to transmitters and antennas with high levels of RF emissions are the following:
   - RF burns due to direct physical contact with exposed RF transmission media
   - Internal overheating of the body tissues and organs
   - Interference to the operation of personal medical devices.
4. RF emissions do not have the same effect on body tissue as ionizing radiation such as xrays or nuclear radiation.

Criteria for Exposure Control

1. Table 1 establishes the limits for MPE and RFPG
2. The RFPG or MPE established limits for human exposure to nonionizing radiation in the frequency range 300 kHz to 100 GHz. These limits are expressed in terms of :
   - Column 2, mean squared electric field (E)
   - Column 3, mean squared magnetic (H) field strengths
   - Column 4, the equivalent plane-wave, free-space power density as a function of frequency (f) in MHz as specified in column 1 and limited by time as specified by column 5.

Measurements

1. For pulsed and continuous fields, the power density should be averaged over a 6-minute period for applications at the RFPGs or MPEs. Measurements should be made at all potential exposure positions such as at the RF source, waveguides, and/or antenna.
2. All measurements to determine adherence to the RFPG or MPE should be made at distances 5 cm or greater from any object.

As Low as Reasonably Achievable

1. The RFPGs and MPEs values given in this procedure are used as guides in the evaluation and control of exposure to radio frequency and/or microwave radiation exposure.
2. These values are not regarded as acceptable or used to distinguish between safe and dangerous levels since all exposures to nonionizing radiation shall be kept as low as reasonably achievable, ALARA.

Safety Procedures

1. A personal safety monitor called a RADMAN will be used to ensure that employees are not working in RF fields that exceed exposure guidelines.
2. Employees shall not be exposed to microwave power densities in excess of 10 milliwatts per square centimeter.
3. Employees shall not look into an open waveguide or antenna that is connected to an energized microwave source.
4. Only qualified and trained employees shall be assigned to install and maintain RF transmitter and antenna equipment.
5. Employees are required to report to their supervisor any RF over-exposure incidents such as RF skin burns, interference with personal medical devices, suspected overheating of the body, etc.
6. Operators of fixed or mobile radio transmitters, other than hand-held, shall ensure that no person is within reach of the radio antenna during transmission.
7. Employees shall not operate the transmitter of a portable UHF or VHF radio unless the radio antenna is at least three inches from the operator's mouth.
8. Employees climbing a tower or working in the vicinity of roof top antennas shall not stop near an active antenna.
9. Employees testing or operating high-powered transmitters shall never use a magnetic mount antenna or other portable antenna device attached to the transmitter cabinet or located in the same equipment room as the transmitter.
10. Employees shall not dismantle or service RF wave guides, coaxial transmission lines, or antennas without ensuring that the transmitter or transmitters are disabled.
11. Employees shall always return transmitter shielding covers and RF connections to normal before returning the transmitter to full service.
12. Employees who work in potentially strong RF fields should receive RF health and safety training to ensure they understand the hazards of RF exposure and the means by which these hazards are controlled.

13. Employees should not operate the transmitter of a mobile radio when someone outside the vehicle is within five (5) feet (1.5m) of the antenna.
14. Whenever possible, employees should not operate the transmitter of mobile radio with a local microphone from outside the vehicle.
15. Mobile and portable radio operators should keep transmit times to a minimum.
16. Employees climbing a tower or working in the vicinity of roof top antennas should assume that all antennas are active unless verified to be inactive.
17. Employees climbing a tower or working in the vicinity of roof top antennas should ensure all antennas on the tower or roof top are de-energized.
18. Employees working in the vicinity of roof top antennas should maintain a 5-foot clearance from all active antennas.
19. Employees should test with the transmitters RF shields in place and with the output terminated in an RF dummy load designed for this purpose.
20. At microwave installations, the transmitter power should be turned off before dismantling the waveguide, working on the antenna feed horn, or working in the immediate area between the feed horn and the antenna reflector.
21. Work shall not begin until the RF hazard has been identified and plans and steps have been put in place to make the work area safe. This applies whether the work is connected with RF equipment and antenna systems or is transmission line maintenance work on transmission towers which have PCS or TVA antenna system's mounted on them.
22. Training in the use of the RADMAN (see note below) shall be given employees, supervisors, and foremen who have work assignments which place them in a potentially hazardous RF environment.
23. When the personal RF safety monitor indicates that safe levels are being exceeded, the employee shall stop, move to a safe area and notify their supervisor or foreman. Work being performed in the overexposure area must be halted until the hazard is identified and steps taken to prevent overexposure. At times, this may require rescheduling the work in the overexposure area until a safety assessment can be made and steps taken to make the area safe.
24. If the supervisor or foreman cannot resolve the RF overexposure problem within the hazardous location, then he/she should contact the TransComm Network Management Center (NMC) at 1-877-534-4151 (toll free) or 1-423-697-4151. The NMC will initiate the assessment process.
25. Work that involves potential RF exposure shall be planned in accordance with TVA Safety Procedure 6, "Plan Jobs Safely".
26. **Note:** The RADMAN personal safety monitor is designed to warn when safe RF levels, both electrical and magnetic, are being exceeded. The use of the monitor requires that an employee "back off" and evaluate the exposure potential when there is an alarm. The monitor gives an audible alarm and a visual indication of the percentage of maximum allowed exposure levels. The monitor must be used as prescribed by the manufacturer or it could give false indications particularly in 60 Hz fields associated with power lines and substations. Training in how to use the monitor and interpret results is required prior to using the monitor.

Definitions

Maximum Permissible Exposure (MPE) - The maximum limit of exposure to radio frequency field strengths and equivalent plane wave power densities that are set to limit unwanted biological effects from energy deposition in the human body.

Radio Frequency Protection Guide (RFPG) - The radio frequency field strengths and equivalent plane wave power densities that are set to limit energy deposition in the human body to restrict the risk of unwanted biological effects.

Specific Absorption Rate (SAR) - The time rate at which radio frequency electromagnetic energy is impaired to an element of mass of a biological body.

Reference

- ANSI C95.3-1979, "Techniques and Instrumentation for the Measurement of Potentially Hazardous Electromagnetic Radiation at Microwave Frequencies"
- ANSI C95.1-1982, "Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields"
- American Conference of Governmental Industrial Hygienists, "Threshold Limit Values and Biological Exposure Indices," 1985-1986
- ANSI C95.5-1981, "Recommended Practice for Measurement of Hazardous RF and Microwave Electromagnetic Fields"
- Title 29, Code of Federal Regulations, Part 1030, "Performance Standards for Microwave and Radio Frequency Emitting Products"
- Title 29, Code of Federal Regulations, Part 1910.97, "Nonionizing Radiation"
- Federal Communications Commission OET Bulletin 65, Edition 97-01, “Evaluating
- Compliance with FCC Guidelines for Human Exposure to Radiofrequency and Electromagnetic Fields, August 1997
- Title 47, Code of Federal Regulations, Parts 1.1307(b), 1.1310, 2.1091 and 2.1093

Table 1 - Limits For MPE and RFPG (1)

Frequency (f) Range (MHz)		E (V2/M2)	H (A2/M2)	Power Density (mW/cm2)	Average Time minutes
0.3	3.0	14 (2) 614 (3) 400,000 (4)	1.63 (2) 1.63 (3) 2.5 (4)	100 (2) 100 (3) 100 (4)	6 (2) 30 (3) 6 (4)
3.0	30	1842/f (2) 824/f (3) 4,000 (900/ft^2) (4)	4.89/f (2) 2.19/f (3) 0.025 (900/ft^2) (4)	900/f^2 (2) 180/f^2 (3) 900/f^2 (4)	6 (2) 30 (3) 6 (4)
30	300	61.4 (2) 27.5 (3) 4,000 (4)	0.163 (2) 0.073 (3) 0.025 (4)	1.0 (2) 0.2 (3) 1.0 (4)	6 (2) 30 (3) 6 (4)
300	1500	none (2) none (3) 4,000 (f/300) (4)	none (2) none (3) 0.025 (f/300) (4)	f/300 (2) f/1500 (3) f/300 (4)	6 (2) 30 (3) 6 (4)
1500	100000	none (2) none (3) 20,000 (4)	none (2) none (3) 0.125 (4)	5.0 (2) 1.0 (3) 5.0 (4)	6 (2) 30 (3) 6 (4)

Table 1 notes:

1. For convenience, the RFPG or MPE may be expressed as the equivalent power density as shown in figure 2.
2. August 1997, FCC OET Bulletin 65 and are exposure limits specifically for "Occupational or Controlled Exposures".
3. August 1997, FCC OET Bulletin 65 and are exposure limits specifically for "General Population or Uncontrolled Exposures".
4. ANSI C95.1-1982
   For exposures consisting of a number of frequencies, the fraction of the RFPG or MPE incurred within each frequency level should be determined and the sum of all fractions should not exceed unity or 1.
   For example, if the field is made up of 10 mW/cm^2 at 3 MHz, 0.5 mW/cm^2 at 3000 MHz, and 1 mW/cm^2 at 1,500 MHz, the limit would be calculated as follows.

$$\frac{10\ mW/cm^2}{100\ mW/cm^2} + \frac{0.5\ W/cm^2}{5\ mW/cm^2} + \frac{1\ W/cm^2}{5\ W/cm^2} < 1$$

$$0.1 + 0.1 + 0.2 < 1$$

$$0.4 < 1$$

At frequencies between 300 kHz and 1 GHz, if the radiating device has an output power of 7 watts or less, the apparatus is excluded from RFPG or MPE limitations. For example, if a handheld transmitter operating at 27 MHz has a maximum power output of 5 watts, it would be excluded from any further field measurements.

The RFPG limits shown in figure 1 are derived from the concept of SAR of energy deposition of 0.4 watts per kilogram averaged over the whole body for a 6-minute (0.1 hour) period.

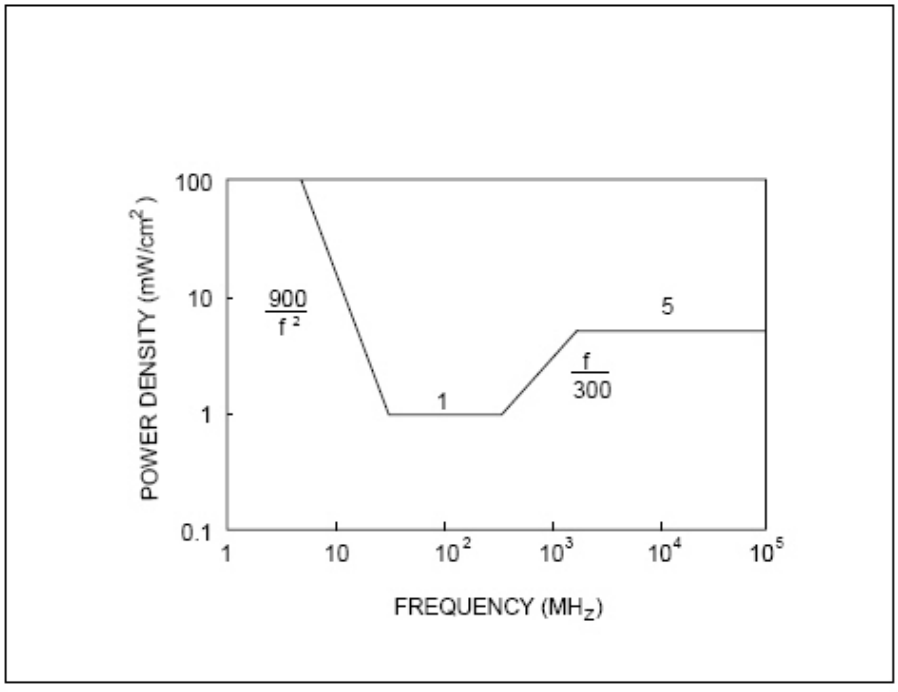

Figure 1
Example using ANSI C95.1-1982 Radio Frequency Protection Guide for Whole-Body Exposure of Human Beings

Procedure 1014 Safe Distribution Systems

TVA Safety Manual

1014 Safe Distribution Systems

Procedure Number 1014

TVA Safety Procedure

Safe Distribution Systems

Revision 0

January 6, 2003

Purpose

This procedure provides requirements for personnel engaging in work with electrical distribution systems.

Requirements

1. Branch circuits will originate in a distribution cabinet or panel board approved for the specific environment where it is located. Covers for the cabinets or control panels shall be appropriately labeled.
2. Branch circuits will include a separate equipment grounding conductor (connected to a grounding system). The grounding conductor will be equal in size and insulation to the load conductors. Bare conductors and conduit will not be used for branch circuit grounding.
3. Branch circuits will be protected with overload devices of the appropriate current rating.
4. Branch circuit conductors will be rated for at least 600 volts.
5. Each switch, GFCI, over-current device, and receptacle will be identified or arranged in such a manner to indicate the circuit it supplies.
6. Use attachment plugs or other connectors that are designed to confine electrical arcs when 300 volts or more is to be distributed.
7. Junction boxes, switch panel boxes, and conduits will be fitted with covers. Covers shall remain in place except for inspection and maintenance functions.
8. Bushings will be used to protect wiring entering or leaving electrical boxes.
9. Power distribution centers will be used whenever extension cord runs of more than 200 feet are required to be used with a large number of portable electrical tools.

Reference

- 29 Code of Federal Regulations 1910 “Electric Power Generation, Transmission and Distribution”.
- 29 Code of Federal Regulations 1910, Subpart S, Electrical
- 29 Code of Federal Regulations 1926, Subpart K, Electrical

Procedure 1015 Temporary Electrical Power Supply and Wiring Systems

TVA Safety Manual

1015 Temporary Electrical Power Supply and Wiring Systems

Procedure Number 1015

TVA Safety Procedure

Temporary Electrical Power Supply and Wiring Systems

Revision 0

January 6, 2003

Purpose

1. The purpose of this procedure is to establish requirements for employees engaging in supplying temporary electrical power.
2. This procedure does not apply to permanent power installations using a Temporary Alteration Permit (TAP).

Requirements

1. All electrical devices used in constructing temporary electrical wiring systems shall contain UL or FM listings.
2. Splices and taps in conductors shall be made with molded or vulcanized insulation equivalent to the cord being spliced. Rosin-core electrical solder or compression connections shall be used to splice conductors within junction boxes.
3. Metal enclosures of energized electrical conductors shall be grounded.
4. Conductors routed through walls, doorways, and other pinch points shall be protected from damage during use and storage. Conductors will be routed over passageways where possible or provided with floor bridges.
5. No wiring of any type shall be installed in ducts used to transport coal dust, other stock, or flammable vapors.
6. Temporary wiring systems in areas containing coal dust, battery charging rooms, or in other areas where flammable gases/vapors may be present shall contain equipment rated for the class of hazard and be installed per the requirements of that class of hazard.
7. Exposed metal parts on 120 volt lighting circuits shall be grounded.
8. Temporary wiring systems shall be dismantled and removed when no longer required.

Procedure 1016 Temporary Lighting

TVA Safety Manual

1016 Temporary Lighting

Procedure Number 1016

TVA Safety Procedure

Temporary Lighting

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish requirements for selection and use of temporary lighting.

Requirements

1. Temporary lighting stringers shall not be electrically loaded beyond the manufacturer's specifications (maximum wattage) or wire size ampacity.
2. Bulb sizes shall not negate the protection of the guard of the lamp holder.
3. No electrical tool or appliance shall be plugged into a temporary light stringer.
4. Portable lamps for routine area lighting shall be protected from accidental contact or breakage.
5. Bulbs shall be protected by suitable fixtures or lamp holders with guards. A permissible alternative is to elevate the light fixture 7 feet above the normal working surface.
6. GFCIs shall be used with all 120 volt portable lights in wet or conductive environments.

Procedure 1017 Transformers - Current and Potential

TVA Safety Manual

1017 Transformers - Current and Potential

Procedure Number 1017

TVA Safety Procedure

Transformers - Current and Potential

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish requirements for current and potential transformers.

Requirements

1. The secondary of a current transformer shall not be opened while the transformer is energized. If the primary of the current transformer cannot be deenergized before work is performed on an instrument, relay, or other section of a current transformer secondary circuit, the circuit shall be bridged so that the current transformer secondary will not be opened.
2. Do not connect or disconnect the primary side of instrument current transformers while it is energized.
3. The primary side (480 volts or above) of potential transformers are not connected or disconnected within metal cabinets while energized.
4. Do not short circuit the secondary terminals on a potential transformer while it is energized.

Procedure 1018 Vehicle Operations Near Energized Lines or Equipment

TVA Safety Manual

1018 Vehicle Operations Near Energized Lines or Equipment

Procedure Number 1018

TVA Safety Procedure

Vehicle Operations Near Energized Lines or Equipment

Revision 0

January 6, 2003

Purpose

This procedure establishes requirements for qualified employees performing work associated with vehicle operations near energized lines or equipment.

Requirements

1. Vehicles and mechanical equipment operated by a qualified employee shall be operated so that the minimum approach distances in Appendix A, Vehicle Minimum Clearance Distances for all Types of Energized Work are maintained from exposed energized lines and equipment.
   Note: The insulated portion of an aerial lift operated by a qualified employee in the lift is exempt from this requirement.
2. A designated employee other than the equipment operator shall observe the approach distance to exposed lines and equipment.
3. Timely warning shall be before the minimum approach distance is reached unless it is certain that the operator can accurately determine that the minimum approach distance is being maintained.
4. If, during operation of vehicle equipment, the equipment could become energized, the operation shall comply with at least one of the following requirements:
   - The energized lines exposed to contact is covered with insulating protective material that will withstand the type of contact that might be made during the operation, or
   - The equipment is insulated for the voltage involved and positioned so that its uninsulated portions cannot approach the lines or equipment any closer than the minimum approach. distances specified in the table below.
5. Where the vehicle could become energized in the conduct of work operations, the following measures shall be utilized:
   - Use appropriate vehicle grounds identified by green color coding.
   - Bond the vehicle to the best available ground source.
   - Bond equipment together to minimize electrical potential differences.
   - When available, utilize ground mats to extend areas of equipotential.
   - Use insulating protective equipment or barricades to guard against any remaining hazardous potential differences.
6. Flammable gas or liquids shall not be stored or dispensed under high-voltage lines.

7. Cranes and other mobile equipment shall not be parked (when not is use) or refueled under energized high-voltage lines.
8. If it is necessary in an emergency for an equipment operator to leave equipment in contact with energized high-voltage lines, the operator shall jump, not step, from the equipment to ground.
9. In generating plant environments, warning (Danger) signs shall be posted where equipment would travel beneath high-voltage lines.
10. The signs shall indicate the line voltage and the line height above the ground.

Definitions

Qualified Employee (Qualified Person) One knowledgeable in the construction and operation of the electric power generation, transmission, and distribution equipment involved, along with the associated hazards. An employee must have the training required by this work practice/procedure in order to be considered a qualified employee. An employee undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties.

Appendix A - Vehicle Minimum Clearance Distances for all Types of Energized Work

Vehicle Minimum Clearance Distances for all Types of Energized Work

VEHICLE MINIMUM CLEARANCE DISTANCE FOR ALL TYPES OF ENERGIZED WORK						
Voltage in Kilovolts Phase to Phase			Distance to Vehicle			
			Phase to Ground		Phase to Phase	
			(FT - IN)	(METERS)	(FT - IN)	(METERS)
51 volts	to	300 volts	Avoid Contact		Avoid Contact	
300 volts	to	1.0 KV	1-0	0.31	1-0	0.31
1.1 KV	to	15.0 KV	2-1	0.64	2-2	0.66
15.1 KV	to	36.0 KV	2-4	0.72	2-7	0.77
36.1 KV	to	46.0 KV	2-7	0.77	2-10	0.85
46.1 KV	to	72.5 KV	3-0	0.90	3-6	1.05
72.6 KV	to	121.0 KV	3-2	0.95	4-3	1.29
138 KV	to	145.0 KV	3-7	1.09	4-11	1.50
161 KV	to	169.0 KV	4-0	1.22	5-8	1.71
230 KV	to	242.0 KV	5-3	1.59	7-6	2.27
345 KV	to	362.0 KV	8-6	2.59	12-6	3.80
500 KV	to	550.0 KV	11-3	3.42	18-1	5.50
765 KV	to	800.0 KV	14-11	4.53	26-0	7.91

Procedure 1019 Wet Cell Storage Batteries

TVA Safety Manual

1019 Wet Cell Storage Batteries

Procedure Number 1019

TVA Safety Procedure

Wet Cell Storage Batteries

Revision 0

January 6, 2003

Purpose

This procedure provides specific instruction and guidelines for personnel engaging in work with wet cell storage batteries.

General Requirements for Wet Cell Batteries

1. Employees servicing or changing batteries shall wear face shields, chemical goggles, rubber gloves, and rubber aprons or rain suits.
2. Only persons properly trained and authorized will change batteries.
3. An emergency eyewash fountain facility shall be installed or available in the charging area. Its location shall be easily accessible to workers. Where facilities will accommodate, an emergency shower should be provided for flushing battery electrolyte splashes or spills from workers.
4. Emergency eyewash facilities shall be capable of providing at least 15 minutes of flushing action utilizing a sanitary flushing solution of water or other approved flushing medium.
5. An adequate supply of water shall be provided for flushing and neutralizing spilled electrolyte.
6. Only spirit thermometers shall be used when taking electrolyte cell temperature. Mercury thermometers could break, and mercury running into the cell between the plates will cause sparking and possible explosions.
7. Cell vent plugs shall be kept firmly in place at all times except when adding water or making hydrometer readings. (These vent plugs shall be the flame-arrester type.)
8. Tools used for tightening connector bolts shall have insulated handles. Rings, wristwatches, etc., shall be removed before working on the battery.
9. Facility mounted or portable material handling equipment shall be provided and used when changing batteries.
10. Smoking, open flames, or welding is prohibited in battery charging areas.
11. Keep tools and metal objects off the top of the batteries to avoid short circuits.

Inside Battery Rooms

1. Inside battery charging shall be provided with sufficient ventilation to ensure diffusion and prevent accumulation of hydrogen. Natural ventilation, located near the roof of such rooms, or powered ventilation should be used. Otherwise, such rooms will be classified as Class I, Division II areas and electrical lighting and fixtures provided to meet that classification.
2. Electrical wiring, conduit, and boxes shall be of the type to resist corrosive action. Aluminum or zinc coated and corrosive protected steel should be used. Battery racks should be treated for corrosion resistance or be constructed of fiberglass.
3. Racks and trays shall be substantial and shall be treated to make them resistant to the electrolyte.
4. Floors shall be of acid resistant construction unless protected from acid accumulations.
5. Battery rooms shall be clean and kept dry. Sufficient work space should be provided for inspection and maintenance.
6. Only authorized and qualified employees shall be allowed inside battery storage rooms. Signs should be posted at the entrance to these rooms prohibiting unauthorized entry. Signs should be as shown below or equivalent.

Forklift and Other Vehicle Battery Charging Areas

1. Areas shall be designated for charging of forklift and other vehicle batteries. Signs shall identify these locations and shall prohibit smoking and open flames in these areas.
2. These areas shall be ventilated, provided with facilities for flushing or neutralizing spilled electrolyte and provided with some means of fire protection. At least one fire extinguisher mounted in the area will satisfy this requirement.
3. Battery charging apparatus will be physically protected from damage that might be caused by the forklift or vehicle.
4. Care shall be taken to ensure that vent caps are functioning. The battery (or compartment) cover(s) shall be open to dissipate heat.

Connecting or Disconnecting Batteries

1. Check all switches and any other current drawing devices of the equipment or vehicle and ensure they are in the OFF position.
2. Bystanders shall be cleared from the area of the battery.
3. Disconnect the grounded battery cable first, then disconnect the positive cable.
4. After replacing and securing the battery, connect the positive cable first, then the grounding cable. Tighten each battery post cable connection before proceeding to the next step.

Reference

- 29 Code of Federal Regulations 1910.178, “Powered Industrial Trucks”
- 29 Code of Federal Regulations 1926.441, “Batteries and Battery Charging”

Procedure 1020 Work In Coal Handling Areas

TVA Safety Manual

1020 Work In Coal Handling Areas

Procedure Number 1020

TVA Safety Procedure

Work In Coal Handling Areas

Revision 0

January 6, 2003

Purpose

This procedure establishes requirements for employees performing work in coal handling areas.

Requirements

1. All electrical equipment installed or used in coal handling areas shall be designed and installed to meet Class II, Division 2 classification requirements.
2. Because of the potential for electrical arcing, all equipment located in coal handling areas shall be deenergized when work is be performed on such equipment.
3. Only portable electrical tools and portable or temporary lighting approved for Class II areas shall be used when performing work in coal handling areas.
4. If welding or cutting must be performed in coal handling areas, a Cutting, Welding, Open Flame and Spark Production Permit must be obtained. A fire watch with portable fire extinguishers shall be provided. The fire watch will monitor the area where the work was performed for at least 30 minutes or as directed by the permit approver after completion of the cutting/welding. For cutting or welding in coal handling facilities there will be a minimum 2 hour period after completion of the work. A detailed inspection should be made during and at the end of the period to detect or verify no possible smoldering fires or hot spots.
5. Equipment that is to be worked on shall be cleaned of deposited coal dust. Methods of cleaning shall ensure that the deposited coal dust is not caused to become airborne.
6. In order to maintain the design function of Class II electrical equipment, all equipment shall have all openings closed with the proper closure fixtures and have all bolt/screw holes closed with the proper bolt/screw after work is performed. All Class II lighting fixtures shall have the globe reinstalled after replacing burned out bulbs.

Procedure 1021 Working on / or Near Energized Electrical Equipment

TVA Safety Manual

1021 Working on / or Near Energized Electrical Equipment

Procedure Number 1021

TVA Safety Procedure

Working on / or Near Energized Electrical Equipment

Revision 4

April 1, 2011

Purpose

The purpose of this procedure is to establish requirements for qualified employees when working on/or near energized electrical equipment.

Roles and Responsibilities

If it is necessary to work on energized circuits or equipment for continuity of service, the final decision as to whether the job may be done safely is the responsibility of the supervisor who has direct charge of the work. It is his or her responsibility to know that his or her crew is properly trained for the work on energized equipment that the proper tools and equipment are used, the tools and equipment have been tested and are safe, and that correct safety measures are taken.

Two-Person Rule

1. At least two qualified employees are required to be present while the following types of work are performed on exposed electrical circuits or equipment energized at more than 600 volts. Energized electrical conductors/parts enclosed in compartments/cabinets or behind closed doors and not within reach of employees are not considered exposed and the two-person rule does not apply.
2. Installation, removal, or repair of de-energized lines if an employee is “exposed to contact” with other circuit parts energized at more than 600 volts. The term “exposed to contact” is meant to apply to an employee who is in a working position from which he/she can reach or take a conductive object within the electrical component of minimum approach distances in paragraph 10, Minimum Approach (Clearance) Distances.
3. Installation, removal, or repair of energized equipment such as but not limited to transformers, capacitors, and regulators.
4. Work involving the use of mechanical equipment other than insulated aerial lifts near energized parts. The term “near” as it applies to non-insulated mechanical equipment that due to its working position can physically contact the energized electrical circuit in question. The contact may be due to either (1) inadvertent movement of the equipment to a point within the minimum approach distances (human error) or (2) mechanical failure of the equipment causing the equipment to move to a point within the minimum approach distances.
5. Other work that exposes an employee to electrical hazards equal to or greater than those posed by the operations described above regardless of voltage or energy level.

Exceptions to the Two-Person Rule

The following activities are exceptions to the two-person rule and can be safely performed by a single qualified employee.

- Routine or emergency switching of circuits where previous experience demonstrates that the conditions present permit the work to be performed safely.
- Work performed with live-line tools if the employee is so positioned as to be neither within reach or otherwise exposed to contact with energized parts.
- Emergency repairs to the extent necessary to safeguard the general public, recognizing that the loss of power can create public safety concerns that outweigh the safety concerns of individual employees as it applies to the two-person rule. Once the emergency to the general public is abated, the two-person rule applies to the remainder of the work.

Noncurrent-Carrying Metal Parts

Noncurrent-carrying metal parts of equipment or devices, such as transformer cases and circuit breaker housings, shall be treated as energized at the highest voltage to which they are exposed unless verified as grounded before work is performed.

Maintenance, Modification and Construction

Maintenance, modification and construction work on electrical circuits and equipment shall not be done until proper authorization has been obtained and it has been determined that the work can be done in a safe manner and that all of this is clearly understood by each involved person.

Conductive Articles

Exposed conductive articles, such as rings, metal wristwatches, bracelets, metal necklaces, key chains, watch chains, and metal belt buckles shall not be worn when working on or within reaching distance of exposed energized electrical conductors or surfaces.

Insulated Hand Tools

1. Insulated hand tools may be used to manipulate exposed energized parts operating at greater than 50 volts up to 1,000 volts.
2. Use insulated hand tools constructed in accordance with American Society for Testing and Materials (ASTM) F1505 Standard. The use of insulated hand tools does not eliminate the need to use voltage rated gloves or other insulating barriers where an employee may accidentally make contact with exposed energized conductors/parts operating at 50 volts or more. For example, if an employee's hand is exposed to contact with energized parts other than the one being manipulated with the insulated tool, rubber insulating gloves would be required.

Personal Protective Equipment (PPE) for Energized Work on Panelboards Rated 240 V and Below or Other Circuits Operating at greater than 240 V but less than 300 V

Select PPE when performing tasks on or near exposed energized conductors or parts on panelboards rated 240 V and below or other circuits operating at greater than 240 V but less than 300 V in accordance with the following chart:

Selection of PPE for Energized Work on Panelboards Rated 240 V and Below or Other Circuits Operating at greater than 240 V but less than 300 V					
Task (Assumes Equipment is Energized)	**Hard Hat[a]**	**Safety Glasses**	**FR Clothing[d]**	**Insulated Tools**	**Voltage Rated Gloves[b]**
Breaker or fused switch operation – covers on or off	As needed	Yes	N.A.	No	No
Work on energized parts, voltage testing	Yes	Yes	N.A.	Yes	Yes[b]
Remove/install breakers or fused switches	Yes	Yes	N.A.	Yes	Yes[b]
Remove/Install fuses	Yes	Yes	N.A.	Yes[c]	Yes[b]
Removal of bolted covers (to expose bare, energized parts) – non-hinged	Yes	Yes	N.A.	No	No
Removal of covers (to expose bare, energized parts) - hinged	As needed	Yes	N.A	No	No

Notes:

a. Hard hats may be omitted in control panels where the voltage present does not exceed 250Vdc, unless required by other procedures or requirements.

b. When maximum exposed voltage is < 300V, voltage-rated gloves are required only when contact cannot be avoided or accidental contact with an exposed energized part is likely. As an alternative to gloves, electrical insulating blankets or sleeves may be used to prevent accidental contact with energized surfaces.

c. An insulated fuse removal tool is used whenever possible for removing/installing fuses not enclosed in an insulated block.

d. N.A. means not applicable

Minimum Approach (Clearance) Distances

1. Only qualified employees may work on exposed, uninsulated energized electrical lines, conductors, or equipment.
2. Only qualified employees may work in areas containing unguarded, uninsulated energized lines or parts of equipment operating at 50 volts or more.
3. Electrical lines and equipment are considered energized unless properly cleared and verified as required by the organization Conduct Clearance Procedure.
4. The table shown below establishes the safe distances to which persons may approach or take conductive objects to exposed energized conductors and parts.

   Minimum Clearance Distance for All Type of Energized Work

			Distance to Employee			
Voltage	**in kV-**	**Phase to Phase**	**Phase to Ground**		**Phase to Phase**	
			Ft - In	Meters	Ft - In	Meters
50 volts	to	300 volts	Avoid Contact		Avoid Contact	
300 volts	to	1.0 kV	1--0	0.31	1--0	0.31
1.1 kV	to	15.0 kV	2--1	0.64	2--2	0.66
15.1 kV	to	36.0 kV	2--4	0.72	2--7	0.77
36.1 kV	to	46.0 kV	2--7	0.77	2--10	0.85
46.1 kV	to	72.5 kV	3--0	0.90	3--6	1.05
72.6 kV	to	121.0 kV	3--2	0.95	4--3	1.29
138 kV	to	145 kV	3--7	1.09	4--11	1.50
161 kV	to	169.0 kV	4--0	1.22	5--8	1.71
230 kV	to	242.0 kV	5--3	1.59	7--6	2.27
345 kV	to	362.0 kV	8--6	2.59	12--6	3.80
500 kV	to	550.0 kV	11--3	3.42	18--1	5.50
765 kV	to	800.0 kV	14--11	4.53	26--0	7.91

5. No employee will approach or take any conductive object closer to exposed energized parts than set forth in the Minimum Clearance Distance for all Type of Energized Work except under the following conditions.
   - The employee is insulated from the energized part, or
   - The energized part is insulated from the employee and from any other conductive object at a different potential, or
   - The employee is insulated from any other exposed conductive object, as during the performance of live-line bare-handed work.

Access and Working Space / Working Position

Sufficient access and working space shall be provided and maintained about electric equipment to permit ready and safe operation and maintenance of such equipment. Guidelines for the dimensions of access and workspace are shown below. These are taken from American National Standard "National Electrical Safety Code," ANSI C2-1987. Specific requirements are those contained in ANSI C2 as in effect at the time of the installation of the equipment.

Working Space - 600 Volts or Less

1. Working space shall not be used for storage. When normally enclosed energized parts are exposed for inspection or servicing, the working space, if in a passageway or general open space shall be guarded.
2. At least one entrance shall be provided to give access/egress to the working space about the electrical equipment.
3. The working space in the direction of access to energized parts operating at 600 volts or less which require examination, adjustment, servicing, or maintenance while energized shall be not less than indicated in the table below, Working Space About Equipment - 600 Volts or Less. In addition to the dimensions shown in table, Working Space About Equipment - 600 Volts or Less the working space shall be not less than 30 in. (750 mm) wide in front of the electric equipment. Distances shall be measured from the energized parts if such are exposed or from the enclosure front or opening if such are enclosed. Concrete, brick, or tile walls shall be considered grounded.

   Working Space About Equipment - 600 Volts or Less

Voltage to Ground		<----------Clear---Distance---------->					
	Condition	1	1	2	2	3	3
		Feet	Millimeters	Feet	Millimeters	Feet	Millimeters
0 - 150		3	900	3	900	3	900
151 - 600		3	900	3 ½	1.07m	4	1.20m

4. Where the conditions are as follows.
   - Condition 1 - Exposed energized parts on one side and no energized or grounded parts on the other side of the working space, or exposed energized parts on both sides effectively guarded by suitable wood or other insulating materials. Insulated wire or insulated bus bars operating at not over 300 V shall not be considered energized parts.
   - Condition 2 - Exposed energized parts on one side and grounded parts on the other side.
   - Condition 3 - Exposed energized parts on both sides of the work space (not guarded as provided in Condition 1) with the operator between.

   NOTE: Working space shall not be required in back of assemblies, such as dead-front switchboards or motor control centers where there are no renewable or adjustable parts such as fuses or switches on the back and where all connections are accessible from locations other than the back.
5. The headroom of working spaces about switchboards or control centers shall be not less than 7 feet (2.13 m).
6. In all cases where there are energized parts normally exposed on the front of switchboards or motor control centers, the working space in front of such equipment shall not be less than 3 feet (900 mm).

Working Space Over 600 Volts

Working space shall be in accordance with the table Minimum Clearance Distance for all Type of Energized Work.

Working Position

To the extent that other safety-related work conditions permit, work will not be performed in a position from which a slip or fall will bring the employee into contact with exposed uninsulated parts energized at a potential different from the employee.

Confined Spaces / Underground Electrical Installations

1. Entry into electrical manholes over 4 feet (122 cm) deep and into unvented cable tunnels, cable chases, and cable/transformer vaults and any other location meeting the definition of a confined space shall be in compliance with TVA Safety Procedure 801, “Confined Space Entry”.
2. In addition to the hazards identified by the Confined Space Permit System, certain confined spaces at fossil plants contain explosive dusts. Those locations are classified as Class II for explosive/flammable dusts and Class I for explosive/flammable gases unless they can be controlled by purging or cleaned of all deposited dusts.
3. If the work involves energized circuits with voltages greater than 50 volts, an attendant must be stationed outside the space. In addition, a communication system shall be required to maintain contact between the attendant and the worker inside the confined space.

Ladder or Climbing Device

A ladder or other climbing device shall be used to enter and exit a manhole or subsurface vault exceeding 4 feet (122 cm) in depth. Climbing into or out of a manhole or vault by stepping on cables and handers is prohibited.

Equipment for Moving Material Into or Out of Manholes / Vaults

Equipment used to lower or retrieve materials and tools into manholes or vaults shall be capable of supporting the weight of the material. The equipment will be checked for defects before use. Employees in the manhole or vault will move clear of the area directly under the opening before lowering or retrieving equipment, materials, or tools.

Underground Locations Containing Multiple Cables

1. When multiple cables are present in the work area, the cable to be worked on must be identified by electrical means, unless its identity is obvious by reason of distinctive appearance, location, or unique identification. Cables other than those being worked on will be protected from damage.
2. Energized cables that are to be moved must be inspected for defects prior to moving them.
3. Where a cable in a manhole has one or more abnormalities that could lead to or be an indication of an impending fault, the defective cable is de-energized before any employee works in the manhole, except when service load conditions and a lack of feasible alternatives require that the cable remain energized. In the latter case, employees entering the manhole will be protected from the possible effects of a failure by shields or other devices that are capable of containing the adverse effects of any fault that could be anticipated.
4. **NOTE: Abnormalities such as oil or compound leaking from cable or joints, broken cable sheaths or joint sleeves, hot localized surface temperatures of cables or joints, or joints that are swollen beyond normal tolerances are presumed to lead to or be an indication of an impending fault.**

Metallic Sheaths

1. When work is performed on cables in manholes (or buried cable), metallic sheath continuity will be maintained or the cable sheath will be treated as energized.
2. When connecting de-energized equipment or lines to an energized circuit by means of conducting wire or devices, the connection will be made first to the de-energized part.
3. When disconnecting equipment or lines from energized circuits by means of conducting wires or devices, the source end will be disconnected first.
4. During connection and disconnecting work involving energized circuits, loose conductors will be kept away from exposed energized parts.

Materials Storage Near Energized Parts / Lines

1. In areas not restricted to qualified employees only, materials or equipment shall not be stored closer to energized lines or exposed energized parts of equipment than the following distances plus an amount providing for the maximum sag and side swing of all conductors and providing for the height and movement of material handling equipment
2. For lines and equipment energized at 50 kV or less, the distance is 10 feet (305 cm).
3. For lines and equipment energized at more than 50 kV, the distances are 10 feet (305 cm) plus 4 inches (10 cm) for every 10 kV over 50 kV.
4. In areas restricted to qualified employees, material shall not be stored within the safe working space required to be maintained about energized lines or equipment.

Definitions

Affected Employee - An employee whose job requires him or her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him or her to work in an area in which such servicing or maintenance is being performed.

Authorized Employee - An employee who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance.

Qualified Employee - One knowledgeable in the construction and operation of the electric power generation, transmission, and distribution equipment involved, along with the associated hazards. An employee must have the training required by this work practice/procedure in order to be considered a qualified employee. An employee undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training and who is under the direct supervision of a qualified employee is considered to be a qualified employee for the performance of those duties.

Voltage (nominal) – A value assigned to a circuit or system for the purpose of conveniently designating its voltage class (as 480 V). The actual voltage at which a circuit operates can vary from the nominal within a range that permits satisfactory operation of the equipment.

Procedure 1022 Arc Flash Hazard Calculation and Required Protection

TVA Safety Manual

1022 Arc Flash Hazard Calculation and Required Protection

Procedure Number 1022

TVA Safety Procedure

Arc Flash Hazard Calculation and Required Protection

Revision 10

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Purpose

1. This procedure defines TVA's method for calculating the electric arc flash incident energy at various distances, establishing the arc flash protection boundary, and selecting the appropriate Flame Resistant (FR) clothing and other personal protective equipment (PPE). The FR clothing and other PPE are selected to prevent the onset of second degree thermal burns. The calculated incident energy at the worker's position is used in the development of a Job Safety Analysis (JSA).
2. This procedure applies to electrical power circuits operating at 480 V through 500 kV. This includes all permanent and temporary circuits. These requirements for arc flash protection apply to all TVA and contractor employees who perform the work activities listed in Table 3 of this procedure. Organizations will identify employees who perform the work listed in Table 3 on circuits and equipment operating at 480 V and above.
   NOTE 1 - Organizations will analyze electrical circuits and equipment down to the 480 V switchgear, Motor Control Center (MCC) and panelboard levels by October 1, 2004. Organizations will develop abatement plans in accordance with TVA Safety Procedure 112, TVA Safety Procedure 12, "Conduct Workplace Regulatory Compliance Inspections," if analyses are not completed in accordance with this date.
   NOTE 2 - The requirement to perform arc flash hazard calculations at electric load termination points has been rescinded, until OSHA issues a requirement for these calculations. Where load termination calculations have already been performed, the calculated incident energy level will be used to select FR clothing and PPE. If calculations at the load terminations have not been performed, the arc flash incident energy calculated at the switchgear, Motor Control Center, or panelboard level that feeds the load will be used to select FR clothing and PPE. Warning signs are not required at load termination points, but may be posted where calculations have been completed.
   NOTE 3 - Until electrical circuits and equipment operating at 480 V through 60 kV are analyzed, the interim arc flash hazard protection consists of the following FR clothing with an Arc Thermal Performance Value (ATPV) at least 4.2 cal/cm^2 (some organizations have established minimum ATPV of 8 cal/cm^2), Hard hat, Arc rated face shield (face shields are not required when applying temporary grounds and/or performing switching on open-air outdoor switches, disconnects, buses, and transmission lines), Safety glasses, Substantial industrial type shoes meeting requirements of TSP 307, "Foot Protection", and leather gloves or voltage rated gloves. The interim arc flash protection is required when performing work specified in section Arc Flash Required Protection item 1, Table 3, "Work Requiring Arc Flash Protection." The interim arc flash protection boundary is ten (10) feet from exposed energized parts at 480 V through 60 kV.

When the analyses are completed and warning signs posted for electrical circuits and equipment, organizations will establish arc flash boundaries in accordance with section Arc Flash Required Protection item 1 and provide appropriate PPE listed in Appendix A, FR Clothing and PPE, Table A-1, "Arc Flash Protective Equipment (PPE)".

NOTE 4: For electrical circuits and equipment operating at greater than 60 kV, arc flash protection consists of FR clothing with an ATPV at least 4.2 cal/cm^2, hard hat, safety glasses, substantial industrial type shoes meeting the requirements of TSP 307, "Foot Protection", and leather gloves. The arc flash protection boundary is10 feet from exposed energized parts operating at 60 kV and above.

3. The requirements of this procedure do not apply to connecting and disconnecting UL listed cord and plug connected equipment such as 480 V cord and plug connected portable welding machines.

Roles and Responsibilities

1. Management
   Managers are responsible for implementing the requirements of this procedure. They are responsible for completing arc flash hazard analyses, maintaining these analyses, purchasing FR clothing and other PPE, communicating the hazards and necessary precautions to employees, and enforcing the requirements of this standard.
2. Safety Process Ownership Team (POST)
   The Safety Process Ownership Team is an Agency team composed of representatives from TVA Health and Safety that is responsible for safety policies and procedures. The Safety POST is responsible for review, approval, and issuance of this procedure.
3. Supervisors, Foremen and Lead-Persons
   Supervisors, foremen, and lead-persons are responsible for enforcing the requirements of this procedure for FR clothing and other PPE.
4. Employee Technical Training and Organizational Effectiveness (ETT&OE
   ETT&OE is responsible for developing training for engineers and technical employees in conducting arc flash hazard analysis and employee training on the requirements of this procedure.
5. Employees
   Employees are responsible for wearing the appropriate FR clothing and other PPE required by this procedure and complying with the arc flash protection boundary as required in this procedure.

Arc Flash Hazards

1. TVA employees have experienced serious injuries from arc flash accidents. To date, these arc flash accidents occurred in the voltage range between 480 V and 161,000 V ac nominal. The injury severity of TVA's arc flash accident experience is due to the high level of energy (radiant and convective) capable of being released by an electrical arc. The incident energy levels associated with an electrical arc are expressed in calories per centimeter squared (cal/cm2) which is a measure of heat.
2. The incident energy level associated with an electrical arc is determined primarily by the following factors:
   - Maximum available short circuit current at the arc location.
   - Duration of the electrical arc.
   - Distance from the arc to the employee.
   - The arc gap (distance between the two conductive objects at different voltage potential).
   - The nominal voltage of the circuit.
3. Vapors, molten metal droplets, sound pressure, shock wave, intense light, and projectiles are common by-products from an electrical arc flash. These hazards are currently being studied by technical committees of national consensus standard organizations. Revisions will be made to this procedure as specific hazards and precautions are further defined by technical committees of national consensus standard organizations.

4. Occupational Safety and Health Administration has worked in coordination with technical committees of the American Society of Testing Materials (ASTM), Institute of Electrical and Electronics Engineers (IEEE), and National Fire Protection Association (NFPA) to develop requirements specifying the type of FR clothing, other PPE, and the arc flash protection boundary, (An flash protection boundary is the distance from an arc at which the incident energy level is equal to 1.2cal/cm^2). These requirements are developed to limit the incident energy level to1.2 cal/cm^2 which is the incident energy level necessary for the onset of second degree burn to the skin.

Arc Flash Hazard Analysis

1. TVA organizations analyze electrical circuits/equipment operating at 480 V and above to determine incident energy levels, select appropriate FR clothing and other PPE, and establish arc flash protection boundaries (see Appendix B, "Arc Flash Hazard Calculation and Protection Flow Chart").
   NOTE: Responsibility for arc flash hazard analyses at interface points between transmission system and generating plant equipment is defined in the Intergroup Agreements which defines the interfaces and working relationships between the generating organizations and Transmission / Power Supply.
2. Determine the scope of the analysis by identifying the circuits and equipment from key-diagrams, single-line electrical drawings, or walking down the equipment. The analysis begins at the generator or utility service supply and continues to switchgear, MCCs, panelboards, and termination points, i.e., motors and static loads, down to 480 V.
   NOTE: If arc flash analyses are not completed down to the load termination points by October 1, 2005, load termination points may be labeled with the incident energy values calculated for the electric circuits and equipment at the switchgear, Motor Control Center (MCC) or panelboard that feeds the load. This interim action is being taken until final requirements are issued by OSHA for calculating incident energy values to the load termination points.
3. This analysis must be performed by or under the direction of an electrical engineer or an individual with the knowledge and training in this procedure to competently perform the analysis.
4. Select the TVA method (1584 or ARCPRO) to use for performing the arc flash hazard analysis. For electrical circuits at voltages 480 V to 15 kV, use the IEEE Standard 1584 with either the Electrical Transient Analyzer Program (ETAP) PowerStation by Operation Technology, Inc., Arc Flash Module or the TVA 1584 Calculator to analyze potential arc flash hazards. For electrical circuits at voltages greater than 15 kV and less than or equal to 60 kV, use the ARCPRO software by Kinectrics, Inc., Toronto, Ontario, to analyze potential arc flash hazards. Due to the lack of an accepted national consensus engineering method for calculating arc flash incident energy at voltages above 60 kV, TVA will not conduct analyses of such circuits.
   NOTE: In switchyards and substations, use ARCPRO for analysis of open-air bus structure circuits from 13 kV through 60 kV.
5. TVA modified the IEEE 1584 formula for determining arc flash protection boundaries. This modification results in arc flash protection boundaries that are between those calculated using IEEE 1584 and NFPA 70E formulas. See Appendix C, "TVA 1584 Calculator Notes", for information on modifications to the IEEE 1584 Calculator (an Excel spreadsheet provided as a part of the IEEE 1584).
   NOTE 1: The TVA 1584 Calculator may be downloaded from the "TVA Safety Homepage" or the SRNet.
   NOTE 2: ARCPRO is available from HD Electric Company, 847/473-4980.
   NOTE 3: The difference between the arc flash boundaries determined by using the ETAP Arc Flash Module versus the TVA 1584 Calculator can be significant. The ETAP module may result boundary distances that are many times greater than the TVA 1584 Calculator.
6. Both methods for performing arc flash hazard analysis are based on the assumption that the overcurrent protection devices will operate as designed and constructed (see section Electrical Equipment Preventive Maintenance for preventive maintenance requirements). The overcurrent protection devices must be properly rated for their installation service.

7. Gather information needed to determine maximum available fault currents and trip times for protective devices as follows:
   - Key-diagram and/or single-line electrical drawings.
   - Breaker settings and their time-current curves. Breaker settings may be obtained from sources such as breaker/fuse coordination studies, breaker setting sheets, and/or engineering drawings. Breaker time-current curves may be obtained from references such as breaker manufacture's documentation, ETAP data library, and TVA relay setting sheets. The ETAP library's time-current curves should be verified as accurately representing the manufacturer's curves.
   - Fuses used and their time-current curves. Fuse time-current curves may be obtained from references such as fuse manufacture's documentation and/or ETAP data library (verify the accuracy of the ETAP library data).
8. Determine through discussions with engineering and operations staff the modes of operation for the electrical system, i.e., normal and any alternative alignments, where there may be multiple supply points through bus ties including any emergency generator(s). In a site with a simple radial distribution system there is only one mode of operation (normal). A more complex system can have many modes. The examples of different modes listed in IEEE Standard 1584 are:
   - One or more utility feeders in service.
   - Utility interface substation secondary bus tie breaker open or closed.
   - Unit substation with one or two primary feeders.
   - Unit substation with two transformers with secondary tie opened or closed.
   - MCC with one or two feeders, one or both energized.
   - Generators running in parallel with the utility supply or standby alignments.
9. Organizations must identify the modes of operation where work on exposed energized circuits will be permitted. Arc flash analysis is only performed on those modes of operation. Work on exposed energized circuits will not be permitted while the electrical system is in a mode of operation that has not been analyzed.
10. If using the TVA 1584 Calculator Method, determine the available three-phase bolted fault currents for the modes of operation to be analyzed. These currents can be determined by the short circuit (SC) analysis feature of ETAP. If an ETAP model of the electrical system is not available, the organization may use other recognized engineering methods or models for determining the fault currents. A motor fault contribution analysis is required for buses connected to large motors (100 hp or greater).
    NOTE: The electricity source impedance data available from the electricity provider/organization should be used in the SC analysis. Base the SC analysis on the symmetrical three phase bolted fault value for the 1.5 to 4 cycle case and a 100 percent system pre-fault voltage (unity). Motor contributions to the bus fault is included in the SC analysis if they are 100 horsepower (hp) or larger. The SC study is performed with all motors "on" unless there are multiple large medium voltage motors that would have fewer operating at any give time, i.e., six 2000 hp motors (4160 V) available, but only 4 operating at any given time. Four of these motors would be "on-line" in the SC study.
11. If using the ARCPRO method, determine the available phase-to-ground fault currents for the modes of operation to be analyzed.
    NOTE – For delta-connected circuits assume fault conditions that will create current flow, i.e., phase-to-phase-to-ground or three-phase faults.

Perform Arc Flash Hazard Analysis Using the TVA 1584 Calculator Method

1. The understanding and use of IEEE Standard 1584 is critical to accurately calculating realistic values of arc flash incident energy. Use IEEE Standard 1584 as a basic reference in performing arc flash hazard analysis at voltages from 480 V to 15 kV. The following parameters are entered into the TVA Calculator for each operating mode selected for analysis. If using the ETAP Arc Flash Module, enter the information required by the computer software.
    1. Enter bus name or identifier for every bus to be analyzed.
    2. Enter nominal voltage for each bus.
    3. Enter bus bolted fault current. Each bus's bolted fault current for the "normal" operating mode is entered on the "data normal" worksheet. The TVA 1584 Calculator automatically calculates and enters the arcing fault current on the spreadsheet. For operating voltages below 1000, the calculator automatically enters an arcing fault current and calculates a reduced (by 15%) arcing fault current. This value is automatically entered in a separate column on the worksheet.
    4. Enter fault current in protective device. For each bus, enter the portion of the bolted fault current that flows through the protective device that will clear the fault. This excludes large motor contribution currents that will not flow through the protective device.
    5. Enter breaker/fuse type. Enter one of the listed breaker or fuse types in the TVA 1584 Calculator. The protective device that will clear the arcing fault current is used here. For listed molded case circuit breakers (MCCB) and low voltage power circuit breakers (LVPCB), enter its value in the appropriate column. This information is found in the breaker reference sheet of the calculator and the IEEE Standard 1584. If the breaker or fuse type being used is not listed, then enter "0" for "other" protective device type, and then enter the appropriate trip and opening time for the device.
    6. Enter trip time or fuse melting time. For circuits over 1000 V, use the "arcing fault current in the protective device" to determine the trip time of the protective device from the breaker/fuse time-current curve. For 480 V circuits, the "arcing fault current in the protective device" and the "85% reduced arcing fault current in the protective device" are used to determine their respective trip times. Enter the value(s) in the appropriate column(s).

       NOTE - If the trip time is longer than two seconds, enter two seconds in the trip time column(s) of the TVA 1584 calculator. The maximum employee exposure time to any arcing fault is considered to be approximately two (2) seconds. This approach is suggested in Appendix B of IEEE Standard 1584. Two (2) seconds is based on maximum length of time a person is likely to remain in the location of an arc flash. Since a person is likely to move away quickly, if it is physically possible, two (2) seconds is a reasonable time for calculating purposes. In situations where the employee may be physically restricted from moving away, i.e., within a confined space, a longer time is used. This note provides an option to entering the actual trip time. This option is recognized in IEEE 1584 Standard. This option may or may not be adopted by OSHA. As a result those that use the option may have to recalculate some exposures and post new signs in the future.
    7. Enter opening time. Use the manufacturer's data or TVA 1584 Calculator reference tables to determine the mechanical opening time of the protective device. Enter the value in the appropriate column.
    8. Enter equipment type/class (open air, MCC, switchgear, or cable). Select the appropriate type/class.
    9. Enter system grounding type (solidly grounded or ungrounded). Select the appropriate type.
    10. Enter distance from the worker's torso to the conductive part, e.g., bus where an arc is likely to be initiated the arc point. The default distance is 18 inches based on the employee's normal reach capability (average distance elbow to end of hand). Based on TVA accident experience, the working distance has been set at 18 inches from the arcing point to the employee's torso. Greater distances are permitted only when one or more of the following conditions are met:

- The design of the electrical equipment limits the employee's approach to a certain distance to the potential arcing point, e.g., a 4160 breaker does not allow an employee closer than 36 inches when racking breaker,
- There is a temporary barrier or barricade that prevents the employee approaching closer than a set distance to the potential arcing point, or
- A tool or remote control device that limits an employee's need to approach the equipment to set distance for operating a disconnect switch, motor starter, contactor, or circuit breaker with its door/cover screwed or latched closed such that there are no exposed energized parts operating at 480 V or greater.

NOTE: In the cases where there are exposed, energized parts, the use of a tool or remote control device alone, e.g., a hot stick, does not meet the requirement for limiting an employee's approach to the potential arcing point. The barricade/barrier may result from equipment design or from a temporality installed device. An example of barrier due to equipment design is a 6.9 kV breaker compartment with the breaker in the "connect" position that limits an employee's approach to 36 inches due to the equipment that is physically between the employee and the potential arcing point. Examples of temporality installed devices include (1) barricade tape or a physical barrier installed in accordance with TSP 602, "Barricades and Barriers," or TSP 1107, "Identifying Energized Electrical Hazards," at a specified distance from the potential arcing point and (2) a 4160 V grounding device inserted into a breaker compartment. These examples of barricades/barriers physically limit an employee's approach to a specific minimum distance to a potential arc flash point.

Perform Arc Flash Hazard Analysis Using the ARCPRO Calculator Method

1. For circuits operating from greater than 15 kV to 60 kV, the most likely electrical fault will be phase-to-ground and not evolve into a 3 phase fault due to greater spacing of conductors. Should the need arise to analyze a 3-phase arc situation, apply a multiplication factor of 3.0 to the ARCPRO Calculator results to obtain the arc flash incident energy.
2. The following parameters must be determined for use in the ARCPRO Calculator.
    1. The ARCPRO calculator is based on single-phase faults in open air. The ARCPRO User's Guide is used for conducting open-air arc flash hazard analysis.
    2. Identify all buses and transmission lines to be analyzed.
    3. For the purposes of this analysis all generating capacity is assumed to be online thus having the potential to produce the maximum available fault current.
    4. Obtain the maximum available phase-to-ground, 4-cycle transient fault current for each bus.
    5. Obtain the duration of the arc clearing time.
    6. For all transmission lines, determine the phase-to-ground fault current and clearing time at the beginning, mid-point, and end of the line.
3. Enter the data into the computer program for each arc fault case.
    1. Enter nominal phase-to-ground voltage.
    2. Enter maximum available phase-to-ground fault current.
    3. Enter the duration (clearing time) in cycles as determined section Perform Arc Flash Hazard Analysis Using the ARCPRO Calculator Method item 2.5.
    4. Enter the arc gap in inches selected from Table 1 – Transmission System Arc Gap. The arc gap is based on the dielectric property of air and the voltage involved. It is assumed that as a worker is performing a task, the initial arc is struck when a worker takes a conductive article within the breakdown distance in air. The dielectric strength of air is taken at 10 kV phase-toground per inch. The calculated arc gap lengths are shown in Table 1.
    5. Enter copper as the electrode material.
    6. Enter the default distance of 202 inches for "distance to the arc".

Table 1 – Transmission System Arc Gap

Line Voltage (kV)	Phase-to-ground Voltage (kV)	Arc Gap (Flashover) (inches)
13	8	1
26	16	2
46	28	3

4. After entering the data, run ARCPRO by selecting the “Fast” command from the “Run” menu bar.
5. In ARCPRO, select “File,” and then “View Table” from the menu bar to display a table of “Heat Versus Distance.” Using Table 2 – Transmission System Default Arc Flash Distance below, reference the applicable line voltage and read the “Default Arc Flash Distance” listed in column 4. Match the distance in column 4 to the same distance listed in ARCPRO’s “Heat Versus Distance Table” and read the incident heat energy in cal/cm^2. This incident heat energy value represents the arc flash exposure for the electric circuit being analyzed.

   NOTE - There were two assumptions made in determining the “distance from the arc” as shown in Table 2. These assumptions are as follows:

   - The arc travels directly toward the employee (i.e., the shortest distance between the employee and the arc).
   - The distance between the arc and the employee is the Minimum Approach Distance (MAD), minus two times the calculated arc gap length for the given voltage. This safety factor allows for mechanical failure causing a violation of the MAD.

   Table 2 – Transmission System Default Arc Flash Distance

Line Voltage (kV)	Minimum Approach Distance (inches)	Arc Gap (inches)	Default Arc Flash Distance
13	25	1	25 - 2 = 23
26	28	2	28 - 4 = 24
46	31	3	32 - 6 = 25

6. Use the incident energy level determined in paragraph 6.5 to select FR clothing and other PPE.
7. To determine the arc flash protection boundary, use the table of “Heat Versus Distance” and select the distance at which the heat energy is equal to or less than 1.2 cal/cm^2.

Review Results

1. The TVA 1584 Calculator determines the following:
   - The incident energy at the worker’s position for each bus, node, or potential arcing point exposure entered on the calculator’s data sheets.
   - The distance from the arcing point to the arc flash protection boundary.
   - The required PPE category at the working distance from the arcing point which is specified in Appendix A, “FR Clothing and PPE”, Table A-1 Arc Flash Personal Protective Equipment PPE.
2. ARCPRO determines the following:
   - The arc flash protection boundary.
   - The incident energy at the worker’s exposure position to be used in selecting the appropriate PPE category specified in Appendix A, Table A-1 Arc Flash Personal Protective Equipment PPE.

Arc Flash Energy Reduction

1. Review the calculated incident energies for opportunities to reduce the higher values through electrical engineering changes to the circuits. The responsible engineering staffs investigate possibilities to reduce the incident energy exposures through engineering changes, i.e., breaker trip setting, current limiting fuses, remote operation, robotics, remote voltage tests, etc.
2. Work is not performed on electrical circuits with incident energy exposure at the worker's position over 100 cal/cm2. Incident energy exposures of this magnitude are reduced to 100 or less cal/cm2 by instituting engineering or administrative controls.
3. New electrical system installations operating at 480V or more are designed to limit the incident energy exposures to less than 100 cal/cm2. Major repair, renovation, or modification to existing electrical systems are also requires the incident energy exposures to be evaluated by electrical engineering with the objective of lowering the exposures to the lowest value possible.

Electrical Equipment Preventive Maintenance

The results of the arc flash hazard analysis are based on the electrical circuit's primary protective device operating as designed and constructed. It is critical that the device parameters are correctly specified, installed, and maintained. If the device fails to operate as designed, constructed, and set; higher incident energy can result and the specified PPE may not be adequate to protect the employee from second-degree burns. Preventive maintenance must be performed on protective devices, i.e., breakers, in accordance with the operating organization's requirements and procedures. These maintenance procedures are developed in accordance with nationally recognized engineering practices.

Electrical System Configuration Control

1. Arc flash hazard analysis must be included in the organization's configuration control management system. The arc flash incident energy is re-calculated if any of the following parameters change:
   - Maximum available fault currents.
   - Protective device clearing times.
   - The distance from the worker to the arcing point.
   - The bus and equipment configuration (additions and/or deletions).
   - Modes of operation that would change A, B, or C above.
2. The arc flash hazard analyses are maintained and available for review by internal and external auditors.

Arc Flash Required Protection

1. FR clothing/PPE requirements and arc flash protection boundaries are established in accordance with the arc flash hazard analysis. Any employee (TVA, contractor or manufacturer representative) inside an established arc flash boundary and performing the work listed in Table 3, "Work Requiring Arc Flash Protection," must don the required FR clothing and PPE specified in Appendix A. Employees are not required to wear FR clothing or PPE when performing other work within or traveling through an area of equipment operating at 480 V and above with doors/covers latched or screwed closed . The arc flash protection boundary must be identified / marked to prohibit entry of persons not wearing arc flash protection appropriate for the exposure when any of the activities listed in Table 3 are being performed.
   NOTE 1: Until analyses are complete and warning signs posted, the interim arc flash protection boundary is ten (10) feet from exposed energized parts operating at 480 V through 60 kV.
   NOTE 2: For equipment operating at greater than 60 kV, the arc flash protection boundary is ten (10) feet from exposed energized parts.

TABLE 3
Work Requiring Arc Flash Protection [Note 1]
(Equipment is energized and the work is performed within the flash boundary)

Work Activity	Applicable Equipment
1. Working on or near exposed energized parts of circuits and equipment. (See Note 1a, 1b, 1c, and 1d for exceptions.)	a. All 480 V and above equipment.
2. Applying or removing temporary protective safety grounds.	a. All 480 V and above equipment.
3. Locally operating a disconnect switch, motor starter, fused contactor, or any circuit breaker, e.g., molded case, insulated case, power breaker. (See Note 1e and 1f for exceptions).	a. 600V Class (includes 480 V nominal) panelboards and disconnects. b. 600 V Class (includes 480 V nominal) motor control centers. c. 600 V Class (includes 480 V nominal) switchgear with power circuits breakers or fused switches. d. NEMA E2 (fused contactor) motor starters 2.3 kV through 7.2 kV. e. 1 kV and above metal-clad switchgear. f. 1 kV and above metal-clad load interrupter switches, fused or unfused.
4. Installing or removing (racking) circuit breaker or grounding device with door closed or open.	a. 600 V Class (includes 480 V nominal) switchgear with power circuit breakers. b. NEMA E2 (fused contactor) motor starter 2.3 kV and 7.2 kV. c. 1 kV and above metal-clad switchgear.
5. Operating outdoor disconnect switch, 1 kV and above (located outside such as in a switchyard). See activity 3 for operating other type disconnect switches, 1 kV and above.	a. Outdoor disconnect switches, hookstick operated. b. Outdoor disconnect switches, gang operated from grade.
6. Removing and installing starter bucket.	a. 600 V Class (includes 480 V nominal) motor control centers.
7. Opening hinged or bolted door/cover to expose bare, energized parts. (see Note 1g for exception)	a. 480 V – 600 V NEMA enclosures. b. 600 V Class (includes 480 V nominal) motor control centers. c. 600 V Class (includes 480 V nominal) switchgear with power circuit breakers or fused switches. d. NEMA E2 (fused contactor) motor starters 2.3 kV through 7.2 kV. e. 1 kV and above metal-clad switchgear. f. 1 kV and above metal-clad load interrupter switches, fused or unfused.

Note 1: Employees and contractors who wear checkoutFR clothing are not required to don FR clothing and those who are in the daily-wear FR clothing program are not required to don additional arc flash protection when:
a. Walking by or performing work near exposed open-air buses (4160 V through 500 kV) in transformer or switch yards if the buses are isolated by location at a height that prevents inadvertent contact by employees.
b. Accessing the operator's booth via the overhead crane's walkway if the open-air, energized, 480 V buses located on the crane's power rails are isolated to prevent inadvertent contact with the buses. However, employees and contractors must don checkout FR clothing and additional arc flash protection as appropriate when performing any work that could create an arc flash.
c. Walking by or performing work near front or rear vented electrical boards that have their doors/covers latched or screwed closed.
d. Walking by or performing work near energized parts that are guarded, isolated, or permanently insulated in accordance to Definitions section item 16.
e. Operating Molded Case Circuit Breakers (MCCB) mounted in low energy (8 cal/cm^2 and below) panelboards. The panel boards must be properly closed and trimmed-out to eliminate any exposed energized parts.
f. Operating low energy (8 cal/cm^2 and below) safety disconnects for motor controllers, motors, electrically driven machinery (shop machines), air-conditioning equipment, and refrigeration equipment. The enclosure must be properly closed and the equipment's main power switch in the "off" position. Safety disconnects are not to be operated (tripped) under load.
g. Opening a "hinged" door of an empty 480 V breaker compartment (breaker has been removed from the compartment) for a visual inspection only. Crossing the plane of the compartment opening with any object or body part is prohibited.

2. When establishing an arc flash boundary, the full distance of the boundary must be identified / marked to prohibit entry of persons without the appropriate arc flash protection unless structures such as concrete/block walls, solid flooring and ceiling, multiple equipment cabinets, etc. that are solid and permanently attached to the building would prevent the travel of arc flash heat and flames. These structures must be able to prevent heat and flames of the arc flash from striking a person who is outside such a reduced boundary. These structures can not be

considered if reflected arc flash heat and flames could strike a person just outside a boundary that was reduced by these structural considerations.

3. Management identifies employees who work on or near exposed, energized power circuits and equipment operating at 480 V and above. Employees in the daily-wear FR clothing program may be (1) exposed to arc flash hazards, (2) required to respond immediately to an area where arc-flash hazards may exist, or (3) required to be in and out of arc-flash boundaries making checkout of FR clothing impractical. Management identifies those employees that are to be provided daily-wear FR clothing. Organizations will maintain a list of employees who are provided daily-wear FR clothing.
4. Employees identified in paragraph 11.3 report to work wearing the daily-wear FR clothing, unless their job assignment temporarily changes to clearly excludes potential exposure to arc flash hazards, i.e., classroom training, conference, etc. The long sleeve FR shirt with the sleeves down and buttoned at the cuff is required to be worn as part of the daily-wear ensemble. Removing the long sleeved FR shirt and wearing only a short sleeved FR shirt is permitted as follows:
    1. When performing work outside an arc flash protection boundary in administrative, conference, and shop areas, and in plant control rooms.
    NOTE - If it becomes necessary to work on equipment operating at 480 volts or more that introduces an arc flash hazard, the employee must don a minimum of a long sleeve FR shirt before entering the arc flash protection boundary. Examples are: (1) working on a 480-volt test board in the shop area, (2) working on an electrical board with exposed 480-volt parts in a control room, and (3) responding to routine/emergency electrical work, e.g., performing emergency switching on 4160-volt switchgear or racking a 480-volt power breaker.
    2. When performing work outside an arc flash protection boundary in areas such as powerhouses, switchyards, substations, and transmission lines.
    NOTE - The employee must don a minimum of a FR long sleeve shirt prior to responding to routine or emergency electrical work that requires the employee to enter an arc flash protection boundary. Examples are performing emergency switching on 4160-volt switchgear and or racking a 480-volt power breaker.
    3. When performing electrical work on equipment/lines/circuits that are de-energized, the following actions must be completed and verified by the supervisor and / or lead employee. The employees performing work listed in A through F must be authorized to perform the work based on having met applicable training requirements.
        A. Obtain a clearance for the equipment/line/circuit.
        B. Locate and verify the equipment/line/circuit under clearance is correct for the work.
        C. Verify the absence of voltage on the equipment/line/circuit under clearance by testing with an electrical test instrument, (either a voltmeter or voltage detector). This test is accomplished on equipment/circuits by using a voltmeter to check the “load side” of the breaker, disconnect switch, or fused disconnect for the absence of voltage; and proceeding to the equipment/circuit location and testing with a voltmeter or a voltage detector for the absence of voltage. This test accomplished on lines by using a voltage detector. A voltmeter is used to measure phase-to-phase or phase-to-ground voltages with a claimed degree of accuracy. Voltage detectors are used to determine the electrical status of circuits or equipment, generally to confirm the conductor/part is deenergized. Voltage detectors include proximity instruments such as the Fluke VoltAlert AC Voltage Detector, Salisbury 4544 Voltage Detector, and White Safety Line VDA040P Voltage Detector
        NOTE - By design or configuration, some Molded Case Circuit Breaker (MCCB) circuits present a problem in that there is often no accessible point to test the circuit for the absence of voltage on the load side of the MCCB. Additional precautions must be taken to verify the absence of voltage and to prevent inadvertent MCCB operation in these cases. The equipment/circuit must be checked for either a visible open at some point in the circuit between the breaker and the equipment/circuit to be

worked on or the MCCB made non-operable. The MCCB may be made non-operable by installing a device on the operating mechanism that physically prevents the breaker from closing or removing the breaker control circuit fuses to prevent operation of the breaker. If one of the above precautions is not implemented, the long sleeve FR shirt may not be removed.

D. Install temporary protective grounds on the equipment/circuit/circuit, where required.

E. Place orange tape in accordance with Safety Procedure 602, "Barricades and Barriers (Temporary)" or Safety Procedure 1107, "Identifying Energized Electrical Hazards."

F. F. Verify that the de-energized equipment/line/circuit is not in the arc flash protection boundary of adjacent energized equipment/lines/circuits on which an employee is engaged in any work listed in section Arc Flash Required Protection item 1, Table 3, "Work Requiring Arc Flash Protection".

NOTE - If all the employees working within an arc flash protection boundary leave the work area un-occupied for any period of time, upon return the employee(s) must determine that the equipment/line/circuit is safe by either an electrical test or a visual observation. The visual observation includes noting such things as open disconnects, temporary protective grounds or an open circuit. If it is not readily apparent by observation that the equipment/lines/circuit remains in an electrical safe condition, then an electrical test is performed in accordance with section Arc Flash Required Protection item 4.3.C above. Before performing the electrical test, the employee must don the long sleeve the FR shirt.

Note: Additional layers of protection may be required in accordance with the posted incident energy exposure.

5. Daily-wear FR clothing includes long sleeve shirt and pants or a pair of coveralls. Organizations may specify a FR tee-shirt as part of their daily-wear ensemble. When a tee-shirt is selected as an option by the employee, the organization provides it. FR dailywear clothing does not include undergarments except for an FR tee-shirt. The FR tee-shirt is not considered to provide primary protection from arc-flash hazards. FR "Lab Coats" over 100 percent natural fiber clothing is not approved for wear within an arc flash boundary
6. Daily-wear FR clothing is rated at least with an ATPV of 4.2 cal/cm^2 for long sleeve shirts, 5 cal/cm^2 for FR tee-shirts, and 6 cal/cm^2 for pants or coveralls. Organizations may require FR clothing with an ATPV of 8 cal/cm2. Reference TVA's Approved FR Clothing Product and Arc Ratings List maintained by Procurement for information on ATPV values.
7. Undergarments except the FR tee-shirt in section Arc Flash Required Protection item 5 must be 100 percent natural fiber material such as cotton, wool, or silk. These undergarments are readily available in thevconsumer market and are not included in the TVA daily-wear FR clothing program.
8. Employees identified in section Arc Flash Required Protection item 3 that are not provided daily-wear FR clothing are provided some other type of issued or checkout FR clothing meeting the ATPV requirements of section Arc Flash Required Protection item 6.
9. When cold weather outer garments or C-Zone clothing must be worn in arc flash exposure situations, the garment must be FR. Management must determine if cold weather garments / rainwear are necessary for the performance of assigned tasks by their employees. When necessary, TVA provides these required garments. While cold weather garments are not part of the daily-wear FR clothing program, a jacket or coveralls, i.e., Carharts, worn over the daily-wear FR clothing does not have to be FR unless the garment is worn inside an arc flash boundary. Thermals may be worn under daily-wear FR clothing provided they are 100 percent natural fiber or FR material. It is suggested that a FR tee shirt be worn under thermals when wearing FR clothing to separate the torso from the thermals. Modesty clothing such as that used when entering a Radiological Control Area is not an "undergarment" as defined in section Arc Flash Required Protection item 7 but regular work clothing. Therefore, modesty clothing must be FR if worn under FR coveralls within an established arc flash boundary. FR modesty clothing is required to have an ATPV of at least 4.2 cal/cm^2.
10. FR clothing is not to be altered or modified.

11. For exposures greater than 4.2 cal/cm^2, use Table A-1 Arc Flash Personal Protective Equipment (PPE) to select the required FR clothing and PPE. If layering of FR clothing is considered, then the ATPV of the layered garments are determined by one of the following:
    - Adding the arc rating values of the daily-wear FR clothing garment and arc rating of the garment to be worn over the daily-wear, together to determine their combined ATPV (this gives a minimum ATPV of the layered garments), or
    - By obtaining manufacturer's layered test data for the actual ATPV of the layered garments.

    NOTE - The organization's safety staff, Management-Official-In-Charge (MOIC), or the MOIC designee approves any layering system to be used.
12. For exposures greater than 8 cal/cm^2, arc flash protective hoods are required in accordance with Appendix A - FR Clothing and PPE, Table A-1. Arc flash protective hoods require a system to supply ambient air.
13. Warning signs are posted on electrical switchgear, panel, motor control center cabinets, and other areas where employees are potentially exposed to an arc flash hazard. The sign specifies the arc flash protection boundary distance, the arc flash incident energy at the work location, the level of FR clothing and PPE (includes voltage rated gloves as appropriate), voltage level, Minimum Approach Distance, and the equipment identity. An example of the sign to be posted is in Appendix D - Sample Arc Flash Hazard Warning Sign. The signs must conform to ANSI Z535.2, "Environmental and Facility Safety Signs".

    NOTE - In PSO, for transmission system equipment, where the possibility of continual changing of arc flash hazard information exists, the warning sign information may be communicated to employees by alternate means such as the SRNet or the work planning process.
14. To ensure consistency in signage, place orders for signs with TVA Corporate Signage at corporate_signage@tva.gov [1].
15. When an electrically safe condition is established in accordance with section Appendix D - Sample Arc Flash Hazard Warning Sign item 4.3 in the work area, employees may remove the additional FR protection being worn over their daily-wear FR clothing. After the electrically safe condition meeting the criteria of section Appendix D - Sample Arc Flash Hazard Warning Sign item 4.3 is established, employees who are not in the daily-wear FR clothing program are not required to wear issued or checkout FR clothing such as coveralls. However, employees designated to be in the daily-wear FR clothing program are required to wear their FR clothing because they may be required (1) to respond immediately to another area where arc-flash hazards may exist and/or (2) to be in and out of arc-flash boundaries during the shift making checkout FR clothing impractical.

    NOTE: If all the employees working on the equipment that is in an electrically safe condition leave the work area un-occupied for any period of time, upon return, the employee(s) must determine that the equipment/line/circuit is safe in accordance with section Appendix D - Sample Arc Flash Hazard Warning Sign item 4.3.F (NOTE).
16. Clothing including undergarments made of synthetic or blends of synthetic fabric are prohibited within the arc flash protection boundary. Approved FR clothing may be constructed of synthetic materials such as Ultra Soft Indura material.
17. If rainwear is needed to perform a task within an arc flash boundary, the rainwear is arc flash rated.
18. Use only a face shield that is designed for arc flash hazard protection. Do not use a non-arc rated polycarbonate face shield that is primarily designed for protection against projectile impact and is not capable of providing adequate arc flash hazard protection.
19. Since performing work on exposed energized parts (480 V and above) is a high hazard job, a JSA is required to be developed in accordance with TVA Safety Procedure 6, Plan Jobs Safely. The JSA is reviewed by the employee (s) prior to starting this work.
20. When working in heat stress areas, comply with the requirements in TVA Safety Procedure 806, "Heat Stress", Heat Stress Management Work Guide.

21. “Arc-resistant switchgear” is designed and installed to prevent employee exposure to arc flash hazards when it is sealed / closed. When performing actions/operations on sealed/closed arc-resistant switchgear, an arc flash protection boundary is not required to be established. When energized arc-resistant switchgear will be opened to expose employees to an arc flash hazard, an arc flash protection boundary must be established prior to opening the equipment in accordance with section Arc Flash Required Protection item 1. Employees designated to be in the daily-wear FR clothing program are required to wear FR clothing when arcresistant switchgear is closed because they may be required (1) to respond immediately to another area where arc flash hazards may exist and/or (2) to be in and out of arc-flash boundaries during the shift.
22. For arc-resistant switchgear, warning signs must specify that employee actions/operations performed on the arc-resistant switchgear must be in accordance with section Arc Flash Required Protection item 21. In addition to the information on signs specified in section Arc Flash Required Protection item 13, the warning sign on arc-resistant switchgear must include the following: (1) “Certified Arc-Resistant Switchgear,” (2) an arc flash protection boundary is not required to perform actions/operations on sealed/closed arc-resistant switchgear, and (3) before opening energized arc-resistant switchgear, an arc flash boundary must be established.

Care of FR Clothing

1. TVA is responsible for cleaning of FR clothing such as coveralls used for layering protection or flash suits.
2. Inspect at least weekly for cleanliness and defects, (i.e. tears, or holes in the garment).
3. Employees are responsible for cleaning and laundry of daily-wear FR clothing in accordance with the instructions in Appendix E - Care and Cleaning of TVA FR Garments.
4. Instructions concerning the proper care and cleaning of FR garments is covered in 00059114.
5. DO NOT spray FR clothing with an insect repellent that contains flammable ingredients such as DEET (N,N-diethyl-m-toluamide, also know as N,N-diethyl-3-methylebenzamide). Many insect repellents contain DEET which is highly flammable. If FR clothing sprayed with a product containing DEET is worn into an area where there is a possibility of a garment ignition, the clothing will be a significant risk of igniting and continuing to burn should an arc flash occur. In this scenario the DEET is serving as a fuel source. DEET containing products are designed to be applied directly to the skin and should be used according to the product label.

Training

1. Training on the hazards of arc flash is required for TVA employees, staff augmentation contract employees and contractor employees who are:
   - Potentially exposed to arc flashes.
   - Authorized to perform the activities listed in Table 3 of this procedure.
   - Authorized to work on exposed energized parts.

   NOTE: Employees who work on electrical parts operating at 120 VAC (nominal) or greater but less than 480V are trained in order to have an awareness of arc flash requirements and when to stop work to avoid a potential arc flash exposure.
2. For TVA employees and staff augmentation contract employees, training course Arc Flash Hazard Calculation & Required Protection, ATIS number 00059114, is a computer based training module that satisfies the requirements arc flash training. Contract employers must assure that all contract employees who may be exposed to an arc flash are trained on arc flash hazards. At a minimum, this arc flash training must include:
   - Arc flash hazard.
   - Configuration change control of the electrical system.
   - FR Clothing and PPE requirements.
   - FR clothing use and care.

3. Engineers and technical employees that are responsible for performing arc flash hazard analysis must be trained on this safety procedure.

Definitions

ac – Alternating Current

Arc duration – This is the time span of the arc from initiation to extinction, specified as a number of cycles.

Arc flash hazard – A dangerous condition associated with the release of thermal energy caused by an electric arc.

Arc gap – The length of the arc, or distance between the arc electrodes.

Arc Thermal Performance Value (ATPV) – The incident energy on a fabric or material that results in sufficient heat transfer (1.2 cal/cm^2) through the fabric or material to cause the onset of a second degree burn based on the Stoll curve.

Arcing current – A fault current flowing through electrical arc plasma, also called arc fault current.

Available fault current – The electrical current that can be provided by the serving utility and facility-owned electrical generating devices and large electric motors, considering the amount of impedance in the current path.

Breakopen – In electric arc testing, a material response evidenced by the formation of one or more holes in the material which may allow thermal energy to pass through the material.

Breakopen threshold energy (EBT) – The average of the five (5) highest incident energy exposure values below the Stoll curve where the garments do not exhibit breakopen.

Clothing weight – The weight of material making up the clothing that is worn by the employee, measured in ounces per square yards (oz/yd^2).

Default arc flash distance – For transmission system arc flash calculations, this is the distance from the arc point to the worker. This distance is derived from assumptions made regarding the Minimum Approach Distance and dielectric properties of air at the operating line voltage for the circuit being analyzed.

EBT – Breakopen threshold energy.

Electrical Hazard – A dangerous condition in which inadvertent or unintentional contact or equipment failure can result in shock, arc-flash burn, thermal burn, or blast.

Electrically safe condition – is a state in which the conductor or circuit part to be worked on or near has been rendered safe in accordance with section Arc Flash Required Protection item 4.3.

Energized – Electrically connected to or having a source of voltage.

Exposed (live parts) – Capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to parts that are not guarded, isolated, or insulated.

- Guarded: Covered, shielded, fenced, enclosed, or otherwise protected by means of suitable covers, casings, barriers, rails, screens, mats, or platforms to remove the likelihood of receiving a level of arc flash incident energy required for the on set of second degree burn, 1.2 cal/cm^2. For example, a component is not “exposed” if guarded by an enclosure designed, manufactured, and Listed by Underwriters Laboratory, if appropriate, to contain electrical components. Components guarded by such things as shields, fences, barriers, rails, etc. are not “exposed,” if an employee cannot approach the guarded component to a distance that is within the component’s arc flash protection boundary.
- Isolated (as applied to location): Not readily accessible (special means for access must be used) to employees at a distance that allows a level of arc flash incident energy required for the on set of second degree burn, 1.2 cal/cm2. For example, the component is not “exposed” if an employee is not within the arc flash protection boundary and must use a special means to gain access to the arc flash protection boundary.
- Insulated: Separated from other conducting surfaces by a dielectric offering a high resistance to the passage of current such that an arc flash cannot be created. For example, a conductor surrounded by intact insulating material

such as electrical tape rated for the appropriate service and listed by UL or another nationally recognized testing laboratory, properly applied by a qualified electrical worker in accordance with the manufacturer's instruction.

Fault current – A current that flows from one conductor to ground or to another conductor due to an abnormal connection (including an arc) between the two.

Flame Resistant –The property of a material whereby flaming combustion is prevented, terminated, or inhibited following application of a flaming or non-flaming source of ignition, with or without subsequent removal of the ignition source.

Flash hazard analysis – A method to determine the risk of personal injury as a result of exposure to incident energy from an electrical arc flash.

Flash protection boundary – An approach limit at a distance from live parts that are exposed within which a person could receive a second degree burn (synonym: Arc flash protection boundary).

FR Clothing – Long sleeve shirt and pants or coveralls made of FR fabric having an ATPV at least 4.2 cal/cm^2 for shirts and 6 cal/cm^2 for pants and coveralls. When outer cold weather garments are worn over daily-wear FR clothing inside an arc flash protective boundary, any outer garment with an ATPV is acceptable, unless the outer garment is being used in a protection layering system (see section "Arc Flash Required Protection" paragraph 11). When FR clothing such as FR coveralls is worn, non-FR regular work clothing, synthetic-blend or natural fiber must not be worn under the FR clothing. If an under-shirt (tee shirt) is worn with FR clothing, the under-shirt must be FR with an ATPV at least 5 cal/cm^2. FR clothing is provided to employees as daily-wear, other issued, or checkout. FR "Lab Coats" worn over regular work clothing, synthetic-bend or 100 percent natural fiber, are not approved for wear within an arc flash boundary.

Incident energy – The amount of energy impressed on a surface, a certain distance from the source, generated during an electrical arc event. Incident energy is measured in calories per centimeter squared (cal/cm^2).

Management-Official-In-Charge (MOIC) – The plant, facility, production, or site manger.

Maximum available fault current – A short circuit or electrical contact between two conductors at different potentials in which the impedance or resistance between the conductors is essentially zero.

Panelboard – An electrical cabinet that has a "dead" front and is designed to be accessible only from the front. A panelboard is different from a switchboard, which is larger and designed to be accessible from both front and rear.

Stoll curve – A curve graphed from data on human tissue tolerance to heat and used to predict the onset of second degree burn injury.

Voltage (nominal) – A value assigned to a circuit or system for the purpose of conveniently designating its voltage class (as 480/277 V). The actual voltage at which a circuit operates can vary from the nominal within a range that permits satisfactory operation of the equipment.

Working distance – The dimension between the possible arc point and the chest of the worker positioned in place to perform the task.

Working near – The area within the arc flash protection boundary.

Reference

- Title 29 Code of Federal Regulations (CFR), Part 1910.269, “Electric Power Generation, Transmission, and Distribution; Electrical Protective Equipment."
- Title 29 CFR, Part 1910, Subpart S, "Electrical - General."
- Institute of Electrical and Electronics Engineers (IEEE) Standard 1584, “IEEE Guide for Performing Arc-Flash Hazard Calculations."
- National Fire Protection Association (NFPA) Standard 70E, “Standard for Electrical Safety Requirements for Employee Workplaces.”
- American Society for Testing and Materials (ASTM) F1958-99, “Standard Test Method for Determining the Ignitability of Non-flame-Resistance Materials for Clothing by Electric Arc Exposure Method Using Mannequins.”
- ASTM F1959-99, “Standard Test Method for Determining the Arc Thermal Performance Value of Materials for Clothing.”
- ASTM F1506-01, “Standard Performance Specifications for Flame Resistance Textile Materials for Wearing Apparel for Use by Electrical Workers Exposed to Momentary Electric Arc and Related Thermal Hazards.”
- ASTM F1891-02a, “Standard Specification for Arc and Flame Resistance Rainwear.”
- ASTM F2178-02, “Standard Test Method for Determining the Arc Rating of Face Protective Products”.
- TVA Safety Procedure 806, “Heat Stress”

Appendix A - Arc Flash Personal Protective Equipment

FR Clothing and PPE

Use Table A-1 to select the FR clothing and PPE for the value of arc flash incident energy calculated in the arc flash hazard analysis.

For exposures from circuits operating at greater than 60 kV in PSO, the incident energy is not calculated for lack of an accepted national consensus method. Employees, who are within 10 feet to exposed energized parts operating at greater than 60 kV, must wear FR clothing with an ATPV at least 4.2 cal/cm^2, hard hat, safety glasses, substantial industrial type shoes meeting the requirements of TSP 307, “Foot Protection,” and leather gloves.

FR clothing can be layered to provide greater protection. The ATPV of a layered system is higher than adding each garment’s ATPV values together. If layering of FR clothing is considered, then the ATPV of the layered garments are determined by one of the following:

- Adding the arc rating values of the daily-wear FR clothing garment and the garment to be worn over the daily-wear. This determines a minimum ATPV of the layered garments. The arc ratings are obtained from TVA’s Approved FR Clothing Product and Arc Ratings List maintained by Procurement, or
- By obtaining manufacturer’s layered test data for the actual ATPV of the selected layered garments.

Selection of a particular layering system for a given arc exposure must be approved by the organization’s safety manager, Management-Official-In-Charge (MOIC), or the MOIC designee in accordance with section Arc Flash Required Protection paragraph 11. Any exposure greater than 100 cal/cm^2 requires compliance with section Arc Flash Energy Reduction item 2.

Table A-1 Arc Flash Personal Protective Equipment (PPE)

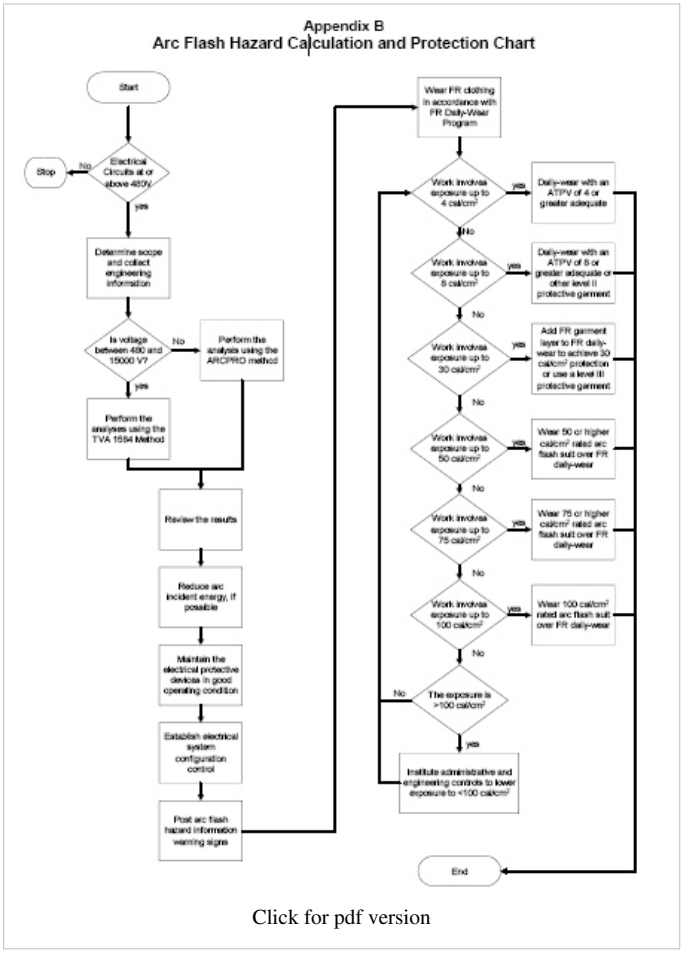
This table applies to arc flash exposures from circuits with a nominal voltage between 480 V and 60 kV

Flash Protection Level	Calculated incident energy (cal/cm^2)	FR Clothing Protective Requirements[1,2]	PPE Requirements
I	0 – 4	FR shirt/pant or coveralls with an ATPV of 4 cal/cm^2 or greater	Safety glasses[3], 8 cal/cm^2 or greater face shield (a face shield is not required for incident energies less than 1.2 cal/cm^2), hard hat, substantial industrial type shoes meeting requirements of TSP 307, "Foot Protection," dry leather gloves or voltage rated gloves/protectors
II	>4 – 8	FR shirt/pants or coveralls with an ATPV of 8 or greater	Safety glasses[3], hard hat, 8 cal/cm^2 or greater face shield, substantial industrial type shoes meeting requirements of TSP 307, "Foot Protection," dry leather gloves or voltage rated gloves/protectors
III	>8 – 30	FR flash suit with an ATPV of 30 or greater, or a Level-I or II FR garments plus another FR garment layer which gives a combined total rating of 30 cal/cm^2 or greater[4]	Safety glasses[3], hard hat, hearing protection, 30 cal/cm^2 or greater hood[5], substantial industrial type shoes meeting requirements of TSP 307, "Foot Protection," dry leather gloves or voltage rated gloves with protectors
IV	>30 – 50	FR flash suit with an ATPV of 50 or greater, or a Level-I or greater FR garment plus another FR garment layer which gives a combined total rating of 50 cal/cm^2 or greater ATPV4.	Safety glasses[3], hard hat, hearing protection, substantial industrial type shoes meeting requirements of TSP 307, "Foot Protection," 50 cal/cm^2 rated hood[5], 50 cal/cm^2 gloves or voltage rated gloves with protectors
V	>50 – 75	FR flash suit with an ATPV of 75 cal/cm^2 or greater.	Safety glasses[3], hard hat, hearing protection, substantial industrial type shoes meeting requirements of TSP 307, "Foot Protection," 75 cal/cm^2 rated hood5, gloves rated for 75 cal/cm^2 or rated voltage gloves with protectors
VI	>75 – 100	FR flash suit with an ATPV of 100 cal/cm^2 or greater.	Safety glasses[3], hard hat, hearing protection, substantial industrial type shoes meeting requirements of TSP 307, "Foot Protection," 100 cal/cm^2 rated hood[5], gloves rated for 100 cal/cm^2 (rated voltage gloves with protectors are not acceptable at this ATPV)
VII	>100	None: This level of exposure requires a Job Safety Analysis and special protection procedures to limit the exposure to 100 cal/cm^2 or less.	None: This level of exposure requires a Job Safety Analysis and special protection procedures to limit the exposure to 100 cal/cm^2 or less.

[1] Tee-shirts worn under FR clothing must be constructed of FR material.
[2] Undergarments (except FR tee-shirts) must be made of 100 percent natural fiber material such as cotton, wool, and/or silk. Non-FR undergarments are not items of daily-wear FR clothing provided by TVA.
[3] The term safety glasses include safety side shields on the glasses.
[4] Where the primary FR garment(s) does not meet the ATPV required, a second FR garment may be worn over the primary garment if the combined ATPV of the two garments meets the exposure incident energy level. Otherwise, select a flash suit that is rated for the level of incident energy exposure.
[5] Arc flash hoods must have an ambient air system provided or recommended by the manufacturer.
[6] Wearing a FR lab coat over 100 percent natural fiber clothing does not meet the requirements for FR clothing within an arc flash boundary.

Appendix B - Arc Flash Hazard Calculation and Protection Flow Chart

Appendix C - TVA 1584 Calculator Notes



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TVA 1584 Calculator Notes

PPE Changes

The IEEE calculator PPE table was expanded to reflect TVA FR clothing and arc flash PPE requirements:

- Added categories to comply with TVA arc flash PPE requirements.
- Changed category names to comply with TVA arc flash PPE requirements.

Arc Flash Protection Boundary Changes

Modified flash protection boundary to reflect the method of calculating distances as adopted by TVA and modified Lee's equation to give safety factor by lowering the incident energy for flash protection boundaries:

- Lee's equation was set to an energy level of 0.3 cal/cm^2 to calculate boundary distance for voltages ≤1kV. This a safety factor of 4.
- Lee's equation was set to an energy level of 0.7 cal/cm^2 to calculate the boundary distance for voltages between 1kV and 15kV. This is a safety factor of 1.7.
- There was no change to the energy level (1.2 cal/cm^2) contained in the IEEE calculator to calculate boundary distances for voltages ≥15kV.
- Added columns to the IEEE calculator pages for choosing the boundary at the lower of IEEE and Lee equations:

  Added columns “Q” on “Calc” pages to choose lower of boundary distances.

  Added column “AM” on “Calc” pages to modify Lee's equation.

Unit of Measure Changes

Modified spreadsheet to allow for units in inches and added ability to select units:

- Added row 9 on the “Basic Information” page to choose unit type.
- Added unit conversions within “Data” and “Calc” pages:
- Column “AB” on “Data” pages converts to metric for “Calc” pages.
- Columns “R,” “S” on “Calc” pages chooses metric or English units for display on “Summary” page.

Bus Name Sorting Changes

Modified spreadsheet to allow for data sorting on data sheets (Do not sort on “Calc” or “Summary” sheets!).

- Column “Z,” “AA” on “Data” pages no longer refers to calculation pages for calculations.
- Columns “AN,” “BC,” “BD” now refers to “Data” pages for values.

Additional Operating Modes Changes

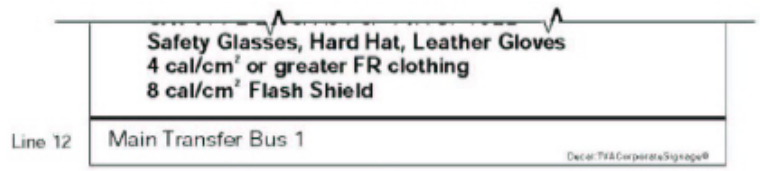
Added pages in order to include additional lineups (operational modes). Added “Data-Alternate” and “Data-Emergency” and “Calc” pages:

- Copied “Data” and “Calc” pages to allow for alternate lineup entries.
- Default values for these pages are the same as normal pages.
- Added columns to “Summary” page:
- Added columns “G”-“L” on “Summary” page to provide summary of “Data-Alternate” and “Data-Emergency” pages.
- Added maximum columns to “Summary” page: Added columns “M” – “O” on “Summary” page to provide for selection of maximum values between operating modes

Appendix D - Arc Flash Hazard Warning Sign

Sample Arc Flash Hazard Warning Sign

Hydro example- Using equipment numeric designation and engineering calculation number on line12.



Fossil example- Using equipment English name number only on line 12.

Appendix E - Care and Cleaning of TVA Protective / Flame Resistant Garments

Care and Cleaning of TVA FR Garments

The TVA daily-wear FR clothing program includes a number of different types of body fabrics and linings. Employees are responsible for the cleaning and maintenance of these garments. Generally, home laundering does not damage either the flame resistance of the material or the garments themselves. **However, the use of chlorine bleach can cause serious problems.** Overloading washing machines will cause abrasion and color loss and over-drying the garments can lead to excessive shrinkage.

Chlorine bleach should never be used when laundering flame resistant garments.

All garments should be properly labeled as to their brand name and/or composition. Unlabeled garments do not satisfy the requirements of TVA’s daily-wear FR clothing program.

The following states the manufacturer’s home laundry recommendations for each type of material:
INDURA and INDURA Ultra Soft/Tuf Stuff: 100% cotton INDURA and 88% cotton/12% high tenacity nylon Ultra Soft/Tuf Stuff fabric.

A. Wash with like colors on Normal or Cotton cycle at any water temperature. Hotter water generally causes greater shrinkage, but may be required to remove oily soils. Turning the garments inside out the first time or two they are washed and dried will help reduce streaking from abrasion.
B. Use any typical laundry detergent. **Do not use soap** (tallow soap containing animal fats). Home wash products are clearly labeled. For example, *Tide* detergent, or *Dial* soap.
C. Any commercial stain treatment may be used such as *Whisk*, or *Shout*.
D. Starch, fabric softener, and other laundry additives should not be used as they can coat the fiber and mask flame resistance.
E. **Do not use chlorine bleach.** Oxygen bleaches such as found in *Tide with Bleach* can affect the color of navy garments and should not be used.
F. Tumble dry on Cotton or Sturdy setting, remove promptly. Do not over-dry.
G. If desired, iron on Cotton/Normal setting.
H. Either perchloroethylene or petroleum solvent can be used in dry cleaning. Jeans should not be dry cleaned because the indigo dye will bleed into the solvent and fade the material.

Excel FR / Excel FR ComforTouch: 100% cotton Excel FR and 88% cotton/12% high tenacity nylon Excel FR ComforTouch fabric.

A. Use any typical home laundry detergent. Home wash detergents that contain sodium perborate and other “color safe” bleach alternatives, both liquid and powder, will not affect the flame resistance of the garments. However, they should not be used to launder Navy dyed garments as this will cause garments to fade to a purple cast.
B. **Do not use chlorine bleach, liquid non-chlorine bleach or detergents that contain hydrogen peroxide.** These include but are not limited to liquid Tide with Bleach, liquid Clorox II, and liquid Vivid.
C. It is important that all potentially flammable soils and other contaminants are completely removed from garments during the wash process. This may require the use of stain removal products, such as Shout, Spray ‘n Wash, or Zout; or presoaking garments prior to washing. The use of hot water can often make detergents more effective in the removal of soils. If all contaminants cannot be removed in home care, you should obtain professional help in getting your FR garments clean.
D. The use of conditioned or soft water can help improve removal of contaminants from garments. Hard water precipitates soaps and can result in the build-up of calcium and magnesium salts. These can serve as fuel in the event they are exposed to a source of ignition.
E. Starch and other laundry additives are not recommended because they can coat fibers and mask FR performance, or serve as fuel in case of garment ignition. If desired, one softener sheet may be used in the clothes dryer. Liquid softeners should not be used.
F. Do not over-dry garments. If desired, you may press with an iron on the normal cotton setting.
G. It is recommended that you turn the garments inside out to help reduce streaking that can occur due to abrasion in the washer.

NOMEX and Cool Touch: NOMEX fabrics and shirts made from 65% NOMEX / 35% Lenzing FR fabric:

A. Wash with like colors on Permanent Press cycle at water temperatures up to 140ºF.
B. Use any typical laundry detergent. Any commercial stain treatment may be used such as *Whisk*, or *Shout*.
C. Starch, fabric softener, and other laundry additives should not be used. NOMEX has a static dissipative fiber in the blend to reduce nuisance static. A build-up of fabric softener on the fabric decreases wick ability that reduces comfort.
D. **Do not use chlorine bleach.** Chlorine bleach can weaken the fabric and accelerates color loss. If necessary, oxygen bleaches such as found in *Tide with Bleach* may be used.
E. Tumble dry on Permanent Press setting with proper cool down, remove promptly. Do not overdry. Do not line dry in direct sun.
F. If desired, use warm iron on Permanent Press setting.

G. Either perchloroethylene or petroleum solvent can be used in dry cleaning.

FireWear: 55% cotton/45% FFR fiber Fire Wear:

A. Wash with like colors on Permanent Press cycle at water temperatures up to 120ºF. Turning garments inside out can result in longer lasting, brighter colors and longer garment life.
B. Use any typical laundry detergent. Any commercial stain treatment may be used such as *Whisk*, or *Shout*.
C. Starch, fabric softener, and other laundry additives should not be used.
D. **Do not use chlorine bleach.** Chlorine bleach accelerates color loss. If necessary, oxygen bleaches such as found in Tide with Bleach may be used.
E. Tumble dry on the lowest possible setting with proper cool down, remove promptly. Do not overdry. Do not line dry in direct sun.
F. If desired, use cool iron on lowest possible setting.
G. Either perchloroethylene or petroleum solvent can be used in dry cleaning.

PBI: (shirts, pants, coveralls, and a lab coats are made from 60% Kevlar Aramid / 40% polybenzimidazole)

A. Wash with like colors on Permanent Press cycle at water temperatures up to 140ºF. Turning garments inside out can result in longer lasting, brighter colors and longer garment life.
B. Use any typical laundry detergent. Any commercial stain treatment may be used such as *Whisk*, or *Shout*.
C. Do not starch.
D. **Do not use chlorine bleach.**
E. Tumble dry on the Permanent Press setting with proper cool down, remove promptly. Do not over-dry. **Do not line dry in direct sun.**
F. If desired, use warm iron on Permanent Press setting.
G. Either perchloroethylene or petroleum solvent can be used in dry cleaning.

Unlabeled or damaged garments and those showing abnormal or excessive wear do not satisfy the requirements of TVA's protective clothing program shall not be worn.

References

[1] mailto:corporate_signage@tva.gov

Chapter 3 Transmission / Substation / Telecommunication

Chapter 3 Section 11 General

Procedure 1101 General - Transmission / Substation / Telecommunication

TVA Safety Manual

1101 Responsibilities and General Requirements for Transmission Employees

Procedure Number 1101

TVA Safety Procedure

Responsibilities and General Requirements for Transmission Employees

Revision 8

April 18, 2008

Purpose

1. The purpose of this procedure is to define individual responsibilities and general safe work requirements for transmission workers.
2. In addition to the requirements provided in this procedure, the requirements defined in TVA Safety Procedure 206, “Employee Responsibilities and Rights” shall also apply.

Responsibilities - Individual

1. Using or being under the influence of intoxicants or drugs which might adversely influence decisions or actions while on duty is prohibited. Employees taking prescribed or other medications that could affect their ability to do their work safely shall so inform their supervisor.
2. Employees shall not engage in fighting or arguing while on duty or on TVA-owned or TVAcontrolled property.
3. Scuffling and horseplay are prohibited.
4. Employees shall not knowingly expose other persons or themselves to conditions or actions hazardous to safety or health.
5. If a condition or practice is observed that is either unsafe, defective, or destructive to TVA personnel or the public, environment, or property, employees shall correct the observed problem, if possible, or report it to their supervisor.
6. Employees shall know and understand the safety requirements which apply to the work they are to perform.
7. Employees shall inform their supervisor of any medical constraints. Medically imposed work constraints shall be enforced by supervisors and not violated by the employee.
8. An employee working alone shall plan his or her tasks to be performed. The planning shall cover the following subjects: hazards associated with the job, work procedures involved, special precautions, PPE requirements, and any system clearances that may be required.
9. Existing conditions related to safety and how to control any hazards shall be determined before work on or near electric lines or equipment is started. Such conditions include the nominal voltages of lines and equipment, the presence of hazardous induced voltages, the presence of remote ground sources, the presence and condition of

protective grounds and equipment grounding conductors, the condition of poles, environmental conditions relative to safety, and the locations of circuits and equipment, including power and communication lines.

10. Employees shall work in a position from which a slip or sudden movement will not bring their bodies into contact with exposed energized equipment parts.
11. Employees should be physically and mentally fit to perform their work. They have an obligation to keep their supervisor informed of physical and mental conditions that may interfere with the safe performance of their work.
12. Worksites or jobsites should be kept in a safe condition. Before leaving a worksite or jobsite, employees should correct, or arrange to give warning of, any condition which might result in injury to a coworker or others unfamiliar with existing conditions.
13. Employees are required to attend and participate in safety meetings.
14. An occupational injury should be reported to the supervisor within one hour after it occurs.
15. Head, back, and eye injuries require diagnosis and/or treatment by a medical provider.
16. A TVA employee involved in an accident or observing an accident involving TVA that results in an injury to a non-TVA person shall notify the TVA Police and his/her foreman/supervisor as soon as possible. Accidents involving serious injury or death require immediate notification by the foreman/supervisor through management channels.
17. When medical care is obtained for a work-related injury/illness, the injured employee must obtain a note from the medical provider detailing guidance on the employees' work status, i.e., "held off duty", "constraints/restrictions", "light duty", or "return to regular duty".
18. Medical provider notes must be coordinated with TVA Workers' Compensation Department. Employees who receive medical care from a TVA contract medical provider will have medical constraints/restrictions documented on form TVA 1444.

Supervisory Responsibilities

1. Key elements in the safe performance of any work activity are the acceptance and active fulfillment of safety and health responsibilities by the individual who is charged with planning and directing the work of others. It is a prime responsibility of supervision at all levels to create and maintain a high level of safety awareness in each member of their working group. Specific supervisory responsibilities shall include, but are not limited to, the following requirements.
2. Persons supervising work activities shall study, observe, and enforce the requirements in the TVA Safety Manual relating to their work activity.
3. Persons supervising work activities shall ensure that all people under their direction are competent to perform their work safely.
4. The supervisor shall discuss with all involved employees, the hazards associated with the job, work procedures involved, special PPE equipment, and any required system clearance. Additional discussions shall be held if significant changes occur during the course of the work.
5. Conflicts of procedures, rules, practices, or other requirements shall be resolved by higher levels of supervision.
6. Each first aid kit shall be readily available for use and shall be inspected frequently enough to ensure that expended items are replaced at least annually.
7. Only qualified employees shall be assigned to work on or with exposed energized lines or parts of equipment or in areas containing unguarded, uninsulated, energized lines or parts of equipment operating at 50 volts or more. Employees in training and under the direct supervision of a qualified employee may also perform work in these areas.
8. Except as provided in the Note below, at least two employees shall be present when exposed to any unguarded, uninsulated power system equipment having the electrical potential of more than 600 volts.
   Note: The above does not apply to the following operations.
   - Routine switching of circuits under conditions that allow this work to be performed safely.

- Work performed with live-line tools, if the employee is positioned so that he or she is neither within reach of, nor otherwise exposed to, contact with energized parts.
- Emergency repairs to the extent necessary to safeguard the general public.

9. Persons supervising work activities should encourage proper attitudes, instruct members of their work unit in safe work techniques, and provide and maintain safe working conditions for employees under their supervision.
10. Persons supervising work activities should inform employees of safety requirements which apply to the work and inform them of any recognized hazards, precautions, or special regulations which may affect safe job completion. Special consideration should be given to new employees or those unfamiliar with the work to aid them in developing safe working habits.
11. Pre-job briefings shall be conducted daily before beginning work.
12. Form TVA 17566, Manager's Checklist for Energized Work, shall be completed, signed and dated by the appropriate manager or his/her designated representative before a crew begins any energized work, as described by procedure 1109, requirement 2.3. Completed checklists shall be retained for 90 days.
13. When determining whether work is available that can accommodate a worker's medical constraint/restriction, Supervisors shall consult with management before employees are returned to work or sent home.

Protection of the Public

1. Members of the public may request information on safe approach distances to power lines. Information on non-utility work minimum approach distances to power lines is shown in TVA Safety Procedure 1108.
2. The public should not be permitted in locations where work activity may endanger them.
3. The public should be protected from the hazards of transmission line construction at water crossings.
4. If worksites or jobsites must be left unattended before completion of a job, employees should correct or give warning of any condition which might result in injury to a member of the public.
5. When work is being conducted along public streets or highways, pedestrian and vehicular traffic should be warned by signs, flags, or flashing lights by day, and lights, flares, luminous tape barriers, or flashing lights by night. When necessary, persons wearing reflective vests should be assigned to signal traffic of the hazard created or divert traffic around the hazard or work activity. Employees flagging traffic should be properly trained.

Motor Vehicle Safety

1. Obedience to laws will not be enough to prevent accidents. Alertness, common sense, and courtesy will improve your chances of avoiding accidents. Safety, in your work or when driving a vehicle, is a state of mind. To extend courtesy to all drivers and pedestrians is the best way to ensure your own safety. By your courteous attitude, you will properly represent TVA. Drive defensively.
2. Work vehicles include pick-up trucks (4- and 2-wheel drive), cargo work vans, station wagons, jeeps, trailers, mobile crane trucks, truck mounted aerial lifts and tractors. Vehicle/manufacturers' rate vehicles using a Gross Vehicle Weight Rating (GVWR) which is the MAXIMUM WEIGHT for a single vehicle including its load. The GVWR is determined by factors such as the power train, suspension, axles, brakes, and tires. Exceeding the GVWR is very dangerous and will affect the steering and braking of the vehicle. By knowing the weight of your vehicle and its GVWR, the safe loading capacity for the vehicle can be determined.
3. When loading a vehicle, the cargo should remain as low as possible. Heavy loads carried on truck racks will raise the center of gravity of the vehicle and will cause the vehicle to become unstable in curves or when swerving to avoid a hazard.
4. Tires also have a load rating. The proper load-rated tire should be installed on the vehicle to safely handle the loads being transported.
5. Vehicles shall not be loaded past their GVWR.
6. Heavy cargo loads (such as steel poles) shall not be hauled on truck racks.

7. The aggregate static Working Load Limit (WLL) of tie-down assemblies used to secure an article against movement during transport shall be equal to at least ½ (0.5) times the weight of the article. An even number of chains shall be used. The WLL shall be determined either from the charts in the Useful Information Section 16 or the tags or labels attached to the tiedown assembly.
   For example, divide weight of load to be hauled by 2 and divide that number by the strength of the chain from chart or tag. This will give the number of chains required: Load =74,000 pounds: 74,000 ÷ 2 = 37,000 pounds
   Strength of chain from chart: 7,100 pounds and
   37,000 ÷ 7,100 = 5.21, therefore, 6 chains required
8. When loading a vehicle, the cargo should be centered and as low as possible.
9. Vehicles should not be loaded past the axle weight rating or the tire load rating.
10. Drivers of vehicles on TVA business are required to hold valid state drivers licenses and are subject to all traffic laws and ordinances. Employees who operate vehicles or equipment requiring a Commercial Drivers License (CDL) must obtain and maintain a current and valid CDL including the required Medical Examination S-05. Suspension or withdrawal of the license must be reported to the supervisor.
    Reference TVA Safety Procedure 610, "Motor Vehicle Operations", paragraph 7.8 for additional CDL maintenance requirements.
11. If it is possible for any part of a vehicle to contact energized equipment or conductors, the body of the vehicle shall be grounded. Be sure that radio and telephone antennas have sufficient clearance.
12. Vehicles stopped on roadways shall be properly identified by approved markers and/or warning light.
13. When vehicles are in motion, operators and passengers shall use seat belts. Drivers shall ensure that all passengers' seat belts are operational and fastened prior to putting the vehicle in motion.
14. Get on or off vehicles only after they have come to a complete stop.
15. When a vehicle is parked, the driver shall set the brake or otherwise secure the vehicle from undesirable movement.
16. When a trailer is disconnected from a vehicle, it shall be secured to prevent undesirable movement.
17. Radio transmitters and cellular phones shall not be operated in the vicinity of blasting operations or near employees with identified electronic pacemakers or medical equipment.
18. Smoking, welding, open flames, or other sources of ignition shall not be permitted within 50 feet (15.2m) of any refueling activity.
19. Headlights shall be used when fog is encountered or when driving in the rain. (Parking lights should never be used in lieu of headlights while the vehicle is moving.)
20. No vehicular equipment having an obstructed view to the rear may be operated on off-highway jobsites where any employee is exposed to the hazards created by the moving vehicle, unless:
    - The vehicle has a reverse signal alarm audible above the surrounding noise level, or
    - The vehicle is backed up only when a designated employee signals that it is safe to do so.
21. Immediately before backing a vehicle, the driver shall determine that the space is clear.
22. When possible, vehicles shall be parked such that backing will not be required when the vehicle is moved. Where possible, vehicles should be driven through "straight" parking spaces and parked to exit by driving forward. When a "drive-through" space is not available, the vehicle should be backed into the "straight" parking space.
23. It is the driver's responsibility to back his or her vehicle safely. When another employee is available, he or she should assist the driver by guiding or observing during the backing of the vehicle.
24. When employees are being transported, the responsible supervisor or driver should verify that the vehicle is not overcrowded, adequate seating is provided, and passengers remain seated while the vehicle is in motion.
25. Tools and other injury-producing objects carried inside vehicles should be secured or a screen installed between the cargo and vehicle occupants. Fuel containers should not be carried inside the passenger/driver compartment.

26. A-frames or collapsible booms mounted on trucks and tractors should normally be disassembled before being transported over public roads and highways. However, if an Aframe is to be used immediately at another location and highway travel is kept to a minimum, it is permissible to transport the assembled A-frame if it is lowered to a safe position and the stiff leg secured. The path should be examined for safe clearance.
27. Check overhead clearance and use extreme caution when driving into or out of any building or area where visibility is limited.
28. Keep vehicle in gear when moving downgrade.
29. The driver should be alert for equipment defects. If a defect causes any unsafe condition or impairs safe operation of the equipment, operation should be suspended until the defect has been corrected. Any employee noting such defects should take appropriate action to secure replacement or repair according to applicable procedures.
30. Equipment or vehicle engines should be shut off during refueling.
31. Drivers should not indicate (telegraph) the intentions of other drivers through the use of turn indicators or hand signals.
32. When filling portable metal gasoline cans, they should be removed from the bed of the vehicle to avoid possible static discharge.
33. Drivers of vehicles on official TVA business, shall maintain a minimum safe following/stopping distance between their vehicle and the vehicle ahead equal to 2 seconds. This rule (2 second rule) is applicable as a minimum safe driving distance when following another vehicle under good driving conditions. Under poor driving conditions (weather or heavy traffic), add additional seconds to the 2 second rule, as appropriate.

General Requirements

1. Oil-soaked rags and flammable liquids shall be stored in approved noncombustible containers.
2. Emergency exits and fire escapes shall be kept clear of obstructions that would prevent use for an emergency.
3. Sufficient illumination shall be provided to enable employees to perform their work safely.
4. Supervisors should assign areas of housekeeping responsibility to individuals and allot time for housekeeping.
5. Glass containers are prohibited at construction worksites unless they are protected from breakage.
6. The operating area or compartment of all vehicles should be kept free of litter and debris.
7. Supervisors shall make regular inspections and enforce housekeeping requirements.
8. Tools, containers, and materials should not be placed where they may be tripping hazards or where they may fall.
9. All scrap, waste materials, and rubbish should be removed from the immediate work area as the work progresses.
10. Disposal of waste material or debris should comply with TVA policy and local fire and environmental regulations.

Fire Prevention and Suppression

1. A fire needs fuel, oxygen, and heat. Remove any one of these to extinguish it. Fires are divided into three classes according to the types of combustible materials involved. Each class requires a different fire fighting technique.
2. Class A fires are fires in ordinary materials, such as wood, paper, excelsior, rags, and rubbish. To extinguish them, use water or solutions containing a large percentage of water.
3. Class B fires are fires in flammable liquids, such as gasoline, oil, and grease. The blanketing or smothering action of dry chemicals or carbon dioxide is effective in extinguishing fires of this class. Solid streams of water are likely to spread the fire; but, under certain circumstances, water-fog nozzles prove effective.
4. Class C fires are fires in or near energized electrical equipment. A nonconductive extinguishing agent, such as carbon dioxide or dry chemicals, is effective in controlling these fires. A solid stream of water should not be used on fires involving energized electrical equipment. However, water from a fog nozzle can sometimes be used on fires in electrical equipment, such as transformers.
5. Signs prohibiting smoking and open flames shall be strictly observed.

6. Dirty clothing, rags, or other combustible material shall not be allowed to accumulate in lockers and tool storage areas.
7. Gasoline and other highly volatile, flammable liquids shall not be used to start fires.
8. Fire protection equipment shall be kept at its designated location except for actual use or maintenance.
9. Liquids which are highly volatile and flammable shall be clearly labeled and not be stored, transported, or left unattended in open containers.
10. Whenever there is danger of static electrical buildup and discharge in the presence of flammable, volatile liquids, or gases, all apparatus and containers shall be bonded together and grounded.
11. Fire-extinguishing equipment shall be inspected monthly.
12. An employee should not leave open fires unattended.
13. When welding or cutting operations are performed at elevated positions, precautions should be taken to prevent hot metal from falling onto people or into combustible materials.
14. Welding or cutting should not be done near exposed, flammable liquids, or gases. Flammable dust in the work area should be removed or shielded to prevent ignition.
15. Where flammable material cannot be removed from exposure to welding or cutting sparks, it should be protected by a shield of non-combustible or fire-resistant material. Suitable fireextinguishing equipment should be readily available.
16. Each employee should be familiar with both the location and operation of all fire protective equipment and systems in the vicinity of their work area.
17. Each employee should know how to turn in a fire alarm and what to do in case of fire.
18. An appropriate fire extinguisher should be installed in TVA work vehicles.

Office Safety

1. Office workers are subject to many of the same types of accidents that occur in production and maintenance areas. Some of the most frequent types of office accidents are falls, strains, cuts, and electrical shocks. To avoid injuries in offices as well as in plant or field areas, all employees should be alert for potential hazards and should conscientiously strive to develop good safety habits.
2. When climbing, use an approved step stool or ladder.
3. Any electrical defects in cords or machines should be promptly reported and repaired.
4. Portable heaters shall not be placed close to combustible or flammable materials.
5. Walk, do not run. Always use handrails when ascending or descending stairways.
6. Extension cords should not be strung across aisles or walkways where people may trip or fall over them.
7. Broken glass or other sharp objects should not be placed in wastebaskets unless wrapped or properly protected.
8. Material or equipment should not be stored or placed where it could fall.
9. Serious strains often result from improper handling of boxes and bundles of office supplies, ledgers, portable filing cases, and office machines. Lifting should be done with back erect, using the more powerful leg muscles. See TVA Safety Procedure 1107, Manual Material Handling for Transmission Workers.
10. Opening loaded file drawers, particularly more than one at a time, may tip over a cabinet. Where several tiers of cabinets are used at one location, they should be fastened together. Single cabinets should be secured from tip-over. Do not leave desk drawers, file drawers, or desk slides open.
11. Keep fingers away from the cutting edge of paper cutters. The cutter blade should be left in a closed position when not in use.
12. Doors should be opened slowly to avoid striking anyone on the other side.

Personal Protective Equipment (PPE) and Clothing

1. PPE shall be worn when its use is deemed necessary by the supervisor. PPE and clothing provided by TVA shall not be altered. When at a power plant, the plant's requirements for PPE must also be met.
2. **Eye and Face Protection**
3. A recognized eye hazard is one that presents a reasonable probability of injury that can be prevented by eye protective equipment such as welding or cutting, electrical arcs, brush chippers, grinding, buffing, or wire brushing with power tools, handling hazardous chemicals, dusty operations, or other similar activities. Contact lenses do not provide eye protection in the industrial sense and may increase the hazard to the wearer's eyes in some situations. Additional requirements for operations requiring eye and face protection may be found in the TVA Safety Procedure 304, Eye and Face Protection.
4. Appropriate industrial eye protection shall be worn by employees whenever they are exposed to a recognized eye hazard.
5. Safety eyewear with sideshields shall be worn in all construction areas, maintenance areas, and during field surveying activities. Safety eyewear is not required in vehicles, office areas, or during safety meetings.
6. Employees shall wear appropriate safety eyewear when performing certain operations such as brush chipping, welding, torch cutting, grinding, buffing, wire brushing, sawing, drilling, installing grounds on high-voltage conductors or equipment, handling chemicals, or working in dusty environments.
7. When the work environment entails exposure to fumes, vapors, splashes, intense heat, molten metals, or highly particulate atmospheres, contact lenses should not be used.
8. **Hearing Protection**
9. Employees exposed to hearing hazards shall wear appropriate hearing protectors.
10. **Knee Protection**
11. Padding should be used when work requires kneeling on a hard surface and placing body weight directly on a bent knee(s).
12. **Foot Protection**
13. Employees shall not wear casual or athletic type footwear in a construction work environment.
14. Employees should wear footwear appropriate to their occupation and the hazards of their job.
15. **Head Protection**
16. Approved head protection issued by TVA shall be worn by all persons when in areas where falling objects or other hazards may cause a head injury and in any areas designated by the supervisor.
17. Employees with hair length that could present a hazardous condition when working around reciprocating or revolving equipment or machinery shall contain hair in a net or other suitable means to prevent entanglement.
18. Safety headgear that exhibits cracks or other signs of deterioration shall be replaced by a new approved headgear.
19. Head protection shall be worn while operating all heavy equipment with the exception of operating an enclosed cab crane where the hard hat would obscure the view.
20. **Skin Protection**
21. Skin should be protected from contact with harmful chemicals.
22. **Respiratory Protection**
23. Specific requirements for respiratory protection are contained in the "Respirator Program" document. The following Rules shall apply in any case of respirator use.
24. When respirators are required for a particular work activity, they shall be used.
25. Those using respirators shall follow the manufacturer's instructions or the specific instructions of supervision.
26. Work requiring respirators shall not be done when conditions prevent a good face seal. Such conditions may be a beard, sideburns, a skull cap protruding under the face piece, or temple pieces on glasses.
27. A medical examination (S-3) shall be given to employees who are required to wear a negative pressure respirator.

28. Employees shall be fit-tested before being issued a respirator to determine the proper size needed and adequate fit.
29. **Clothing**
30. Employees shall wear fire resistant clothing when they are within four (4) feet (1.2m) of any area where there is the possibility of exposure to the hazards of electrical arc or flashover and when performing switching. Fire resistant clothing or switching jackets will be provided to employees whose work assignments potentially expose them to this environment. An electrical potential of 480 or more volts (ac) with a fault current capacity of 1000 or more amperes is considered capable of producing a flashover or arc hazardous to employees who are within four (4) feet (1.2m) of it when it occurs.
31. When work is performed within reaching distance of exposed energized parts of equipment, each employee shall remove or render nonconductive all exposed conductive articles, such as key or watch chains, rings, or wrist watches or bands, unless such articles do not increase the hazards associated with contacting the energized parts.
32. Protective chaps shall be worn by chain saw operators when they are operating a chain saw except when working off the ground.
33. Hand protection shall be worn when performing any activity which could puncture, cut, burn, pinch, or otherwise injure the hand, such as: handling poles; steel; wire or cable; barrels; drums; cylinders; heavy materials; ropes; handlines; climbing poles, structures, or ladders; or assembling poles or structures.
34. Rings, dangling jewelry, and similar items that constitute a hazard shall not be worn while operating or working around moving machinery. When performing construction or maintenance activities where there is the risk of finger injury, rings shall be removed or gloves worn.
35. Shirt sleeves should be no shorter than tee shirt length or at least three inches in length on rights-of-way or in other industrial environments. Shirts should not be removed.
36. **Lifejackets**
37. Whenever an employee may be pulled or pushed or may fall into water where the danger of drowning exists, the employee shall use a U.S. Coast Guard approved personal flotation device properly fastened or secured.
38. Each personal flotation device shall be maintained in safe condition and inspected before each use to ensure that it does not have rot, mildew, water saturation, and/or any other condition that could render the device unsuitable for use.
39. **Fall Protection Systems**
40. Any lifeline, body belt, safety belt, body harness, or lanyard subjected to in-service loading shall be immediately removed from service and shall not be used again for employee safeguarding.
41. All body belts, safety straps, safety belts, lanyards, lifelines, and body harnesses shall be inspected annually (by February 1) and marked to indicate the year tested as outlined in TVA Safety Procedure 617 Color Coding Identification - Safety Test / Inspection of Material and Equipment. In addition, these fall protection systems shall be inspected before use each day to determine that the equipment is in safe working condition. A 4-inch space in the center of the back on all body belts shall be free of tool loops, bolt bags, or any other attachments.
42. Lifelines shall be protected against being cut or abraded.
43. Personal fall arrest systems shall be rigged such that an employee can neither free fall more than six (6) feet (1.8m) or contact any lower level.
44. If vertical lifelines or droplines are used, only one employee shall be attached to any one lifeline.
45. Snap hooks shall not be connected to loops made in webbing-type lanyards nor to each other.
46. Safety lanyards used with a body harness shall be of the decelerating type.
47. Safety strap and lanyard snap hooks shall be of the locking type.

Reporting of Accidents, Injuries, or Near- Miss Incidents

1. Injuries shall be reported promptly to the supervisor. Near-miss incidents that have the potential for causing serious injury or property damage shall be reported. Injuries to nonemployees as a result of TVA activities shall be promptly reported. The scene of any serious accident or near-miss incident shall be left as near undisturbed as possible pending investigation.
2. All accidents involving rented, leased, or private vehicles being used for official TVA business shall be reported promptly. Employees shall comply with all applicable local and state regulations and make an immediate report of vehicular accidents to their supervisor and TVA Police.

Procedure 1102 Electrical Safety - General

TVA Safety Manual

1102 Electrical Safety - General

Procedure Number 1102

TVA Safety Procedure

Electrical Safety - General

Revision 1

July 15, 2006

Purpose

The purpose of this procedure is to establish general requirements for connecting electrical lines and equipment.

Requirements

Connections involving exposed energized lines or parts of equipment shall be made as follows:

- In connecting de-energized equipment or de-energized lines to an energized circuit by means of a conducting wire (jumper) or device, first attach the jumper to the de-energized equipment or line.
- When disconnecting equipment or lines from an energized circuit by means of a conducting wire (jumper) or device, remove the energized source first.
- When lines or equipment are connected or disconnected from energized circuits, loose conductors shall be restrained to prevent contact with exposed energized parts.
- All connections must be made with a hot-line tool. Never make or adjust connections with bare hands since lethal voltages exist between the energized and de-energized circuits.

Procedure 1103 Electrical Protective Equipment

TVA Safety Manual

1103 Electrical Protective Equipment

Procedure Number 1103

TVA Safety Procedure

Electrical Protective Equipment

Revision 3

July 15, 2006

Purpose

This procedure provides specific requirements for personnel working with insulating gloves, sleeves, matting, blankets, covers, and line hose for protection from contact with exposed energized conductors.

Cover-up Material

1. Rubber electrical protective equipment, i.e., blankets, line hose, hoods, gloves, and sleeves, shall be inspected prior to each use and immediately following any incident that can reasonably be suspected of having caused damage. They shall be discarded if they have cracks, holes, snags, blisters, tears, ozone cutting or checking, embedded foreign objects, texture changes (swelling, softening, hardening, sticky, or inelastic), or other defects that render them unsafe. Equipment found to have other defects that might affect their insulating properties shall be removed from service and returned for testing.
2. In applying protective equipment, the nearest conductor shall be covered first to protect the employees as they progress. In removing protective equipment, the reverse order shall be maintained. Protective equipment shall be applied from a position underneath the conductor.
3. Rubber goods should never be placed directly on the ground.
4. Work should be performed from below energized parts.

Rubber Blankets

1. Rubber blankets shall be rolled and never folded or creased when in storage or being transported.
2. When rubber blankets are being rolled, their surfaces shall be brushed clean to prevent dirt or other foreign matter from becoming embedded in the surface of the rubber.
3. Workmen shall not wear climbers when standing on or stepping on a rubber blanket.
4. Rubber blankets shall never be placed on the ground without protecting them from physical damage and moisture by means of a dry tarpaulin, canvas, or protective mat.
5. Rubber blankets shall be electrically tested at first issue and every 12 months thereafter.

Rubber Line Hose and Insulator Hoods

1. When line hose and hoods are stored in compartments, they shall be laid so that no part is strained or distorted.
2. Line hose and insulator hoods shall be electrically tested upon indication that the insulating value is suspect.

Non-Rubber Cover-up Materials

Non-rubber cover-up material shall be inspected periodically and before use. The material shall be discarded if physical defects render it unsafe for further use.

Conductive Clothing

1. Employees using the live-line, bare-hand technique shall wear conductive footwear or other bonding equipment designed for that purpose.
2. Approved conductive clothing designed for live-line, bare-hand work shall be used for all bare-hand work above 230 kilovolts. This clothing shall not be used if dirty, torn, or if damaged, i.e., bonding straps not in good condition.
3. Before beginning work, workers shall bond their conductive clothing to the energized circuit. Additionally, if two workers are involved at the same work location, they shall bond their clothing to each other.

Rubber Gloves and Sleeves

1. Rubber gloves shall be electrically tested at first issue and every six months thereafter. Sleeves shall be tested at first issue and every 12 months thereafter.
2. Rubber gloves shall be given a visual inspection and an “air” test before each usage.
3. Rubber gloves and sleeves shall be rated and marked with their safe working voltage.
4. Leather protectors shall be worn with rubber gloves. Rubber gloves are never to be used alone.
5. Rubber gloves should be stored in suitable canvas bags.
6. Rubber gloves should be worn when it is necessary to contact leads or equipment connected to distant grounds and leads that parallel transmission lines or extend past substation fences.

Live-Line Tools (Hotsticks, etc.)

1. If any defect or contamination that could adversely affect the insulating qualities or mechanical integrity of the live-line tool is present after cleaning, the tool shall be removed from service and examined, cleaned, repaired, and tested before being returned to service.
2. Wood sticks shall not be used. Wood hotsticks shall be destroyed.
3. Rubber gloves shall not be used with hotsticks for live-line work.
4. In using hotsticks, hands shall never be placed closer to energized parts than the prescribed TVA Safety Procedure 1110, Minimum Clearance Distances for Energized Work.
5. Each live-line tool including hotsticks, switch sticks, fiberglass measuring rods, and ground sticks, shall be wiped clean and visually inspected for defects before use each day.
6. A live-line tool shall not be used if it is not marked with the current year’s color tape as described in TVA Safety Procedure 617, Color Code Identification - Safety Test / Inspection of Material and Equipment.
7. The examination, repair, and test procedure described in this paragraph shall be performed annually (by February 1) or when a defect is identified during the inspection of a tool before its use. All hotsticks, switch sticks, fiberglass measuring rods, and ground sticks shall be thoroughly examined for defects or contamination that could adversely affect the insulating properties or mechanical integrity of the tool. If no defect or contamination is found, the tool shall be cleaned, waxed, and a wet electrical test shall verify the tool’s integrity using the A. B. Chance LS-80 Hotstick Tester or according to IEEE Standard 978-1984. If any defects or contamination is found, the tool shall be repaired and refinished or permanently removed from service. After the tool has been repaired or

refinished, a wet electrical test shall be performed to verify the tool's integrity using the A. B. Chance Hotstick Tester or according to IEEE Standard 978-1984. Any defective tool that cannot be refinished or repaired so that it passes the wet test shall be permanently removed from service.

8. After passing the annual examination and electrical test, each tool shall be marked with the color tape for the current year as described in TVA Safety Procedure 617 Color Code Identification - Safety Test / Inspection of Material and Equipment.
9. Hotsticks and live-line ropes should be kept in a clean, dry location.
10. Live-line ropes should be replaced whenever they become contaminated.
11. Hotsticks should never be placed directly on the ground.
12. Rope used in live-line work activities shall meet the requirements of ASTM Standard F1701 for dielectric testing of new rope. Only Yale Cordage HY-DEE Braid Rope, green in color, shall be acceptable for use in live-line applications.
13. Rope used in live-line work activities shall be tested on an annual basis and shall be marked with the color tape for the current year as described in TVA Safety Procedure 617 Color Code Identification - Safety Test / Inspection of Material and Equipment. . H-D Electric Rope Tester RT-200 should be used for dielectric testing of live-line rope.
14. Rope approved for live-line work activities shall be the only rope permitted on hotline trailers. Care, inspection, testing, and protection of live-line rope shall be similar to that of other live-line tools.
15. Rope used for live-line work shall not be used for any other purpose.

Procedure 1104 Electrical Safety (Non-Power Systems)

TVA Safety Manual

1104 Electrical Safety (Non-Power Systems)

Procedure Number 1104

TVA Safety Procedure

Electrical Safety (Non-Power Systems)

Revision 2

July 15, 2006

Purpose

There are many electrical hazards associated with working on or near energized, lower voltage circuits, and equipment. The procedure applies to electrical conductors and equipment within buildings, on buildings, and on other premises such as yards, parking lots, and station service circuits in substations, i.e., commercial wiring.

Requirements

1. When working on fixed electrical equipment or electrical circuits which have been deenergized, the energizing circuits shall be locked out, tagged out, or both.
2. Locks shall be attached so as to prevent persons from operating the disconnecting means unless resorting to undue force or the use of tools.
3. Each tag shall contain a statement prohibiting unauthorized operation of the disconnecting means and removal of the tag.
4. Test equipment shall be used to verify that the circuits and the equipment to be worked on are de-energized.
5. Test and visual inspections shall be conducted to verify that all tools, electrical jumpers, grounds, and other such devices have been removed, so that the circuits and equipment can be safely energized.
6. Employees exposed to the hazards associated with re-energizing the circuit or equipment shall be warned to stay clear of the circuit or equipment.
7. Only employees familiar with the operation of fixed electrical equipment and the hazards involved shall work on energized circuits or equipment.
8. Employees working on energized circuits or equipment shall be familiar with the use of precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools.
9. Employees shall not enter spaces containing exposed energized parts, unless the space is properly illuminated.
10. Portable cords (extension cords) and plug connectors shall be visually inspected for external defects before use.
11. Portable cord plugs shall not be altered in a manner which would prevent proper continuity of the equipment grounding conductor circuit.
12. Circuits and equipment to be worked on shall be disconnected from all electrical sources when possible.
13. A lock and tag should be placed on each disconnecting means used to de-energize circuits and equipment on which work is to be performed.
14. Each lock and tag should be removed by the employee who applied it or under his or her direct supervision.
15. Employee should not perform housekeeping duties where there is a possibility of contacting energized circuits unless adequate safeguards are provided.

16. When a qualified person is working in the vicinity of overhead lines, whether in an elevated position or on the ground, the person should not approach or take any conductive object without an approved insulating handle closer to exposed energized parts than shown in Table 1 unless:
    - The person is insulated from the energized part (gloves, with sleeves if necessary, rated for the voltage involved are considered to be insulation of the person from the energized part on which work is performed), or
    - The energized part is insulated both from all other conductive objects at a different potential and from the person, or
    - The person is insulated from all conductive objects at a potential different from that of the energized part.

Note: For voltages normally encountered with overhead power line, objects which do not have an insulating rating for the voltage involved are considered to be conductive.

TABLE 1
APPROACH DISTANCES FOR QUALIFIED EMPLOYEES*
(Alternating Current)

Voltage Range (phase to phase)	Minimum Approach Distance
300V and less	Avoid Contact
Over 300 V, not over 750 V	1 ft. 0 in. (30.5 cm).
Over 750 V, not over 2 kV	1 ft. 6 in. (46 cm).
Over 2 kV, not over 13 kV	2 ft. 0 in. (63.5 cm).
Over 13 kV	Follow TSP 1110

* For Minimum Clearance Distances for Energized Work at voltages 13 kV or greater see TVA Safety Procedure 1110, Minimum Clearance Distances for Energized Work.

Procedure 1105 Field and Shop Safety for Transmission System Employees

TVA Safety Manual

1105 Field and Shop Safety for Transmission System Employees

Procedure Number 1105

TVA Safety Procedure

Field and Shop Safety for Transmission System Employees

Revision 2

November 01, 2005

Purpose

1. The purpose of this procedure is to establish field and shop safety requirements for transmission system employees.
2. Requirements included in this procedure:
   - Housekeeping
   - Machines and machine guarding
   - Hand tools
   - Power tools
   - Grinding tools
   - Explosive actuated tools
   - Cleaning operations
   - Painting
   - Painting tower and substation equipment
   - Welding and cutting
   - Electric welding
   - Gas welding
   - Ladders (general)
   - Portable ladders
   - Fixed ladders
   - Live - line ladders
   - Hook ladders
   - Portable and vehicle mounted generators
   - Portable heating equipment
   - Fuels handling and storage
   - Survey work
   - Boating

Housekeeping

Housekeeping is an orderly arrangement of tools, equipment, supplies, and storage facilities. It is a practical method of increasing efficiency of operation, reducing accidents, and improving morale. Work areas and interiors of vehicles should be kept clean and orderly.

Machines and Machine Guarding

1. Compressed air shall not be used to remove waste material from machines, workbenches, or other equipment unless the pressure has been reduced to 30 psi or less and then used only with protective equipment (goggles, face shields, or safety glasses with sideshields).
2. Do not attempt to repair a machine while it is in operation.
3. Eye protection shall be worn by operators of machine tools.
4. Do not remove or replace machine guards while a machine is in operation.
5. Machine guards shall be replaced after repairs and before placing any machine in service.
6. Loose-fitting clothing, especially loose sleeves and cuffs of shirts or jackets, neckties, rings, watches, and bracelets should not be worn by machine operators. Long hair should be contained in a net or other suitable means to prevent entanglement in reciprocating or rotating equipment or machinery.
7. Holding work in your hand while using a drill press is a hazardous practice. Use clamps, jigs, or a vise, as appropriate, to hold work securely.
8. Run the machine only at its proper cutting speed. Avoid forcing or feeding material too fast. This may result in broken or splintered tools and may cause serious injury.
9. Adequate guards should be installed as necessary to protect people from exposed moving machine parts and belts.

Hand Tools

1. Many injuries are caused by the misuse of hand tools. Injuries include loss of eyes or vision because of flying chips, severed tendons from knives and axes, and broken bones because of slipping or defective wrenches.
2. All tools used shall be maintained in a safe condition. Defective tools shall be repaired or discarded.
3. When impact tools, such as chisels, punches, and drift pins, become mushroomed or cracked, they shall be properly dressed, repaired, or replaced before further use.
4. Eye protection shall be worn when woodworking, cutting tools or metal-to-metal striking tools are used.
5. Hand tools such as rakes and shovels shall be laid with the tines and shovel tip pointing down.
6. Employees should select and use the proper tool for the job to be performed.
7. Tools, such as hammers with metal handles, screwdrivers with metal continuing through the handle, and metallic measuring tapes, should not be used on or near energized electrical circuits or equipment.
8. Tools of such size that they can fall through grates or other openings should never be placed unsecured on elevated places or on uncovered gratings.
9. Tools should not be thrown from one worker to another but should be passed hand to hand or attached to a handline.
10. Sharp-edged tools should have edge guards in place when not in use.
11. Files or other tools with pointed tangs should not be used unless equipped with approved handles and guards.
12. Use the proper size wrench for the job. Do not improvise with extensions (cheater bars).

Power Tools

1. When portable electric hand tools are used in damp or conductive areas, a ground-fault circuit interrupter shall be used. This requirement does not apply to double-insulated tools.
2. Power tools shall be operated only by employees who have been instructed in their use.
3. Eye protection shall be worn when operating power tools.
4. The use of hoses or electric cords for hoisting or lowering tools is prohibited.
5. The non-current carrying metal parts of portable electric tools, such as drills, saws, and grinders, shall be effectively grounded when connected to a power source unless:
   - The tool is an approved double-insulated type, or,
   - The tool is connected to the power supply by means of an isolating transformer or other isolated power supply, such as a 24-V dc system.
6. Power tool guards shall not be removed or made inoperative.
7. Before making adjustments or changing pneumatic tools, unless equipped with quickchange connectors, the air shall be shut off at the air supply valve ahead of the hose. The hose shall be bled at the tool before breaking the connection.
8. Safety clips or retainers shall be securely installed and maintained on pneumatic impact (percussion) tools to ensure that air lines do not come loose from the tool.
9. Magnetic base drill presses shall be secured by safety chains or straps when used overhead.
10. Compressed air used for cleaning shall be reduced to 30 psi or less and then used only with PPE (including goggles, safety glasses with sideshields, or faceshields).
11. Compressed air shall not be used to blow dust or dirt from clothing.
12. The manufacturer's safe operating pressure for pneumatic or hydraulic hoses, pipes, valves, filters, and other fittings shall not be exceeded.
13. Approved hearing, eye, and toe protection shall be worn when operating a jackhammer or pavement breaker.
14. Electrical power tools and appliances in maintenance service shall be electrically tested annually and marked to indicate the year of test. Due to the increased wear and tear on such tools and appliances in construction service, they shall be electrically tested semiannually and marked. Use the annual color code prescribed in TVA Safety Procedure 617 Color Coding Identification - Safety Test / Inspection of Material and Equipment to identify inspected power tools and appliances.
15. Power extension cords laid in drive areas shall be protected from vehicular traffic.
16. Safe operating pressures for hydraulic and pneumatic tools, hoses, valves, pipes, filters, and fittings shall not be exceeded.
17. A hydraulic or pneumatic tool used where it may contact exposed live parts shall be designed and maintained for such use.
18. Hydraulic or pneumatic hoses shall not be kinked.
19. Employees shall not use any part of their bodies to locate or attempt to stop a hydraulic leak.
20. Electrical tools shall not be used in hazardous atmospheres (flammable vapors, gases, or dusts), unless they are rated for that environment.
21. Power tools should be examined before use to ensure serviceability and the presence of safety devices.
22. Ground-fault circuit interrupters should be protected from inclement weather.
23. Power tools should be used only within their capability and should be operated in accordance with the instructions furnished with the tool.
24. Power tools should be kept in good repair and should be disconnected from the power source while repairs are being made.

Grinding Tools

1. Die grinders shall be equipped with a "deadman" switch for power "on" and "off."
2. Persons using grinding wheels shall be familiar with the use and care of this type of machinery.
3. Grinding wheels shall not be used on non-ferrous metals, such as aluminum, copper, brass, and lead. Any metal that will clog the pores of the wheel may cause the wheel to explode.
4. Under no circumstances shall a wheel be mounted on a machine on which the RPM exceeds the maximum safe RPM specified by the wheel's manufacturer. Grinding wheels without legible speed ratings shall not be used. The ratings on pencil grinders are shown on the containers.
5. After mounting grinding wheels, the safety guards shall be properly positioned before starting the wheel.
6. All grinding wheels shall be run to operating speed with safety guards in place or in a protective enclosure before applying work, during which time no one shall stand in front of or in line with the wheel.
7. All bench or pedestal grinders shall be equipped with protective clear guards, which shall be used in addition to approved eye protection (goggles, face shields, or safety glasses with sideshields).
8. Regardless of pressure required and regardless of their weight, size, or shape, objects shall be ground only on the face, not the side of the wheel (the only exception are wheels designed for side grinding).
9. On bench or pedestal grinders, tool rests shall be properly positioned with not more than 1/8-inch clearance between the rest and the surface of wheel. The tongue guard shall be adjusted to not more than 1/4 inch from the wheel.
10. Grinding wheels shall be dressed or discarded when rounded or rutted.
11. Ring tests shall be made on stone grinding wheels used with bench and pedestal grinders before the wheel is installed (See TVA Safety Procedure 2008 for proper testing techniques).

Explosive-Actuated Tools

1. Only qualified persons shall operate line launchers.
2. Only properly instructed and certified employees shall be allowed to operate explosive-actuated tools.
3. The tool shall be tested each day before loading to verify that safety devices are in proper working condition. The method of testing shall be in accordance with the instructions furnished with the tool.
4. Any tool found not in proper working order or that develops a defect during use shall be immediately removed from service, tagged, and not used until properly repaired.
5. Tools shall be maintained in good condition and serviced only by qualified persons. The material on which these tools are used shall be examined before work is started to identify any unsafe conditions.
6. The operator shall ensure that all protective devices are in place and in working order before use.
7. Tools shall not be loaded until just before the intended firing time. Neither loaded nor empty tools shall be pointed at anyone. Hands shall be kept clear of the open barrel end.
8. These tools shall not be used in an explosive or flammable atmosphere.
9. Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tile, surface-hardened steel, glass block, live rock, glazed brick, or hollow tile.
10. Driving into materials easily penetrated shall be avoided unless such materials are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the other side.
11. Only cartridges with an explosive charge adequate for the job and for proper penetration shall be used.
12. Tools and cartridges shall never be left unattended in the work area and shall be stored in a secure room, cabinet, or box when not in use.
13. Operators of explosive actuated tools and other workers in the immediate vicinity during use shall use appropriate eye, face, and hearing protection.

Cleaning Operations

1. Cleaning is often made easier by the use of chemicals, such as caustics, acids, degreasing solvents, detergents, and patented compounds. Before using a cleaning agent with which you are unfamiliar, you should read the manufacturer's instructions carefully to determine any hazards associated with its use. Protective equipment, such as rubber gloves or face shields, should be used to avoid skin contact when some cleaning agents are used. A list of antidotes should be available, and some common antidotes should be accessible in case of accident.
2. Cleaning solvents shall be used in accordance with the restrictions contained in the applicable MSDSs. Highly volatile material such as gasoline and naphtha shall not be used for cleaning or to start fires.
3. Only approved cleaning solvents shall be used.
4. All solvents shall be kept in properly labeled containers.
5. Steam-cleaning units shall be electrically grounded and bonded to the hose nozzles.
6. Sandblast operators shall wear suitable clothing to protect all skin areas. They shall tie trouser bottoms, use gloves furnished for sandblasting, and wear hoods equipped with an outside source of fresh air in accordance with TVA Safety Procedure 301, "Breathing Air Systems".
7. Unauthorized personnel shall not be allowed in the area of sandblasting operations.
8. Sandblasting equipment shall be electrically bonded and grounded to any conductive equipment which the operator is cleaning.
9. Employees working near sandblasting operations shall wear goggles and appropriate respirators.

Painting

1. The general type of respiratory protective devices used in spray-painting operations are the supplied air respirator, the chemical cartridge respirator, and the disposable respirator, all of which must be approved for the specific hazard encountered or suspected. Respiratory protection for painting shall be used in accordance with TVA Safety Procedure 312, "Respiratory Protection".
2. Supplied air respirators may be needed when working in confined spaces.
3. Chemical cartridge respirators are used only for exposure to specific chemicals which are indicated on the cartridge and for limited periods in an atmosphere that contains sufficient oxygen. The cartridge must be replaced when the user can smell vapors in the mask, when breathing becomes difficult, or when the respirator has been used for the specified lifetime of the cartridge. Pre-filter pads should be changed when breathing becomes difficult.
4. Disposable mask respirators are available for short-term use in spray-painting operations. There are precautions, however, that must be taken; and the manufacturer's recommendations should be followed closely.
5. Painting or mixing of paint shall be performed only in accordance with the restrictions contained in the MSDSs, applicable to the paint being used.
6. Paint shall be stored away from direct sun heating. Paint shall be kept away from heat and open flames. Smoking and flame-producing devices shall be prohibited in an area where oil-based paint is being applied.
7. Spray-painting equipment shall be properly selected so that hose and gun pressure ratings correspond to air pressure used.
8. Handle a spray gun cautiously. Never point the gun at yourself or anyone else or place the tip or nozzle in direct contact with any part of the body.
9. Always tighten threaded connections carefully and securely and handle the hose with care.
10. Where drop cloths are used, ensure that floor openings are not covered, thus creating a falling or tripping hazard.
11. Do not place drop cloths over heat-generating equipment, i.e., lights or heaters that may automatically operate.
12. Aerosol containers shall not be punctured or disposed of in a fire. Aerosol containers shall be stored out of the sun.
13. Painters shall use the proper type of respirator for the job being performed and the chemicals involved.

14. Materials such as rags and drop cloths that are saturated with oil-based paint shall be stored in properly labeled, non-combustible containers out of the sun.
15. Before eating, drinking, or smoking, employees who have been painting should wash/clean their hands and face to avoid any toxic effect of paint.
16. Do not go near open flames while wearing clothing contaminated with paint or thinner.
17. Paint containers, when not in use, should be closed.
18. High-vapor and high-mist concentrations due to overspray should be reduced by decreasing air pressure in the spray gun.

Painting Tower and Substation Equipment

1. When painting at heights, employees shall use appropriate safety equipment for fall protection.
2. When painting is performed on transmission line towers or energized lines or substation structures near energized equipment, minimum clearance distances for energized work shall be maintained and proper clearance procedures shall be followed (minimum clearance distances are shown in TVA Safety Procedure 1108).
3. Care should be used when painting towers or substation structures to avoid danger of flashovers caused by drifting or dripping paint and insulator contamination.
4. When spray-painting, precautions should be taken to prevent direct spray or drift from depositing paint on bushings or other insulators.

Welding and Cutting

1. Welding equipment shall be used only by qualified persons.
2. Approved fire-extinguishing equipment shall be readily available in the work area.
3. Adequate ventilation shall exist or job-approved respirators used while welding in confined spaces or on zinc, brass, bronze, stainless steel, galvanized, or lead-coated materials.
4. Before welding or cutting a painted surface, have a test done to determine if the paint or undercoat contains lead or cadmium, if these substances are present, then the material shall not be cut or welded until precautions are taken.
5. Job-approved eye protection, gloves, and clothing shall be worn during welding or cutting operations. Other employees shall not observe welding operations unless they use approved eye protection (TVA Safety Procedure 304, “Eye and Face Protection”).
6. Proper eye protection shall be worn to guard against flying particles.
7. Open flames shall not be brought near to, nor shall welding or soldering be done on, any vessel which may have contained flammable or explosive substances until the vessel has been thoroughly purged by steam, or filled with water, or otherwise handled by special approved safety procedures.
8. Rules and instructions supplied by the manufacturer or affixed to the welding equipment shall be followed.
9. Welding or cutting shall not be done in areas containing combustible gases, vapors, or dust until precautions have been taken to safeguard the area from fire or explosions.
10. Material being welded or cut should not be placed directly on a concrete floor.
11. Hot material should be cooled or plainly marked before leaving it unguarded.
12. When welding or cutting is to be done in elevated positions, precautions should be taken to prevent hot metal from falling on people or into combustible materials. Where flammable material cannot be removed from exposure to sparks, it should be protected by a shield of noncombustible or fire-resistant material.
13. All welding equipment should be checked by the welder before being used.
14. Low-cut shoes should not be worn.
15. Clothing should be free from oil or grease, and flame-resistant clothing may be necessary in confined areas.

Electric Welding

1. The electric welding machine shall be properly grounded before use.
2. Adequate ventilation shall be used when gasoline-driven arc welders are operated in enclosed or confined spaces.
3. When electrode holders are to be left unattended, the electrodes shall be placed or protected so that electrical contact cannot be made with employees or conducting objects.
4. When the welder must leave his work or stop work for any appreciable length of time or when the welding machine is to be moved, the power supply switch to the equipment shall be opened.
5. The welding machine, cables, holders, and ground clamp shall be inspected before use and kept in safe working condition.
6. Cables should be positioned to avoid creating hazardous obstructions.
7. Welding screens should be used, if feasible, whenever other persons could be exposed to the arc of the welding operation. Welders should not strike an arc with an electrode without first alerting persons nearby to the possible danger.

Gas Welding / Cutting

1. No attempt to repair or alter cylinder valves shall be made. Pressure gauges and regulators provided for use with a particular welding gas shall not be substituted on cylinders containing a different gas.
2. Grease or oil shall not be used on or around oxygen couplings.
3. Leaking or defective welding equipment shall not be used.
4. Special precautions related to the handling and storage of compressed gases shall be strictly observed as specified in TVA Safety Procedure 706, “Compressed Gas Cylinders”.
5. When welding equipment is not in use, the cylinder valves shall be closed. Pressure shall not be left on gas regulators or hose when not in use.
6. Flashback arresters shall be used on all gas welding torches.
7. Do not store torches connected to cylinders in enclosed tool boxes even if pressure is turned off.
8. Only properly marked and identified hose specially made for oxyacetylene service shall be used for gas welding and cutting. (Red is for acetylene and green is for oxygen.)
9. Acetylene cylinders shall be properly secured and always be used, transported, or stored in a vertical position.
10. Valve protection caps shall always be in place, hand tight, except when cylinders are in use or connected for use.
11. Cylinder valves shall be operated only with handwheels or tools specifically dedicated for that purpose and left in place while cylinders are in use. When welding is to be stopped for a few minutes, it is permissible to close the torch valves only; otherwise, the cylinder valves shall be closed. Valves of empty cylinders shall be closed and capped.

Ladders (General)

1. All ladders shall meet TVA minimum specifications applicable to ladder types and construction.
2. Boxes, chairs, etc., shall not be used as ladders.
3. While climbing or descending a ladder, face the ladder and use both hands.

Portable Ladders

1. Ladders shall not be painted; only a clear, nonconductive finish shall be used.
2. Portable ladders shall not be used as platforms, stages, or scaffolds unless specifically designed and tested for such service.
3. Stepladder legs shall be fully spread when the ladder is in use.
4. Ladders shall not be spliced together to form a longer ladder.

5. Ladders must be inspected immediately after purchase to ensure that a label identifying the manufacturer, ANSI standard, and the type IA designation is attached, and that the ladders were not damaged in shipping. In addition, portable ladders shall be inspected frequently by the user and after the ladder has been dropped or otherwise abused. Ladders with weakened, broken or missing steps, broken side rails, or other defects shall be tagged and removed from service, repaired, or discarded.
6. To prevent collapse of extension ladders, the minimum overlap of sections shall be:
   - 3 feet on ladders up to 36 feet (11m).
   - 4 feet on ladders 37-48 feet (11.2-14.6m).
   - 5 feet on ladders above 48 feet (14.6m).
7. Where there is a hazard of slipping or tipping, the ladder shall be securely held in place by an employee at the foot of the ladder or by tying the ladder.
8. The distance from the foot of the ladder to the support it rests against during use shall be equal to 1/4 the length of the ladder.
9. If ladders must be placed near doors or in passageways, they shall be protected against anything or anyone striking them.
10. When dismounting from a ladder at an elevated position (such as a roof), the employee shall ensure that the ladder side rails extend at least three (3) feet (0.9m) above the dismount position or that grab bars are present.
11. All portable ladders should be equipped with suitable safety "feet."
12. Ladders should be stored on brackets and in a sheltered location.
13. Portable conductive, i.e., metal ladders, shall not be used near exposed energized lines or equipment except as approved by the supervisor in specialized high-voltage work, i.e., in 500-kV switchyards.
14. Employees should not stand above the third step from the top of a straight ladder.
15. If practical, employees should belt off to a ladder or other secure point whenever both hands must be used for the job or there exists a possibility of the employee falling from an elevated position.
16. A ladder should not be placed against an unsafe support.
17. Employees should not stand on or above the first step from the top of a stepladder.
18. When an employee is working on a stepladder over 10 feet high (3m), the ladder should be properly secured.
19. Portable ladders should be used by only one person at a time.

Fixed Ladders

1. Where fall protection devices are installed on fixed ladders, no one shall ascend or descend the ladders without properly using the device. A body belt or harness shall be used with the fall protection device.
2. Before climbing a fixed ladder, the employee should inspect it for defects and determine that the ladder is safe to climb.

Live-Line Ladders

1. Only ladders approved for live-line work shall be used for that purpose.
2. Live-line ladders shall not be used at voltages above which they are approved.
3. Insulated ladders that have been used for de-energized maintenance shall be tested before being used as an insulated platform for live-line maintenance (use the hotstick tester on the side rails between the rungs.)
4. Special precautions should be taken to protect live-line ladders from weather or contaminants.

Hook Ladders

1. Hook ladders shall have safety chains installed on the hooks, and the chains shall be used when the ladder is hooked for use.
2. Split bolts shall be installed at the ends of wooden hook ladder side rails.
3. Hook ladders shall be inspected prior to each use and annually refurbished, if necessary.
4. Fall protection shall be used when employees are working or climbing on a hook ladder. They shall wear a body harness and decelerating safety lanyard attached by a rope grab device to a 5/8-inch safety rope on the hook ladder or a body harness and retractable lifeline attached to the structure.
5. Ladders shall only be used in applications for which they were designed and shall not be loaded in excess of their designed working loads.

Portable and Vehicle Mounted Generators

1. Portable and vehicle-mounted generators, used to supply power to cord and plug-connected equipment, shall meet the following requirements.
2. The generator shall only supply equipment located on the generator or the vehicle and cord-and plug-connected equipment through receptacles mounted on the generator or the vehicle.
3. The non-current carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles shall be bonded to the generator frame.
4. In the case of vehicle-mounted generators, the frame of the generator shall be bonded to the vehicle frame.
5. Any neutral conductor shall be bonded to the generator frame.

Portable Heating Equipment

1. Oil-fired or kerosene-fired space heaters are sometimes used. The following Rules and Practices shall be followed to eliminate the hazards of explosion, fire, or suffocation.
2. Oil-fired or kerosene-fired space heaters shall not be transported, refueled, or lighted while hot.
3. Safety stands shall be used with oil-fired or kerosene-fired space heaters designed for safety stand use.
4. Oil-fired or kerosene-fired space heaters shall be used only in properly ventilated areas.
5. Oil-fired or kerosene-fired space heaters shall not be operated where flammable vapors or dust present an explosion hazard.
6. Fuel shall be stored in an approved, properly labeled, container.
7. Oil-fired or kerosene-fired space heaters should be properly maintained and inspected before use.
8. Oil-fired or kerosene-fired space heaters should not be operated close enough to combustible material or clothing to create a fire hazard.
9. Oil-fired or kerosene-fired space heaters should not be placed in high-traffic areas or where there is danger of tipping or upsetting during operation.
10. Oil-fired or kerosene-fired space heaters should not be left unattended while in operation.
11. Oil-fired or kerosene-fired space heaters should be refueled outdoors.

Fuels Handling and Storage

1. Gasoline or other fuels shall not be handled, stored in, or dispensed into any portable container except properly labeled safety cans designed and approved for that purpose.
2. Fuel shall not be siphoned by mouth.
3. Smoking, welding, open flames, or other sources of ignition shall not be permitted within 50 feet (15.2m) of any motor-fueling operation.
4. Internal combustion engines, cellular phones, and radio transmitters shall be turned off during vehicular refueling operations.
5. Before motor fuel is transferred to or from a tanker to a storage tank, both shall be grounded to a common ground.
6. Gasoline shall not be used as a parts-cleaning solvent, degreaser, or to clean the skin.
7. Containers with fuel should not be transported or stored in the passenger compartment of vehicles.
8. The refueling of gasoline-operated equipment should be accomplished outdoors.
9. Gasoline or other fuel stored indoors should be in properly labeled containers approved for that purpose and in a quantity not to exceed one day's supply for the intended use.

Survey Work

1. Only nonconductive measuring tapes or measuring rods shall be used inside energized substations.
2. Only approved, tested, and color coded fiberglass-level rods shall be used inside energized substations.
3. All electrical circuits and equipment shall be treated as energized unless properly grounded.
4. Open-wire telephone lines and insulated ground wires shall be treated and worked as energized 13-kV lines unless they are properly grounded.
5. Surveying instruments, rods, axes, or any other equipment shall not be carried above the shoulders when working inside energized substations.
6. Kaiser blades, brush hooks, axes, and other sharp tools shall be transported and stored in designated places.
7. "Cut" resistant gloves shall be used when sharpening or repairing bladed tools.
8. File guards shall be used when sharpening tools.
9. Axes and brush hooks shall be secured while being sharpened.

Boating

1. The vehicle trailer hitch, boat trailer, and boat shall be visually inspected for damage before each use. Damaged equipment shall be removed from service.
2. The required number of Coast Guard approved fire extinguishers shall be on board.
3. All drain plugs shall be visually inspected for proper installation before launching the boat.
4. Battery terminals shall be covered to prevent contact with tools and gas cans.
5. Gasoline vapors will accumulate at the bottom or bilge of the boat, therefore, matches or other open flames shall not be used until gasoline vapors have been removed either by natural or forced ventilation.
6. Only persons authorized by the supervisor in charge shall operate a boat. The person piloting the boat shall be qualified to safely operate the craft and to cope with conditions of the particular body of water on which the boat will be operated. The authorized person shall know the water safety rules, the meanings of buoys, and the various distress signals.
7. Boats shall be operated in accordance with water safety rules.
8. Coast Guard approved Personal Floatation Device(s) (PFD) shall be worn by each person in the boat at all times. PFDs shall be inspected annually by February 1 and before each use and if defective removed from service.
9. Employees shall not stand up while starting the boat's motor.

10. When loading a boat, the load should be distributed evenly, kept as low as possible, and secured as necessary. The manufacturer's recommended capacity for the combination of material and personnel should not be exceeded.
11. A boat should not be operated alone without approval of the operator's supervisor or responsible manager.
12. The weather forecast should be checked before getting the boat under way. Weather conditions hazardous to boat operations should be avoided.
13. The boat's speed should be reduced when operating in unfamiliar waters due to possible hazardous conditions, i.e., shallow spots, rocks, and strong current.
14. An outboard motor boat or an inboard motor boat without a cabin should not be operated unless the boat is equipped with an engine kill switch. The kill switch cord should be attached to the operator when operating the motor.
15. In boats 16 feet or less, occupants should not stand up or move about when the boat is under way.
16. A secondary means of propulsion, e.g., either a small engine, oars, or paddles, should be carried in the boat.

Procedure 1106 Hazardous Material Handling for Transmission Workers

TVA Safety Manual

1106 Hazardous Material Handling for Transmission Workers

Procedure Number 1106

TVA Safety Procedure

Hazardous Material Handling for Transmission Workers

Revision 1

November 01, 2005

Purpose

1. The purpose of this procedure is to establish requirements for the handling and safe use of various hazardous materials by transmission system employees.
2. Subjects covered include the following:
   - Hazardous Materials
   - Material Safety Data Sheets (MSDS)
   - Solvents
   - Paint
   - Polychlorinated Biphenyl (PCB)
   - Battery Electrolyte
   - Aerosol Spray Cans
   - Asbestos
   - Explosives

Hazardous Materials

1. The material or classes of material listed in this procedure are considered hazardous to life or equipment unless special precautions are observed. Some materials, such as petroleum-based cleaning solvents or paint thinners, are dangerous because their vapors form an explosive mixture with air. Other materials are included because their misuse can produce varying toxic or physiological effects to the body. Sufficiently high concentration of some gases or vapors can cause death.
2. This procedure lists only a few of the more prominent materials. They are listed because of their wide use or special precautions or hazards involved. This procedure does not include all potentially hazardous materials. Each employee using hazardous material should understand the hazards involved with its use by reading the Material Safety Data Sheet (MSDS) for the particular material being used.
3. Special precautions must be considered when using any form of chemical or chemical compound inside a nuclear plant operations area. Before any chemical or chemical compound is brought onsite, it must be approved for use by the applicable plant procedure/guidelines. Those chemicals or chemical compounds approved for use will be included on an Approved Chemical List (ACL). The ACL is limited to those chemicals that are safe for employee use and are necessary for plant operations and maintenance.
4. If you do not know what it is, do not use it. All materials shall be labeled for identification.

5. Hazardous materials shall be kept in approved containers. They shall be separated from other containers and clearly labeled so they will not be mistaken for other materials.
6. Appropriate personal protective equipment shall be worn as required.
7. Disposal of hazardous materials or hazardous waste shall be in accordance with applicable regulations.

Material Safety Data Sheets (MSDS)

1. MSDSs shall be obtained on all materials used. They shall be readily available to all employees.
2. Hazardous material spills shall be handled in accordance with the MSDS and appropriate regulations.

Solvents

1. Flammable or combustible solvents shall not be used in confined spaces or poorly ventilated areas because of the hazards of oxygen deficiency, toxicity, or fires.
2. Flammable or combustible solvents shall be stored and transported in approved, properly labeled containers.
3. No smoking or open flames shall be allowed where flammable solvents are being used.

Paints

1. The maximum quantity of tower or substation paint that may be stored inside a building shall be 125 gallons in metal containers or 660 gallons in a portable tank. Any quantity can be stored in a building used solely for this purpose. Storage of epoxy, resin, or other type paints shall be in accordance with specifications on a MSDS for the specific paint or with standard 29 CFR 1910.106.
2. Aerosol spray paint cans shall not be punctured or disposed of in a fire.

Polychlorinated Biphenyls (PCBs)

1. PCBs are used in capacitors, transformers, reactors, and other electrical equipment. Every effort must be made to prevent PCB release or spills into the environment.
2. Exposure to PCBs should be minimized. If skin should come into contact with PCBs, it should be cleaned with waterless hand cleaner or mild soap and water before eating, drinking, smoking, or using the restroom.
3. If contact with PCBs is required, suitable protective clothing, including aprons and neoprene gloves, shall be used.
4. Any PCB and PCB-contaminated materials shall be disposed of in accordance with established procedures.
5. Employees should avoid breathing vapor from heated PCBs.

Battery Electrolyte

See TVA Safety Procedure 1201, “Electrical Storage Batteries”.

Nickel Cadmium Batteries

The solution of electrolyte in these substation control batteries is a mixture of highly corrosive potassium hydroxide and water. These batteries, when being charged, give off a highly explosive mixture of hydrogen and oxygen. Used nickel cadmium batteries should be disposed of as hazardous waste.

Lead Acid Batteries

The solution of electrolyte in substation control and communication equipment batteries is a highly corrosive mixture of water and sulfuric acid. These batteries, when being charged, give off a highly explosive hydrogen gas. HYDROGEN IS COLORLESS, ODORLESS, AND TASTELESS.

Aerosol Spray Cans

1. Aerosol spray cans are pressure containers. Each can is partially filled with material and then closed and pressurized. Often, after most of the material has been dispersed, the can is discarded while still under pressure. If the can is heated, the gas expands and the increased pressure may rupture the can with explosive force. To eliminate this hazard, reduce the pressure in the can as much as possible by discharging it through the spray nozzle before discarding the can. Do not assume that all the pressure has been released.
2. Aerosol spray cans shall not be punctured or disposed of in a fire.

Asbestos

1. All materials known to contain asbestos shall be labeled.
2. Prior to performing work on material that may contain asbestos, a sample shall be obtained and analyzed for asbestos content.
3. All work on material containing asbestos shall be directed by an employee certified in the proper procedures to be used.
4. A regulated area shall be established when working on asbestos containing material (ACM).
5. The minimum respiratory protection used when working with ACM shall be a dual cartridge, half-mask type.
6. A High Efficiency Particulate Air (HEPA) filter vacuum shall be used when performing work on ACM, i.e., removing or installing equipment, cutting, drilling, or the removal of bolts from an ebony asbestos panel.

Explosives

1. Explosives shall be stored and transported as prescribed by federal, state, and local regulations and TVA policies.
2. Only certified employees shall handle and use explosives.
3. Adequate precautions shall be taken to prevent blast damage from shock or debris. When blasting within 500 feet (152.4m) of a dwelling, structure, or road, a minimum of two serviceable blasting mats will be used to cover each indivi dual blast area.
4. When blasting near energized lines, a caution order shall be obtained.
5. Flagmen shall warn motorists and others during blasting operations.
6. Handling of explosives shall be in keeping with TVA safety directives. An accurate detailed inventory shall be maintained at all explosive storage facilities, and periodic audits shall be performed.
7. Accepted audible alarms shall be given before and after each blast.
8. Only qualified employees may store, handle, or use implosive type conductor splices.

Procedure 1107 Identifying Energized Electrical Hazards

TVA Safety Manual

1107 Identifying Energized Electrical Hazards

Procedure Number 1107

TVA Safety Procedure

Identifying Energized Electrical Hazards

Revision 1

November 01, 2005

Purpose

The purpose of this procedure is to establish requirements for identifying energized electrical hazards.

Requirements

1. Orange tape with the legend "DANGER: ELECTRICAL HAZARD-AUTHORIZED PERSONNEL ONLY" is used to designate an area where an electrical hazard may be present. It means "DO NOT CROSS" for all persons except those designated to work in the area enclosed by the tape.
2. Orange tape shall be used to designate energized electrical equipment or areas containing such equipment which pose an electrical hazard. The tape shall be installed, preferably at a height of four (4) feet (1.2m) above ground level and at other locations both vertically and horizontally where necessary to fully identify the hazard.
3. Orange tape shall be installed surrounding the test set and equipment under test when a high potential is being used to test equipment. This would include high-potential testing of generators, synchronous condensers, and cables; insulation dielectric tests; and other similar types of work.
4. When substation equipment such as circuit breakers and transformers are removed from service for maintenance and/or tests, orange tape shall be installed approximately four (4) feet (1.2m) from the ground outlining the adjacent items of energized equipment.
5. In high-potential testing, the engineering unit employee in charge of the tests shall agree with maintenance employees involved about who will enter the area enclosed by the orange tape. The employee in charge shall be sure that all persons who enter the area are acquainted with the test procedures and safety precautions.
6. The orange tape should be properly maintained and removed immediately following the completion of the work for which it was installed.
7. Orange tape should not be used for any purpose other than designating areas of danger from electrical hazards.

Procedure 1108 Manual Material Handling for Transmission Workers

TVA Safety Manual

1108 Manual Material Handling for Transmission Workers

Procedure Number 1108

TVA Safety Procedure

Manual Material Handling for Transmission Workers

Revision 2

April 18, 2008

Purpose

1. The purpose of this procedure is to establish requirements for material handling for transmission workers.
2. Topics include:
   - Manual Material Handling
   - Material Handling Equipment
   - Hand Trucks
   - Forklift Trucks
   - Work Platforms on Forklift Trucks
   - Hoists
   - Compressed-Gas Cylinders

Manual Material Handling

1. Injuries from manual material handling usually result from unsafe working habits, such as improperly lifting, carrying a load that is too heavy, gripping the load in an unsafe manner, and failing to use protective equipment. Setting an object down is essentially the reverse of lifting. See TVA Safety 609, “Lifting / Handling Material”.
2. If employees are unable to see over or around the load they are handling, an observer shall be used to give directions.
3. Nails or staples shall be removed from boxes, kegs, or crates before removal of material. When pulling is not practical, nails or staples shall be completely bent down.
4. Material shall be properly stacked or secured to ensure stability.
5. When two or more employees are lifting material, one person shall be designated to direct and coordinate the lift.
6. Approved PPE shall be used when handling hazardous materials.
7. Gloves or other hand protection shall be worn when gripping loads with sharp edges or corners.
8. Before gripping an object to make a lift, first consider the probable weight and dimensions involved.
9. Inspect material for slivers, jagged edges, burrs, and rough or slippery surfaces.
10. Get a firm grip on the object.
11. Keep fingers away from pinch points, especially when setting material down.
12. Keep hands free of oil and grease.
13. Wipe off greasy, wet, slippery, or dirty objects before you handle them.
14. When handling lumber, pipe or other long objects, keep the hands away from the ends of the object to prevent them from being pinched.

15. A wide range of hand or hand-operated tools, kits, and other devices can be used to handle materials. Each tool, jig or other device should be kept in good repair and should be used only for the job for which it was designed.
16. Do not lift more than you can handle comfortably. If necessary, request help.
17. Safe lifting techniques should be used for manual material handling. The following should be considered prior to lifting any load manually: size, weight, shape of load, feet, and body position. Lift with your legs, keep your back straight, ensure firm grip and footing, and maintain adequate control over and around load. Exertion should be performed while exhaling.
18. Avoid twisting the body when handling material.
19. Straighten your legs to lift the object and, at the same time, swing your back into a vertical position.

Material Handling Equipment

1. Rigging used in mechanical lifting shall be of adequate capacity and support for the intended load. Rigging equipment shall be inspected before each use, and any found defective shall be tagged defective and not used until repaired, or it shall be discarded.
2. Half inch or larger hand line shall be used as a load line when raising or lowering equipment or materials to or from an elevation.
3. Tag lines shall be used to control loads being handled by hoisting equipment in areas where other workers are present.
4. Mechanical equipment, when not in use or left unattended, shall have blades and/or buckets on the ground, booms racked or on the ground, and ignition switches locked or the equipment reasonably disabled to prevent starting by unauthorized personnel.
5. Seat belts shall be installed, maintained, and worn on equipment with rollover protection.
6. Load-hook latches should be used and maintained in an operable condition.

Hand Trucks

1. Keep the center of gravity of the load as low as possible.
2. Place the load well forward so that the weight will be carried by the axle and not by the handles of the truck.
3. Place the load so that it will not slip, shift, or fall off. Load only to a height which will allow a clear view ahead.
4. Let the truck carry the load. The operator should only maintain its balance and provide the motive power.
5. When going up or down an incline, keep the truck below you.
6. Move the truck at a safe speed. Do not run. Keep the truck constantly under control. The operator should have an unobstructed view.
7. A four wheel truck should be loaded evenly to prevent tipping.

Forklift Trucks

1. Only certified operators shall operate forklifts.
2. Internal combustion engines shall be turned off while refueling and shall be refueled only in open or well-ventilated areas.
3. Overhead clearances shall always be observed.
4. Forklifts shall not be left unattended unless the forks are on the floor or ground.
5. Only the driver shall be allowed to ride a forklift during transit.
6. If you must leave the equipment unattended, shut off the power, neutralize the controls, and set the brakes. Unattended is when the operator is 25 feet (7.6m) or more away from the lift which remains in his view; or whenever the operator leaves the lift and it is not in his view, wheels shall be blocked if the lift is on an incline.
7. Keep your legs and feet inside the guard or operating station of the forklift.

8. Observe traffic rules: Operate at a safe speed, keep to the right whenever possible, slow down or stop at intersections, and use the horn at blind corners.
9. Travel a forklift with the forks or the pallet about four inches off the floor. On a downgrade, the loaded forklift should go down with the load last; on an upgrade, with the load first.
10. Keep the forklift under control so that an emergency stop can be made in the clear distance ahead.
11. Do not use the reverse control on electric forklifts for braking.
12. Travel slowly when crossing a bridge plate.
13. Cross railroad tracks diagonally whenever possible.
14. When operating in close quarters, keep your hands where they cannot be pinched between the steering control and projecting stationary objects.

Work Platforms on Forklift Trucks

1. Forklifts shall be operated only by certified persons.
2. Before work is begun aloft near energized equipment, the forklift shall be properly grounded.
3. Operators and employees working aloft near energized equipment shall know minimum clearance distances and the location of energized equipment before starting work.
4. The work platform shall be firmly secured to the forks.
5. The platform shall have guardrails and toe-boards to prevent falls, and a floor of nonskid material.
6. The forklift shall not be moved with employees on the platform.
7. Because the weight of the forklift is such that miring is a problem, the path to be taken should be carefully chosen to avoid soft ground. A heavy plywood sheet or board may be placed under the wheels to distribute the load over a greater area.

Hoists

1. A hoist shall never be loaded beyond its rated capacity.
2. Do not use a known defective hoist.
3. Never wrap the hoist, load chain, or cable around the load.
4. Seat the load securely in the hook throat.
5. Do not operate with a twisted, kinked, or damaged chain.
6. A sleeve or "cheater" shall not be used on the handle of hand-operated hoists.
7. The chain should be kept clean, lubricated, and free of rust.
8. Stand clear of all loads being lifted.

Compressed Gas Cylinders

1. Compressed gases are received from vendors in metal cylinders at very high pressure. If a cylinder ruptures or a cylinder valve assembly is broken off, the sudden release of this pressure would produce a rocket effect and propel the cylinder with enormous force. This rocket effect has been known to knock down walls, wreck buildings, and more tragically, maim or kill people.
2. Do not repair, alter, abandon, or destroy compressed-gas cylinders. Defective cylinders shall be tagged and returned to the vendor.
3. Valve protection caps shall always be in place, hand tight, except when cylinders are connected for use.
4. Do not force connections or tamper with the safety relief devices or valves on compressed-gas cylinders.
5. Compressed-gas cylinders, whether full or empty, shall be stored in an upright position and properly secured. This does not apply to SF6 gas cylinders.
6. Compressed-gas cylinders shall be stored in a well-ventilated area.

7. Compressed-gas cylinders shall not be rolled, lifted by the valve cap or valve, dropped, jarred, or exposed to extreme temperatures.
8. Compressed-gas cylinders shall not be placed where they might accidentally become part of an electrical circuit.
9. Oxygen cylinders in storage shall be separated from fuel gas cylinders or highly combustible materials (such as oil or grease) by a distance of 20 feet (6.1m) or a fireretardant wall.
10. Oil, grease, or similar materials shall not be allowed to come into contact with any valve, fitting, regulator, or gauge of oxygen cylinders.
11. Acetylene cylinders shall be used, transported, or stored in a vertical position.
12. Compressed gas cylinders transported by crane, hoist, or derrick shall be handled in suitable cradles, nets, or boxes and shall not be lifted by magnet or slings, unless the slings are designed and constructed to prevent accidental release of the cylinder.
13. Compressed gas cylinders in portable service should be conveyed by suitable trucks (hand) or temporarily attached lifting handles (commercially manufactured).

Procedure 1109 Protective Grounding

TVA Safety Manual

1109 Protective Grounding

Procedure Number 1109

TVA Safety Procedure

Protective Grounding

Revision 5

November 01, 2005

Purpose

The purpose of this procedure is to establish requirements for the installation and maintenance of electrical safety grounds.

Installation and Maintenance of Safety Grounds - General

1. Safety grounds are used for the protection of employees working on equipment. Safety grounds limit voltages between points at the work site and shunt currents around the employees. These voltages and currents arise from several sources such as:
   - ground rise potentials from grounds remote to the work site,
   - electro-magnetically induced energy,
   - electro-statically induced energy,
   - inadvertent contact with other energized circuits,
   - station service back-feeds,
   - instrument transformer back-feeds,
   - test equipment back-feeds, or
   - inadvertent energization of the normal power circuit.

   Good grounding procedures which control induced voltage are increasingly important as lines are constructed closer together. The following grounding requirements do not cover every grounding application; but if the principles given are applied with discretion and judgment, safe working conditions will result.
2. Safety grounds do not protect employees from lightning strikes near the work location. When lightning is a threat, work must be suspended.
3. ALL ELECTRICAL CIRCUITS AND EQUIPMENT SHALL BE TREATED AS ENERGIZED UNLESS PROPERLY GROUNDED. THIS INCLUDES OVERHEAD GROUND WIRES.
4. Temporary safety grounds shall be placed at such locations and arranged in such a manner as to prevent each employee from being exposed to hazardous differences in electrical potential, i.e., worksite grounding. This means that an equipotential work zone for the exposed employees shall be established unless alternate grounding methods are approved by management with appropriate consultation with safety, technical, or appropriate engineering and design staff. Employees are not considered "exposed to hazardous difference in electrical potential" when working on lines or equipment that can NOT be energized from ANY source and is adequately grounded to remove any induced voltage.
   NOTE: Prior to installing temporary protective grounds at Fossil Power Group (FPG) plants, a written plan detailing where the temporary protective grounds will be placed must be submitted and approved by

the manager responsible for performing the work and the manager at the plant responsible for the grounding. This plan must include a Job Safety Analysis (JSA) prepared in accordance with TVA Safety Procedure 6, "Plan Jobs Safely," a generation sensitive activity sheet (if applicable), electrical diagrams, and a description of the work to be accomplished. A pre-job safety briefing (Safety Procedure 6) on the installation of the temporary protective grounds must be conducted with all involved personnel.

5. Grounding of only one phase for establishing an equipotential work zone is allowable only if 3-phase grounds are also in place and safe work clearance to adjacent phases are maintained.
6. Only approved grounding devices shall be used. Safety grounds shall be tested annually (by February 1) and marked to indicate the year tested as outlined in TVA Safety Procedure 1504, Safety Grounds and Field Test Procedures for Safety Grounds, and TVA Safety Procedure 617 Color Coding Identification - Safety Test / Inspection of Material and Equipment.
7. In all cases, the person holding the clearance shall be responsible for placing and removing the safety grounds and informing everyone involved of the limits of the clearance.
8. A voltage detection device shall be used prior to placing of safety grounds to detect nominal potentials. Buzzing with a hotstick is acceptable only if the voltage detection device is inoperable or in emergency situations. This requirement does not apply to gas-insulated switchgear (see paragraph 5 of this procedure, Gas-Insulated Switchgear Grounding).
9. When attaching grounds, fasten the ground end first. Use an approved insulated tool to attach the other end.
10. When attaching grounds to flat surfaces, the set screw shall be tightened.
11. When removing grounds, remove the line or equipment connection first with an approved insulated tool (never use hands) and then break the ground connection.
12. Two or more grounds shall not be connected in series to make a longer safety ground.
13. In no case shall a power circuit breaker be used for extending a grounding circuit.
14. All safety grounds and ground sticks shall be visually inspected before each use.
15. Protective grounding equipment shall be capable of conducting the maximum fault current that could flow at the point of grounding for the time necessary to clear the fault (See TVA Safety Procedures 1503, 1504, 1505, 1506.
16. Any safety ground known to have experienced fault currents from nominally energized equipment or lightning stroke current shall be removed from service and discarded.
17. The appropriate clamp shall be used when connecting to bus, conductor, structures, etc., and shall be sized to meet or exceed the current carrying capability of the safety ground conductor.
18. TVA employees working on non-TVA equipment, facilities, or systems SHALL adhere to the TVA safety grounding requirements.
19. The standard ground conductors for transmission line and substation grounding shall be 1/0, 2/0, or 4/0 or 250 MCM extra flexible copper conductor with yellow thermoplastic elastomer (TPE). The purpose of the yellow thermoplastic elastomer (TPE) is to protect the strands of the ground cable from abrasion and mechanical damage and is not considered as insulation for the purpose of personnel protection.
20. After repair or replacement of conductor or clamps, each safety ground shall be tested and marked with color tape as designated in TVA Safety Procedures 1504 and 617 Color Coding Identification - Safety Test / Inspection of Material and Equipment.
21. The grounding surface shall be clean and free of rust, corrosion, paint, or other insulating coatings.
22. Employees on the ground should avoid unnecessary contact or work within 10 feet (3m) of any structure, temporary ground rod, or equipment connected to the worksite safety grounding system, since a rise in potential above the surrounding terrain may occur. If employees must perform work within this 10-foot zone, they should not stay any longer than is required to perform their work.
23. All ground sticks should be tested at regular intervals (see test criteria in TVA Safety Procedure 1102, "Electrical Safety - General", requirements from Section Grounding of Overhead Ground Wires, items 1 and 8).

24. Safety grounds should be kept as short as reasonably possible and installed so as to hang as straight as possible with no folds or sharp bends. Folds or bends increase the mechanical hazard and impedance should fault current result from unintended energization.
25. Only one subconductor in a bundled phase conductor needs to be grounded.
26. When working on de-energized circuits, all phases of lines or apparatus should be grounded.
27. When applying grounds, always ground the nearest conductor, bus, or apparatus first then proceed outward and upward. Reverse this procedure when removing grounds. Remove the farthest safety ground first.
28. Workers should stand well below and not directly under the parts to be grounded in order to keep their bodies away from any arc that may occur when the ground device is applied. The employee shall not hold the ground conductor in his hand or next to his body while installing.
29. Be aware of capacitive discharge from apparatus when grounding.
30. An air break switch can be used to extend a ground circuit but only if it has been closed, tagged, and locked. When an air break switch is being worked on, both sides of the switch should be grounded.
31. If it becomes necessary to relocate a ground during the work procedure, it should not be removed until an additional ground is installed at the point of relocation.
32. Safety grounds should not be dropped from structures. They should be stored in such a manner as to keep wear and tear to a minimum.
33. A systematic installation and removal procedure should be utilized using uniquely numbered ground disks and record-keeping to reduce the risk of leaving safety grounds in place when they should have been removed.
34. Where multiple grounds are required for transmission line and substation equipment grounding due to increased fault current, only one ground rod shall be used for each ground cable. All ground rods shall be electrically connected (bonded).
35. Multiple vehicle units (trucks, heavy equipment, etc.) may be connected to a single driven ground rod.

Equipment Safety Grounds

1. All equipment safety grounds shall be green jacketed or marked with a 3-foot-green heat-shrink on the ground end.
2. The attachment point (temporary or permanent) for equipment safety grounds must be capable of conducting the fault current for the time necessary to clear the fault. Equipment safety grounds shall be attached to equipment frames, bumpers, or heavy metal beds. Equipment safety grounds shall not be attached to sheet metal items, i.e., bins, tool boxes, or fenders.
3. Equipment operators/drivers are responsible for ensuring that equipment safety grounds are installed and removed in accordance with these procedures.
4. The person removing the equipment safety ground shall physically trace the ground from the equipment to the ground end before removing it.
5. Equipment safety grounds shall be completely uncoiled while in use.

Substation Grounding

1. In addition to the following requirements, the requirements in paragraph Installation and Maintenance of Safety Grounds – General apply.
2. The station ground mats in substation and switchyards that conform to the requirements of "IEEE Guide for Safety in AC Substation Grounding (ANSI/IEEE STD. 80-1986) are considered an equipotential zone. All TVA substations and switchyards are designed to conform to ANSI/IEEE STD. 80-1986.
3. Safety grounds in substations and switchyards shall be located as close as practical to the work area.
4. When work is being performed on equipment such as transformers, regulators, or circuit breakers, a ground shall be placed on each bushing lead not visibly grounded. When it is necessary to test, grounds may be removed for the duration of the test and then replaced. The person holding the clearance or subclearance shall approve the

removal and replacing of grounds. When the only work to be done is of a type that cannot be done with grounds in place, bringing a single ground into momentary contact with each bushing connection immediately before starting the work fulfills the intent of this requirement. If further work is to be done after tests are complete, the equipment shall be properly grounded.

5. Neutral reactors shall not be worked on unless de-energized or bypassed with grounds.
6. After de-energizing capacitor banks, wait five (5) minutes before grounding them.
7. Wye-connected capacitor banks may not have an installed ground on the wye-connection. If no installed ground is present, the wye shall be grounded before working on the bank.
8. Ground switches shall not be used for safety grounding on primary circuits except as provided on gas-insulated switchgear and 3-phase ground switches in Kirk Key Systems for capacitor banks.
9. Noncurrent-carrying metal parts of equipment or devices, such as transformer cases and circuit breaker housings, shall be treated as energized at the highest voltage to which they are exposed, unless an inspection of the ground strap prior to work being performed determines that these parts are grounded.
10. Safety grounds shall be installed on newly constructed switchgear and/or buswork as soon as it is possible to energize it by any source (including induced voltages).
11. Ground mat additions or separations shall be shunted to the existing mat with a safety ground prior to connection or disconnection.
12. When applying safety grounds to transformers and other apparatus, be alert to possible capacity discharge. On rotating equipment, windings should be grounded long enough to drain off all charge before touching or attaching leads.
13. On power circuit breakers with internal capacitors, safety grounds should be applied and the breaker closed to discharge the capacitors before work is performed.
14. When work is being done on de-energized equipment on both sides of an air break switch, safety grounds should be installed on both sides of the switch or the switch should be closed, locked, and tagged to extend the ground circuit. In no case should a circuit breaker be used for this purpose.
15. Mobile equipment should be grounded when used in a substation. Where the fence ground and the station ground are separated, this equipment should not be set up within seven feet (2.1m) of the fence. If this is not possible, the fence ground and the station ground should be tied together for the duration of the setup.
16. Only one safety ground shall be attached to each stirrup in locations where multiple grounds are required due to increased fault current.

Gas-Insulated Switchgear Grounding

1. In addition to the following requirements, the requirements in paragraph Installation and Maintenance of Safety Grounds – General apply.
2. Because of the construction of gas-insulated switchgear, the only access to the conductor is by means of a ground switch/test probe built into the grounded enclosure. Therefore, the ground switch must be used as a safety ground, but only if it meets the following criteria:
   - It must be able to carry the available system short-circuit current.
   - It must be able to be disconnected from the motor operator.
   - It must be lockable in the closed position.
3. Before closing the ground switches, the person doing the switching shall determine that the disconnect switches are fully open. There is no provision for "buzzing" the conductor.
4. The person holding clearance is responsible for verifying that the disconnect switch is fully open and that the ground probes are fully inserted into each phase bus.
5. Employees shall not look in gas-insulated switchgear portholes during switching operations.

Transmission Line Grounding

1. In addition to the following requirements, the requirements in paragraph Installation and Maintenance of Safety Grounds – General apply.
2. Where an equipotential worksite safety grounding system is established, employees on the ground shall be protected from hazardous step and touch potentials by grounding mats, insulating platforms, or markers.
3. Markers shall be installed to provide a 10-foot buffer zone around temporary safety ground rods used in the worksite safety grounding system.
4. Equipment electrically bonded to the worksite safety grounding system shall be operated from insulated platforms or grounding mats bonded to the equipment being operated.
5. Uninsulated Overhead Ground Wires (OHGW) shall be connected as part of the worksite safety grounding system.
6. Insulated OHGW shall not be used in the worksite grounding system; the insulated OHGW shall be treated as an energized 13-kV conductor unless it is properly cleared and grounded.
7. A conductor shall not be opened by cutting or jumper removal in a manner that will isolate a portion of the line from the safety ground.
8. A ground cluster block should be used as an intermediate connection between the safety ground leads, pole ground wires, if any, and the temporary ground rod. The #4 iron down wire pole grounds must not be used as the safety ground even when multiple ground wires are available. A safety ground(s) sized appropriately for the available fault current must be provided independent of the #4 iron wire pole ground. The #4 iron wire should be bonded to the safety ground via the cluster block.
9. A steel crossarm may be used in lieu of a ground cluster block after arm connections to the pole grounds have been inspected.
10. A pole ground wire used for safety grounding should be inspected before grounding to determine that it has not been cut or damaged.
11. If necessary to provide proper climbing clearance, an underbuilt circuit on the same structure with the transmission circuit to be grounded should be de-energized and properly grounded before placing the transmission safety grounds. When this is not practicable, the energized underbuilt circuit should be set out in hotsticks or covered with appropriate protective covering to obtain this clearance.
12. The ground switches at 500-kV terminals should be closed before safety grounds are installed on the line.
13. Any type OHGW, except those insulated for communications, should be considered as a secondary ground source and used as a primary ground source only when it is the least hazardous alternative.
14. Safety ground rods should be 5/8 inch, bronze, copper, or copperweld at least five (5) feet (1.5m) long and be of the driven type.
15. Ground rods should be driven to the maximum depth possible. If a rod cannot be driven 4 feet (1.2m), a total of three (3) rods shall be driven in a triangular pattern 5 to 10 feet (1.5 to 3m) between each one and as deep as possible. The three (3) rods should be electrically connected with safety grounds prior to connecting them to the worksite safety grounding system.
16. Temporary ground rods should be protected from tampering by the public.
17. Guy wires should not be used as a ground path.

Conductor Stringing or Removal-Grounding

1. In addition to the following requirements, the requirements in paragraph Installation and Maintenance of Safety Grounds – General apply.
2. Only approved protective devices shall be used in stringing operations.
3. Traveling grounds shall exert constant pressure on the wire being pulled.
4. Pulling and tensioning equipment shall be bonded and effectively grounded and not operated from the ground except from bonded mats.
5. Approved traveling grounds shall be installed within 20 feet (6.1m) of the tensioning and pulling machines in order to ground each pulling line, conductor, subconductor, and OHGW.
6. Pulling lines, conductors, subconductors, and OHGW shall be grounded at the first structure from the tensioner, puller, wire reel, or snub point.
7. Conductors, subconductors, and OHGW shall be grounded adjacent to all dead ends or catch-off points.
8. An approved ground shall be located on each side of and as close as possible to the work area where splices are being made at ground level. The two ends of a conductor being spliced shall be bonded together.
9. Where conductors are installed parallel to existing energized conductors and employees are working on bare conductors, grounds shall be placed at each location where these employees are working.

Grounding of Overhead Ground Wires

1. Overhead ground wires (OHGWs), also called shield wires or static wires, may be insulated (IGWs) or uninsulated. Insulated ground wires may be used as communication circuits. Both OHGWs and IGWs are capable of providing lethal levels of energy at a worksite from remote grounds (ground rise), electrostatic coupling, electromagnetic coupling or inadvertent contact with energized conductors. IGW with communications paths will also have potentially lethal currents due to these signal paths.
2. Both energized and de-energized work may be performed on the line conductors/circuits that have each type of OHGW. When the work requires grounding IGWs the Network Management Center (NMC) must be notified. A Hold Order will then be required for the IGW and the circuit will then be grounded at the worksite. No further communications switching for grounding or issuance of the Hold Order will be required. In this case, communications circuit grounding switches, if they exist, may remain open.
3. When the power circuit is worked, either energized or de-energized, any OHGW must be grounded with safety grounds at the site and treated as a source of lethal energy when not grounded.
4. When the power circuit is worked, either energized or de-energized, the IGW must be treated as an energized 13 kV circuit unless it can be grounded at the work site.
5. Work site grounding of OHGWs and IGWs constitute the clearance for work on these ground conductors when they are grounded. The dispatcher does not issue clearance on them as they are not power circuits. Before grounding an IGW, request the dispatcher to receive permission to do so via the NMC.

Procedure 1110 Minimum Clearance Distances for Energized Work

TVA Safety Manual

1110 Minimum Clearance Distances for Energized Work

Procedure Number 1110

TVA Safety Procedure

Minimum Clearance Distances for Energized Work

Revision 2

January 27, 2006

Purpose

The purpose of this procedure is to establish minimum clearance distances for energized work.

Minimum Clearance Distances for Energized Work

1. The following minimum clearance distances shall be maintained for all types of energized work except as permitted by use of approved barriers, guards, insulated tools, or insulated aerial lift equipment.

Nominal Voltage (Phase -to-Phase) kV	Minimum Clearance Distances (Phase -to-Ground) Inches	Minimum Clearance Distances (Phase -to-Phase) Inches
13	25	26
26	28	31
46	31	34
69	36	42
115	40	54
161	48	68
230	63	100
345	102	160
500	119*	240
750	180	372

* Note: Switching over voltage factor is 2.2 which allows a phase-to-ground minimum clearance distance of 119 inches. The procedure listed below should be substituted for the 119-inch minimum working clearance distance on electrical circuits rated at 500 kV if the circumstances exist as described below:

1. On transformer-terminated lines and reactor-terminated lines, a 41-inch air gap device should be installed and at least 84 inches of clearance maintained.
2. In circumstances where 119 inches of clearance cannot be maintained, a 41-inch air gap device should be installed and at least 84 inches of clearance maintained.

Chapter 3 Section 12 Transmission / Generation / Electrical Testing / Telecommunication Work Activities

Procedure 1201 General Requirements for Transmission, Substation and Telecommunication

TVA Safety Manual

1201 General Requirements for Transmission, Substation and Telecommunication

Procedure Number 1201

TVA Safety Procedure

General Requirements for Transmission, Substation and Telecommunication

Revision 4

April 18, 2008

Purpose

1. The purpose of this procedure is to provide a summary of the general requirements for transmission, generation, electrical testing, and telecommunication work activities.
2. In addition to the requirements specified in this procedure, the requirements defined in the referenced TVA Safety Procedures shall apply. This procedure includes the following:
   - Heavy Equipment

     Reference: TVA Safety Procedure 711, “Heavy Equipment Operations”
   - Electrical Storage Batteries

     Reference: TVA Safety Procedure 1019, “Wet Cell Storage Batteries”
   - Scaffolds

     Reference: TVA Safety Procedure 813, “Scaffolds and Temporary Work Platforms”
   - Excavations and Trenching

     Reference: TVA Safety Procedure 804, “Excavations and Trenching”
   - Ropes, chains, and rigging hardware

     Reference: TVA Safety Procedure 721C, “TVA Rigging Manual”
   - Power Generating Plant Work
   - Nuclear Plants

- All Terrain Vehicles

  Reference: TVA Safety Procedure 601, “All Terrain Vehicles”

Aerial Lifts

Requirements for operating or working in aerial lifts are included in TVA Safety Procedure 702, “Aerial Lifts”.

Heavy Equipment

1. Mechanical equipment, when not in use or left unattended, shall have keys removed from ignition switches or the equipment reasonably disabled to prevent starting by unauthorized personnel.
2. When heavy equipment is being transported on a trailer, as a minimum, a 4-point tiedown method shall be used.
3. The aggregate static Working Load Limit (WLL) of tie-down assemblies used to secure an article against movement during transport shall be equal to at least ½ (0.5) times the weight of the article. An even number of chains shall be used. The WLL shall be determined either from the charts in Procedure 1607 or the tags or labels attached to the tie-down assembly.
4. Example: divide weight of load to be hauled by 2 and divide that number by the strength of the chain from chart or tag. This will give the number of chains required: Load = 74,000 pounds: 74,000 ÷ 2 = 37,000 pounds.
5. Strength of chain from chart: 7,100 pounds and 37,000 ÷ 7,100 = 5.21, therefore, 6 chains required.
6. Seat belts shall be installed, maintained, and worn on equipment with rollover protection.
7. When left unattended, bulldozer blades, earth moving buckets, and bushhogs shall be placed on the ground.
8. Risks shall be thoroughly evaluated before loading or unloading heavy equipment.
9. Only qualified operators should operate heavy equipment, i.e., bulldozers, loaders, backhoes, hole diggers, track drills, anchor installers, stringing equipment, etc.
10. Bulldozers should be parked on timber whenever there is the possibility of freezing temperatures.
11. Bulldozer tracks, rollers, and idlers should be cleaned daily.

Electrical Storage Batteries

1. The following protective equipment shall be used by employees when performing battery maintenance (not required for routine tests).
   - Either goggles or plastic face shield or both.
   - Protective gloves.
   - Protective apron or rain suit.
2. Before work on batteries is initiated, employees shall ensure that a fully operational eyewash is close at hand in case of an electrolyte splash to the eyes. If electrolyte spills on skin, rinse with clear water promptly.
3. The battery compartment or room shall be well ventilated before placing a battery on equalizing charge.
4. Do not smoke or use open flames around batteries. Post "NO SMOKING" signs in battery rooms where they are clearly visible to anyone entering.
5. Only spirit thermometers shall be used when taking electrolyte cell temperature. Mercury thermometers could break, and mercury running into the cell between the plates will cause sparking and possible explosions.
6. Cell vent plugs shall be kept firmly in place at all times except when adding water or taking hydrometer readings. (These vent plugs shall be the flame-arrester type.)
7. Tools used for tightening connector bolts shall have insulated handles. Rings, wristwatches, etc., shall be removed before working on the battery.

Scaffolds

1. Unnecessary tools, materials, and debris shall not be allowed to accumulate in quantities to cause a hazard.
2. Guardrails (top-rail, mid-rail and toe-board) shall be made an integral part of all scaffolds.
3. Scaffolds shall not be overloaded.
4. Before using any stationary scaffold, employees should make a careful inspection to satisfy themselves that all parts are in a safe condition and securely fastened together, set on an adequate foundation, and plumbed.
5. Do not jump on or off scaffolds.
6. Barricade around scaffolds whenever practicable. If the area must be used as a walkway, adequate overhead protection shall be provided.

Excavations and Trenching

1. The location of utility installations, such as sewer, telephone, fuel, electric, or any other that may be encountered during excavation work, shall be determined prior to opening the excavation.
2. All excavations left unattended shall be covered or barricaded with suitable material to provide protection for people and vehicular traffic. See safety color code for marking physical hazards in TVA Safety Manual, Useful Safety Information 1608 “Color Codes for Marking Physical Hazards and the Identification of Certain Equipment”.
3. No employee shall work in an open excavation with a load suspended overhead.
4. No employee shall work in any excavation more than four (4) feet (1.2 m) in depth until it has been inspected by a competent person and any required protective system installed to protect employees from cave-in.
5. Employees shall not be lowered into or raised out of an excavation by mechanized equipment other than equipment suitable for this purpose.
6. Excavated or other materials or equipment shall be at least two (2) feet (0.6m) from the edge of excavations, or retaining devices shall be used to prevent materials and equipment from falling or rolling into excavations. A combination of these methods shall be used if necessary to provide employee protection.
7. Employees shall not work in excavations deeper than four (4) feet (1.2m) without a stairway, ladder, ramp, or other safe means of entrance and exit.
8. When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be used such as a barricade, hand or mechanical signals, or stop logs.
9. Vehicles shall not be parked where they could roll either forward or backward into an excavation.
10. Employees shall be adequately protected from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals, as necessary on the face to stop and contain falling material; or other protective means.
11. Employees shall not work on the faces of sloped or benched excavations at levels above other employees except when employees at the lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.
12. Where oxygen deficiency or a hazardous atmosphere exists or could reasonably expect to exist, such as in excavations in landfill areas, near sewers, or natural gas lines, the atmospheres in the excavations shall be tested before employees enter excavations greater than four (4) feet (1.2 m) in depth.
13. Adequate precautions shall be taken to prevent employee exposure to atmospheres containing less than 19.5 percent oxygen and other hazardous atmospheres.
14. Adequate precaution shall be taken to prevent employee exposure to an atmosphere containing a concentration of a flammable gas in excess of 10 percent of the lower flammable limit of the gas.
15. When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to ensure that the atmosphere remains safe.

16. Emergency rescue equipment shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended.
17. Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, shall wear a body harness with a lifeline attached to it. The lifeline shall be individually attended at all times while the employee is in the excavation.
18. Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation.
19. A competent person for excavation means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.
20. If water accumulation is controlled by the use of water removal equipment, the equipment and operations shall be monitored by a competent person to ensure proper operation.
21. If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains require an inspection by a competent person.
22. Daily inspections of excavations, the adjacent areas, and cave-in protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.
23. Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until necessary precautions have been taken to ensure their safety.
24. Where employees or equipment are required or permitted to cross over the excavation, walkways or bridges with standard guardrails shall be provided.

Ropes, Chains, and Rigging Hardware

1. Synthetic rope slings shall not be used to catch off or suspend conductors or ground wires. Voltage bleed-off may cause synthetic slings to fail.
2. Chokers, wire rope, chain, or other rigging hardware shall be of adequate size, type, condition, and arrangement to safely handle the load. (See TVA 721C “TVA Rigging Manual”.)
3. An employee shall warn other employees of unsafe rigging observed.
4. Rigging equipment shall be inspected before each use, and any found defective shall be tagged defective and not used until repaired, or it shall be discarded.
5. When chain is used for lifting, only alloy steel chain shall be used.
6. Chain used for rigging shall not be shortened by twisting, knotting, or with nuts and bolts.
7. Before using chain to lift a load, each link shall be inspected for wear, nicks, gouges, stretch, corrosion, shear, and localized bending.
8. Wire rope slings or running rope shall be replaced if there are six or more randomly distributed broken wires in one rope lay or three or more broken wires in one strand in one rope lay. (A rope lay is that length along the rope in which one strand makes one complete revolution around the rope.)
9. Wire rope slings or running rope shall be replaced if the individual wires in the outer layer are worn by one-third the original diameter of the wire.
10. Shackles used for rigging shall be discarded if worn in the crown or in the pin by more than 10 percent.

11. Cold shuts, lap links, quick links, or "missing" links shall not be used for chain repair or to attach hooks.

Power Generating Plant Work

1. There are risks in the operation and maintenance of generating plants that are not found in other electrical installations. The requirements in this paragraph deal with the risks peculiar to these plants and shall be strictly observed by employees. Employees are also responsible for observance of all other requirements that are applicable. Plant safety rules shall be followed where applicable.
2. Cubicles containing electrical equipment shall be entered only by experienced persons in the performance of their duties.
3. When normal barriers, such as guardrails, floor gratings, hatch covers, deck plates, or equipment, are removed leaving unattended openings in decks, floors, and gratings, temporary barriers shall be installed and maintained while work is in progress.
4. Employees shall not enter or leave a machine unless the person in charge of the work is informed.
5. All persons shall be out of the machine and accounted for by the person responsible for the work before it is released to service.
6. In no case shall an employee stand on or between wicket-gate arms and rings while equipment is in operation.
7. All tools, personal effects, and foreign material shall be removed from the generating unit before it is readied for service.
8. If work is to be performed in the generator enclosure, the CO2 automatic fire protection system shall be cleared and tagged under the authorized plant operating procedure.
9. Employees shall not enter the generator casing until all gas has been replaced by air and the casing is known to contain a life-sustaining atmosphere. Smoking or open flames shall not be permitted.
10. Employees shall not enter a wheel pit after a generator CO2 discharge until the measures in Confined Space Entry have been taken. See TVA Safety Procedure 801, “Confined Space Entry”.
11. Appropriate protective equipment shall be worn by employees performing work in areas that present special hazards, such as flying particles, falling objects, hot metal, exposure to chemicals, and irritating or toxic gases.
12. Employees, upon entering and leaving supervisory-controlled stations, should report to the operator/dispatcher in charge of the station.
13. Rope, air lines, or extension cords coiled or intermingled on walkways, stairways, or landings are prohibited. Protect electrical cords or air lines by use of temporary boards at roadway or walkway crossings.
14. When in wheel pits, employees should stand in a safe position for maintaining balance and should keep hands and fingers in the clear.
15. Employees should not step or stand on parts of an idled generator or turbine subject to rotation. They should maintain the proper clearance from all mechanical and electrical parts until the machine is cleared and tagged under the established procedure from all sources of energy, both hydraulic and electrical, including headgates being set and tagged.
16. Employees should be extremely cautious while working on or near collector rings or commutators while the generator is in operation. They should also remove all loose material from pockets in clothing before beginning such work.
17. When work is performed near the generator rotor brake cylinders, keep fingers and hands clear of the pressure surfaces of the brake cylinders.
18. When cleaning or working in actuator cabinets with the equipment in service, stay clear of parts subject to movement.

Nuclear Plants

1. The nonradiation hazards associated with the operation of a nuclear plant are similar to those in other plants. Therefore, many safety requirements from other portions of section Power Generating Plant Work, are applicable. Separate requirements for hazards peculiar to nuclear plants will be added as necessary.
2. Permissible dose rates, exposure limits, and rules for control are contained in the TVA Health Physics Manual. The limits and controls specified therein shall be adhered to as though written here.
3. Because of the nature of the hazards associated with a nuclear facility, specific written procedures are required for emergencies at each plant. These procedures, including site evacuation and plans with local civil authorities, will be issued before the startup of a nuclear unit at any facility.

All Terrain Vehicles

1. ATVs equipped with a single front tire shall not be used on transmission line rights-ofway.
2. ATVs shall be equipped with roll over protection, bench seat, and seat belts for each passenger.
3. Personal Protective Equipment (PPE) shall include a hard hat and safety eyewear.
4. ATVs are for off-road operations and should not be driven on public streets and roads.
5. When tools or equipment are transported, they should be properly secured on the vehicle.
6. A personal flotation device should be worn when fording streams that could cause the tires to float.
7. ATVs are intended to be operated at safe speeds, depending on terrain and conditions. At no time should an ATV be operated in an unsafe manner or used for purposes other than its intended use.
8. Passengers shall only be permitted when the vehicle is equipped with the manufacturers-approved seating for passengers except in the event of a medical emergency.

Procedure 1202 Electrical Testing

TVA Safety Manual

1202 Electrical Testing

Procedure Number 1202

TVA Safety Procedure

Electrical Testing

Revision 1

November 01, 2005

Purpose

The purpose of this procedure is to establish safety requirements for electrical testing at reduced, normal, or high potentials. It applies only to testing involving interim measurements and not to testing involving continuous measurements as in routine metering, relaying, and normal maintenance and operations work.

General

1. Electrical test work is different in many important respects from other power system activities. Consequently, special attention must be given to work hazards and safety in performance of electrical tests. In many cases, tests and adjustments make it necessary to energize equipment at reduced, normal, or high potential. Therefore, the possibility of electrical shock to test employees and others in the vicinity must be a constant consideration.
2. Always assume any equipment is energized until checks have been made to verify that the circuit is cleared. Make sure that the person holding the clearance is aware that test work is in progress and that the clearance will be held until the test work is complete.
3. When grounds are removed temporarily during tests, each employee shall use insulating equipment and be isolated from any hazards involved, and additional measures shall be instituted as necessary to protect each exposed employee in case the previously grounded lines and equipment become energized.
4. Unless proper precautions are taken, alternating current test potential applied to a secondary circuit or device (such as a relay or meter) can feed back through transformers, develop primary voltage at the high-voltage terminals, and energize any connected buses or equipment. Before energizing secondary circuits or devices, isolate them from the transformers or make sure the high-voltage terminals are in the clear and are guarded properly.
5. On large pieces of equipment or on equipment mounted at heights, safe practices should be followed in the handling of ladders or other means of access. Physical injury from slips, falls, and improper lifting should be constantly guarded against.
6. During fault conditions, dangerous voltages may exist between a station ground and a remote ground (including a fence ground). Therefore, leads and equipment connected to one ground should be treated as hot with respect to other grounds. In the course of ground impedance measurements, or other tests when it is necessary to contact leads or equipment connected to a distant ground, rubber gloves or other protective equipment should be used.
7. Specific safety precautions to be taken during the various types of test work are given in each section of the Field Test Manual for transmission line, substation, and switchyard activities. These precautions should be followed carefully in the performance of electrical test work.

Rotating Equipment Testing

1. Windings to be tested shall be grounded long enough to drain off any charge before being touched. This is particularly important after dc high-potential and dielectric absorption tests (grounding time may exceed one hour).
2. Windings to be grounded shall be solidly grounded to the station ground. Test equipment shall be connected to the same grounding point.
3. Apparatus undergoing test shall be identified by means of orange tape. See TVA Safety Procedure 1107, “Identifying Energized Electrical Hazards”.
4. No one except those directly involved with the test shall be allowed in the taped-off area while a test is in progress.
5. When applying a test voltage to voltage-regulating equipment, be sure the test voltage does not unintentionally energize any voltage transformers.

High-Potential Testing

1. Apparatus undergoing test shall be identified by means of orange tape or by an interlocked fence. The tape shall be taken down if there is a long delay between tests.
2. There shall be a definite understanding between the test set operator and others helping make the tests about the number of tests to be made, duration, and voltage values to be impressed on the various parts of the apparatus. All others working in the vicinity shall be warned not to enter the isolated area and not to carry pipes or other long material which may protrude into the area.
3. The test set voltage controls shall be run down to the lowest position after each test and left there before the all-clear signals are given. The energizing plug shall be pulled; or, where a knife switch is used, it must be open before the all-clear signal is given. An open power circuit breaker is not sufficient clearance.
4. The apparatus under test shall be solidly grounded to the station ground, and the test set ground lead shall be attached to the same grounding point.
5. No one except those directly involved with the tests shall be allowed inside the taped-off or fenced-off areas while tests are in progress.
6. Test leads carrying high potential may need to be supported with insulating tape. This tape shall not be tied off to ungrounded supports.
7. During dc high-potential tests, ground all conductive bodies within the field of influence of the test set and the specimen under test to prevent a buildup of dc voltage on such bodies due to capacitance voltage divider action.
8. After dc high potential tests, ground the test specimen long enough to drain off its charge. High-capacitance specimens, such as generators or cables, may require grounding times of an hour or more. A dc high potential may reappear on the test specimen if the ground is removed too soon.

Procedure 1203 Energized Equipment Maintenance

TVA Safety Manual

1203 Energized Equipment Maintenance

Procedure Number 1203

TVA Safety Procedure

Energized Equipment Maintenance

Revision 1

January 27, 2006

Purpose

The purpose of this procedure is to establish requirements for energized equipment maintenance.

Requirements for Energized Equipment Maintenance

1. Where there is a possibility of remote or automatic reclosing, a caution order shall be obtained before working on or near any equipment where a system voltage may be contacted.
2. Only tools and equipment designed, tested, and approved for live-line work shall be used. All work shall be personally supervised by a person qualified to perform this work.
3. Work shall not be permitted while there is any indication of lightning in the vicinity.
4. Live-line equipment shall be wiped clean and visually inspected prior to use each day in accordance with TVA and/or the manufacturer's instructions. Any discrepancies shall be reported to the supervisor and corrected before equipment use (see TVA Safety Procedure 1206, "Live Line Work").
5. When approaching, leaving, or bonding to an energized part, workers shall maintain themselves and their conductive equipment at a distance from other energized or grounded parts at least equal to the minimum approved phase-to-phase and phase-to-ground clearance distances (see TVA Safety Procedure 1110, "Minimum Clearance Distances for Energized Work").
6. A 41-inch air gap device shall be installed immediately adjacent to the work location before working on transformer-terminated or reactor-terminated 500-kV lines or when the 119-inch clearance distance to a grounded surface cannot be maintained, then the minimum clearance shall be 84 inches.
7. Approved conductive clothing designed for live-line, bare-hand work shall be used for all bare-hand work above 230 nominal kilovolts.
8. Employees using the live-line, bare-hand technique shall wear conductive footwear or other bonding equipment designed for the same purpose.
9. Before any employee uses the live-line, bare-hand technique on energized high-voltage conductors or parts, the following information shall be determined.
   - The nominal voltage rating of the circuit on which the work is to be performed.
   - The minimum clearance distances to ground from lines and other energized parts on which work is to be performed.
   - The voltage limitations of equipment to be used.
10. Insulated equipment, insulated tools, and aerial devices and platforms used shall be designed, tested, and intended for live-line, bare-hand work. Tools and equipment shall be kept clean and dry.

11. Work shall not be performed when adverse weather conditions would make the work hazardous. Additionally, work shall not be performed when winds reduce the phase-to-phase or phase-to-ground minimum clearance distances at the work location below that specified in TVA Safety Procedure 1110, " Minimum Clearance Distances for Energized Work", unless the grounded objects and other lines and equipment are covered by insulating guards.
12. For live-line, bare-hand work, a nonconductive measuring device shall be readily accessible to assist employees in maintaining the required minimum clearance distance.
13. A telescoping fiberglass measuring stick designed for that purpose should be used for measuring minimum clearance distances.

Procedure 1204 Helicopter Operations for Transmission Line Work

TVA Safety Manual

1204 Helicopter Operations for Transmission Work

Procedure Number 1204

TVA Safety Procedure

Helicopter Operations for Transmission Work

Revision 1

April 16, 2004

Purpose

The purpose of this procedure is to establish requirements for helicopter operations for transmission work.

Requirements

1. The use of helicopters to support our work activities results in unique hazards that require special precautions.
2. The helicopter pilot shall conduct a pre-job safety briefing with all involved employees before the job begins. This briefing shall include, but not be limited to, the following:
   - Safety related specifications of the helicopter and other equipment to be used
   - Safety zone when the aircraft is on the ground with the rotors turning
   - The distance from the helicopter to the quick connect/disconnect
   - The hand signals used
   - The verbal commands used for normal operations, to indicate a problem, and to stop operations.
3. The pilot shall review emergency and general procedures with employees who fly in the helicopter.
4. Passengers in an aircraft shall follow the instructions of the pilot-in-command.
5. The foreman or the pilot-in-command shall halt operation in the event a change in plans is required. Operation shall not resume until a new plan is agreed upon and discussed with all involved.
6. When hooking up a load, a member of the ground crew shall be in radio contact with the pilot and/or with the flight crew member (spotter) who is guiding the pilot.
7. Ground-to-air radio communications shall be checked for proper operation prior to starting helicopter operations involving the ground personnel. In the event that a ground crew member believes an unsafe condition is developing regarding the aircraft, they shall contact the pilot using the agreed upon verbal communications.
8. During the work, ground personnel shall minimize radio communications to avoid confusing the pilot and spotter.
9. Communication systems between the pilot and/or spotter and ground personnel shall be understood and checked in advance of hoisting the load. This applies to either radios or helicopter hand signals (see Useful Safety Information, 1603 “Hand Signals for Helicopter Operations”).
10. When employees are required to perform work under hovering craft, a safe means of access shall be provided to reach the hoist line hook and engage or disengage cargo slings. Employees shall not perform work under hovering craft except when necessary to hook, unhook, secure or place loads.
11. Every practical precaution shall be taken to provide for the protection of employees from flying objects in the rotor down-wash. All loose materials within 100 feet (30.5m) of the place of lifting the load, depositing the load,

and all other areas susceptible to rotor downwash shall be secured or removed.

12. Employees working in the vicinity of helicopter operations shall wear hearing protectors, goggles, and hard hats with chin straps. Loose-fitting clothing likely to flap in the downwash, and thus be snagged on the hoist line, shall not be worn.
13. The helicopter load hook shall be a quick connect/disconnect type. A hands-on demonstration of the quick connect/disconnect shall be performed by all crew members who will operate it. Tag lines shall be of a length that will not permit their being drawn up into rotors.
14. Pressed sleeve, swagged eyes, or equivalent means shall be used on wire rope slings for all freely suspended loads because hand splices may spin open or cable clamps loosen.
15. Wire rope shall be used to connect a suspended load to the hoist line hook.
16. No unauthorized person shall be allowed to approach within 50 feet (15.2m) of the helicopter when the rotor blades are turning.
17. Whenever approaching or leaving a helicopter with blades rotating, all employees shall remain in full view of the pilot and keep in a crouched position. Employees shall avoid the area from the cockpit or cabin rearward (toward the tail rotor) unless authorized by the pilot to work there.
18. There shall be no smoking within 50 feet (15.2m) of the helicopter.
19. Open fires shall not be permitted in an area that could result in such fires being spread by the rotor down-wash.
20. Employees may assist in field refueling operations only under the direction of the flight crew. Smoking or open flames are prohibited within 50 feet (15.2m) of the refueling area.
21. Poles, crossarms, etc., should be transported vertically to reduce in flight motion.
22. Dust masks should be worn when dusty conditions exist.

Procedure 1205 Insulator Cleaning on Energized Circuits and Equipment

TVA Safety Manual

1205 Insulator Cleaning on Energized Circuits and Equipment

Procedure Number 1205

TVA Safety Procedure

Insulator Cleaning on Energized Circuits and Equipment

Revision 1

July 15, 2006

Purpose

The purpose of this procedure is to establish safety requirements for insulator cleaning on energized circuits and equipment.

Basic Requirements

1. Cleaning insulators can be safely accomplished by either of two methods, washing with high-pressure distilled water or by use of compressed air and an abrasive material.
2. The compressed-air method can be used for all types of contaminants and is the only method to remove some deposits.
   - Some individuals experience discomfort from static discharge to their body from the laminated tubing using this method.
   - This can be eliminated by bonding the body to the nozzle with a conductive strap.
   - High-pressure distilled water can be more efficient for removing less adherent deposits if the physical arrangement of the equipment allows its use.

Compressed Air Method

1. All equipment, such as air compressors, specially adapted sandblaster, hose, and laminated tubing shall be approved for this work.
2. Only approved cleaning materials, such as lime, pulverized corncobs, and walnut hulls, shall be used.
3. The laminated tubing used as a nozzle shall be electrically tested as follows:
   - Test at 75 kV per foot before use.
   - Test at 75 kV per foot with air and grit flowing before use.
   - Observe for static buildup and discharge.
   - Check leakage current as cleaning operation is commenced, beginning at insulator base and advancing to energized circuit. Leakage current shall not exceed two milliamperes.
4. The requirements in TVA Safety Procedure 1203, “Energized Equipment Maintenance”, relating to work on energized circuits and equipment shall be observed.
5. The air stream shall never be directed toward people.
6. The following approved protective equipment shall be used:
   - Respirator

- Eye protection
- Hearing protection

7. Weather conditions have a direct effect on the operation of the cleaning equipment. Normally, work should be suspended during periods of high humidity or when the ambient temperature is below 40 degrees F.
8. The water trap on the air compressor should be checked frequently and emptied as necessary.
9. When using a telescopic boom, care should be taken to prevent grit from contacting the boom surface.

Pressurized Water Method

1. Since the resistivity of water varies widely from distilled water to contaminated water, leakage currents associated with live-line washing vary proportionately to the quality of the water.
2. Each tank of water shall be tested immediately before use. Water resistivity of less than 2500 ohms per cubic centimeter shall not be used.
3. Only special high-pressure nozzles and hose designed for this service shall be used. The nozzle shall not be directed toward people.
4. The nozzle, hose, tank, truck, platform, and all washing equipment shall be grounded.
5. When washing insulators or bushings on energized equipment of buses, maintain clearances between the grounded nozzle and the energized equipment as outlined in the following table:

Nominal Voltage	1/4 Inch Nozzle or Smaller	3/16 Inch Nozzle or Smaller
13 kv	9 feet (2.7m)	6 feet (1.8m)
26 kv	10 feet (3.0m)	7 feet (2.1m)
46 kv	11 feet (3.4m)	8 feet (2.4m)
69 kv	12 feet (3.7m)	9 feet (2.7m)
115 kv	13 feet (4.0m)	10 feet (3.0m)
161 kv	15 feet (4.6m)	11 feet (3.4m)

6. Before attempting live-line washing, the foreman should review and see that the crew is thoroughly familiar with special instructions covering this subject.
7. Avoid shooting a direct stream of water on disconnect switches. There may be enough pressure in the stream to move the blades if applied in the right direction. For the same reason, be careful with the stream around jumper loops and potential transformer leads, both primary and secondary. Caution should be observed to avoid a direct stream on breathers, gasketed joints on transformers, breakers, and bushings.
8. Since complete washing is essential, be sure there is sufficient water in the tank to finish washing an insulator once washing has been started.
9. Extreme caution should be exercised in handling the water gun at high pressure. Keep the gun pointed down at all times except when in actual use. Never point the gun otherwise until ready to use. The person operating the wash truck should be sure that those using the guns are ready before opening the valves or starting the pump.

Procedure 1206 Live-line Work

TVA Safety Manual

1206 Live-Line Work

Procedure Number 1206

TVA Safety Procedure

Live-Line Work

Revision 1

July 15, 2006

Purpose

The purpose of this procedure is to establish safety requirements for live-line work.

Requirements

1. The final decision of whether live-line work can be done safely is the responsibility of the supervisor directing the work. The supervisor shall ensure that the crew is properly trained for the work on energized equipment, that proper tools and equipment are used and that correct safety measures are implemented.
2. Electrical circuits and equipment shall be considered energized until they are properly grounded.
3. A caution order shall be obtained on any transmission line or substation equipment being worked on while energized.
4. Employees performing energized work on the same structure shall not work on different phases at the same time.
5. Rubber gloves shall not be used with hotsticks for live-line work.
6. While working or climbing nearer than 25 feet (7.6m) to energized conductors or parts on 500-kV transmission line structures, workers shall wear conductive-sole shoes or other bonding equipment designed for that purpose.
7. Conductive material shall not be hung on the lip of the aerial lift bucket in such a way as to reduce required clearances.
8. Only ropes that are maintained specifically for live-line work shall be used on energized lines or equipment.
9. All live-line tools when not in use shall be kept clean and dry in approved protective containers.
10. Live-line tools shall be visually inspected and wiped clean before use in accordance with TVA Safety Procedure 1103, “Electrical Protective Equipment”.
11. While equipment, lines, or buses are energized, no employee at ground potential shall touch insulators, bushings, lightning arresters, or insulator pins except as provided by special work procedures.
12. When tying or untying energized conductors to or from insulators, keep the tie wire short enough to maintain clearance distance between the tie wire and the supporting structure.
13. Insulated portions of hotline tools shall be properly tested for insulation value as required.
14. When approaching or working on energized circuits, except from an insulated lift or similar device, the minimum distances as stated in Appendix A - Minimum Clearance Distances for Energized Work shall be followed.
15. Before any energized equipment is worked on, consideration should be given to the arc that will result if accidental short circuiting or grounding occurs and plans should be made for that possibility.

Appendix A - Minimum Clearance Distances for Live Line Work

Minimum Clearance Distances for Energized Work

Nominal Voltage (Phase-to-Phase) kV	Minimum Clearance Distances (Phase-to-Ground) Inches	Minimum Clearnace Distances (Phase-to-Phase) Inches
13	25	26
26	28	31
46	31	34
69	36	42
115	40	54
161	48	68
230	63	100
345	102	160
500*	119	240
750	180	372

* Note: Switching overvoltage factor is 2.2 which allows a phase-to-ground minimum clearance distance of 119 inches.

The procedure listed below should be substituted for the 119-inch minimum working clearance distance on electrical circuits rated at 500 kV if the circumstances exist as described below:

- On transformer-terminated lines and reactor-terminated lines, a 41-inch air gap device should be installed and at least 84 inches of clearance maintained.
- In circumstances where 119 inches of clearance cannot be maintained, a 41-inch air gap device should be installed and at least 84 inches of clearance maintained.

Procedure 1207 Stringing and Removing Conductors

TVA Safety Manual

1207 Stringing and Removing Conductors

Procedure Number 1207

TVA Safety Procedure

Stringing and Removing Conductors

Revision 2

July 15, 2006

Purpose

The purpose of this procedure is to establish safety requirements for stringing and removing electrical conductors.

Requirements

1. In addition to the following safety requirements, TVA Safety Procedure 1109, “Protective Grounding” shall also apply to conductor stringing and removal work.
2. The tension stringing method, barriers, or clearance poles shall be used to minimize the possibility that conductors and cables being installed or removed will contact energized powerlines or equipment.
3. The protective measures required by TVA Safety Procedure 1201, "General Requirements for Transmission, Substation and Telecommunication" paragraph 2.19 for mechanical equipment shall also be provided for conductors, cables, and pulling and tensioning equipment when the conductor or cable is being installed or removed close enough to the energized conductors that any of the following failures could energize the pulling or tensioning equipment or the wire or cable being installed or removed.
   - Failure of the pulling or tensioning equipment.
   - Failure of the wire or cable being pulled.
   - Failure of the previously installed lines or equipment.
4. Reel handling equipment, including pulling and tensioning devices, shall be in safe operating condition, leveled, aligned, and anchored.
5. Load ratings of stringing lines shall not be exceeded.
6. Pulling and tensioning devices, shall be in safe operating condition, leveled, aligned, and anchored.
7. Pulling lines and accessories shall be repaired or replaced when defective.
8. Conductor grips shall not be used on wire rope unless the grip is specifically designed for this application.
9. Reliable communications, through 2-way radios or other equivalent means, shall be maintained between the reel tender and the pulling rig operator.
10. The pulling rig shall only be operated when it is safe to do so. Examples of unsafe conditions include employees in locations prohibited by requirement #11, conductor and pulling line hang-ups, slipping of the conductor grip, and loss of communications.
11. While the conductor or pulling line is being pulled (in motion) with a power-driven device, employees shall not be directly under overhead operations or on the crossarm.
12. When stringing or removing conductors parallel to or crossing energized circuits or apparatus, proper grounding procedures shall be followed on the new conductor for protection against static or induced voltages and accidental

contacts with energized circuits. When conductor is in motion, this can be accomplished by grounding the stringing block. Before removing the conductor from the grounded block, install grounds on the conductor with a hotstick.

13. Tape shall not be used to reinforce cotter pins on stringing blocks. Defective cotter pins shall be replaced.
14. Tensioners and pullers shall be adequately grounded and anchored in such a manner that during pulling, slacking, or sagging, the equipment will not move from its position.
15. Communication shall be established and maintained between employees controlling the stringing operation. If communication is lost, the stringing operation shall be stopped.
16. Protection shall be verified and a caution order obtained on all energized circuits or apparatus being crossed by conductor-stringing or removal operations.
17. When conductors parallel to an energized circuit are being strung or removed, care should be taken to keep the conductor from becoming fouled in trees, bushes, crossarms, or other objects. If the conductor becomes fouled, the pulling operation should be stopped immediately and the tension on the conductor should be relieved before any attempt is made to clear it.
18. Conductors being strung or removed should be kept clear of sidewalks, driveways, alleys, streets, highways, and railroad tracks if possible. When this is not possible, employees should be stationed to stop or reroute vehicles and pedestrians.
19. Conductors should not be attached to or removed from a structure until it is reasonably certain that the structure will withstand the altered strain.

Procedure 1208 Transmission Line Work

TVA Safety Manual

1208 Transmission Line Work

Procedure Number 1208

TVA Safety Procedure

Transmission Line Work

Revision 4

April 18, 2008

Purpose

The purpose of this procedure is to establish safety requirements for transmission line work, including handling and climbing poles.

General Requirements

1. No employee shall be under a tower or structure while work is in progress, except when such a working position is necessary to assist employees working above.
2. Tag lines or other similar devices shall be used to maintain control of tower sections being raised or positioned unless the use of such devices would create a greater hazard.
3. The loadline shall not be detached from a member or section until the load is safely secured.
4. Work shall be discontinued when adverse weather conditions make the work too hazardous. Thunderstorms in the immediate vicinity, high winds, snow storms, and ice storms are examples of adverse weather conditions that make this work too hazardous to perform, except under emergency conditions where special precautions are taken to protect the employees.
5. Before work is begun in the vicinity of vehicular or pedestrian traffic that may endanger employees, warning signs or flags and other traffic control devices shall be placed to alert and channel approaching traffic. Where additional employee protection is necessary, barricades shall be used. At night, warning lights shall be prominently displayed.
6. A safe means of passage shall be provided for employees crossing streams or other bodies of water.
7. When a pole is set, moved, or removed near an exposed energized overhead conductor, each employee shall use insulated devices when handling the pole and not contact the pole with uninsulated parts of his or her body.
8. Before structures, such as poles or towers, are subjected to the stresses of climbing or the installation or removal of equipment, it shall be determined, i.e., "sounding" or "probing", that the structures are capable of sustaining the additional or unbalanced stresses. If the pole or other structure cannot withstand the loads that will be imposed, it shall be braced or otherwise supported to prevent failure.
9. Pole holes shall be attended or physically guarded whenever anyone is working nearby
10. Fall protection shall be used by employees working at elevated locations more than four (4) feet (1.2m) above the ground on towers or similar structures. While climbing or relocating on towers or similar structures, fall protection is not required for qualified employees. Upon reaching the work location, fall protection is required. If conditions such as ice, high wind, the design of the structure for example, no provision for holding on with hands, or contaminates prevent the climber from climbing safely, fall protection is required.
11. The "free" walking of horizontal members, i.e., no hand holds, is prohibited.

12. Workers shall not attach conductors to their belts or hold them in their hands while climbing. They shall use a hand-line to raise or lower conductors on a structure after they reach their work position.
13. Equipment operators shall take movement signals only from the designated person. The operators shall obey a stop signal from anyone.
14. Ropes or lines used in handling loads shall not be wrapped around workers' bodies.
15. Suspension insulators shall not be climbed.
16. Before performing switching on a line switch, the switch grounding plate shall be clean and properly positioned.
17. The switch grounding plate conductor connections and the switch rod grounding braid connections shall be inspected for tightness and found in good condition before performing switching.
18. When operating an air break line switch, the operator shall position both feet firmly on the switch grounding plate and maintain this contact throughout the switching process, touching only the switch handle.
19. When starting to pull a pole, the pole should be "loosened" by using a winch, pole jack, auger, bulldozer or other method before the pole is lifted by a crane.
20. Before leaving the ground, the employee should survey the work to be done and determine the best position to use on the structure to perform the work.
21. Avoid unnecessary conversation while ascending or descending a structure.
22. Any employee is responsible for signaling an equipment operator to stop when they think there is imminent danger.
23. All equipment used in rigging should be of an approved type or fabricated according to accepted industry practices.
24. Any employee shall warn other employees of unsafe rigging practices they observe.
25. Workers shall not work directly beneath other employees unless it is absolutely necessary.
26. The area immediately under the structure should be kept uncluttered.
27. Side guys used in installing structures should be attached to substantial objects.
28. Tools and material should not be thrown or dropped from structures.
29. Workers should stand clear of loaded winch cables, making sure they are not in the bight of the cable.

Pole Handling General

1. Clearance poles and arms shall have balance point and 10-foot butt mark readily visible.
2. Before loading or unloading is begun, the wheels of the transporting vehicle shall be blocked or securely braked.
3. Before unloading poles from a railroad car, the brakes shall be set and the wheels chocked.
4. Reflectors shall be installed on clearance poles adjacent to roadways.
5. Poles loaded on trailers shall be securely bound to the trailers before towing. A minimum of two tied-owns, plus a tie-down for each additional ten (10) feet (3m) of load, are required.
6. When traveling on public roads, the trailing end of a load of poles shall be marked by a red flag during the day and a red light at night.
7. Employees shall not remain on a pole pile or trailer when a pole is being loaded or unloaded.
8. Chokers, wire rope, or other rigging hardware used to lift poles shall be of adequate size, type, condition, and arrangement to safely handle the load. (See TVA Safety Procedure 721C "TVA Rigging Manual")
9. Only ratchet-type load binders shall be used.
10. When poles are being handled, they shall be controlled by tag lines, butt ropes, cant hooks, or cant straps, as appropriate.
11. Concrete poles shall be lifted only from the manufacturer-designed lifting points.
12. Braided nylon slings or nylon chokers of adequate size shall be used when lifting concrete poles. Wire rope choker shall not be used on concrete poles.
13. Poles placed on piles shall be securely blocked or secured to prevent rolling or shifting.

14. Load binders shall not be released with employees standing on the load of poles unless other means have been used to secure the load.
15. Employees and equipment should be placed so as to minimize the danger of injury or damage should a pole or poles get out of control.
16. Poles should be removed from storage in such a manner as to leave the pile in a safe condition. Storage piles should be rearranged after the removal, if necessary, to avoid possible shifting.
17. Employees, while handling poles, should wear suitable clothing and gloves to protect against creosote burns and splinters.
18. Poles should not be stored under energized conductors.
19. Employees should not needlessly climb on top of pole piles.
20. If possible, load binders should be installed so that they can be operated from the ground.
21. Where practical, employees should work on the uphill side of the poles.

Working on Wood Poles

1. When poles are being handled, they shall be controlled by tag lines, butt ropes, or cant hooks.
2. When wood poles are being set or removed in proximity to live-line conductors:
   - They shall not be considered as insulation.
   - They shall not be allowed to contact live conductors.
3. Body belts and safety straps shall be used when working off the ground on poles or wooden structures.
4. Climber gaffs less than 1 1/4 inches in length shall not be used.
5. Poles shall be "HITCH-HIKED" up and down except when moving around crossarms or other obstructions.
6. Climber straps and gaffs shall be inspected before use, maintained in good condition, and stored with gaff protectors in place.
7. Workers should not be on poles that are being plumbed or canted.
8. When climbing poles, use care to set gaffs securely in the pole and avoid cracks, knots, holes, nails, and pole attachments.
9. When an old pole is being replaced with a new pole, employees should work from the new pole whenever possible.
10. When climbing trees, workers should not rely on dead limbs for support. They should not let bark build up under the gaffs.

Working on Steel Poles and Towers

1. When steel poles are being handled, they shall be controlled by tag lines, butt ropes, or canting devices.
2. Body belts and safety straps or lanyards shall be used when work is being done off the ground.
3. Safety strap snap-ends shall be fastened in a D-ring on the body belt while the safety strap is not in use.
4. Prior to setting steel poles, step-bolts shall not be installed from the point of crane attachment to approximately 15 feet (4.6m) above point of attachment to provide headroom for crane boom.
5. Prior to lifting a steel pole, all slip-joints below the crane attachment point shall be securely lashed to prevent any possibility of separation during lifting.
6. Fiberglass pole cant with straps shall be used to cant steel poles in the vicinity of energized lines or equipment.
7. The bottom 10 step-bolts shall be removed before leaving the site.
8. Temporary step-bolts shall be properly attached.

Working on Concrete Poles

1. When concrete poles are being handled, they shall be controlled by tag lines, butt ropes, or canting devices.
2. Concrete poles shall be lifted only from the manufacturer-designed lifting points.
3. Braided nylon slings or nylon chokers shall be used when lifting concrete poles. Wire rope chokers shall not be used on concrete poles.
4. Prior to setting concrete poles, step-bolts shall not be installed from the point of crane attachment to approximately 15 feet (4.6m) above point of attachment to provide headroom for crane boom.
5. The bottom 10 step-bolts shall be removed before leaving the site.

Procedure 1209 Right-of-Way Clearing and Grounds Maintenance

TVA Safety Manual

1209 Right of Way Clearing and Grounds Maintenance

Procedure Number 1209

TVA Safety Procedure

Right of Way Clearing and Grounds Maintenance

Revision 2

July 15, 2006

Purpose

The purpose of this procedure is to establish requirements for right of way clearing and grounds maintenance.

Farm Tractor and Bushhog

1. The operator and crew members shall wear safety goggles or other appropriate eye protection and protective headgear while working with this equipment.
2. Roll bars shall be installed on the tractor and the seat belt used.
3. Before this equipment is transported on trucks or trailers, it shall be tied down (TVA Safety Procedure 1201, "General Requirements for Transmission, Substation and Telecommunication" paragraph "Electrical Storage Batteries" item 3) and the trailer brakes checked for proper operation.
4. Do not allow unauthorized persons near the equipment while it is being operated.

Chain Saw Operation

1. The majority of chainsaw injuries are caused by kickback. Most kickbacks occur when the top or nose of the moving chain hits an obstruction. As a result, the chain saw is often thrust toward the operator's face. To prevent kickback, make certain there are no obstructions which will come into contact with the nose of the bar. The anti-kickback chain will cut as well as the standard chain and will help reduce the force of any kickback.
2. Only employees trained in the use of chain saws shall be allowed to operate chain saws.
3. PPE shall be visually inspected prior to use and unserviceable PPE shall be discarded or repaired.
4. Anti-kickback chains shall be used.
5. Each chain saw shall be equipped with a chain brake.
6. Use approved safety cans, properly labeled, for mixed gasoline.
7. Operators shall wear appropriate eye protection, gloves and foot protection while operating chain saws.
   Note: Minimum footwear permitted for PSO chain saw operations shall be: heavy duty footwear constructed with cut-resistant material, water resistant, and providing ankle support. Reference 29 CFR 1910.266.
8. Operators shall use appropriate protective chaps during any use of a chain saw except when working off the ground.
9. Tree felling or limbing shall always be preceded by an evaluation of tree lean, dead limbs, vines, or other conditions which affect the safety of personnel.
10. When felling trees, select a clear path of retreat to be used when the tree is falling.

11. If a tree accidentally is cut or falls into a powerline, no contact shall be made with the tree until the line is de-energized, tagged, and grounded under a Hold Order clearance, unless approved hot-line techniques are used.
12. Extreme caution shall be used when cutting dead trees or trees adjacent to dead trees.
13. Chain saw operators shall inspect the saw prior to operating to determine that all handles, guards, and brakes are in place and tight, all controls function properly, and that the muffler is operative.
14. Chain saw operators shall follow manufacturer's instructions as to operation and maintenance of the saw.
15. Chain saws shall be fueled in safe areas and not under conditions conducive to fire such as near people smoking, hot engines, directly under powerlines, etc.
16. Chain saws shall be started at least 10 feet (3m) away from fueling area.
17. Chain saw operators shall be certain of their footing and clear away brush which might interfere before starting to cut.
18. Chain saw engine fuel shall not be used for starting fires or as a cleaning solvent.
19. A chain saw shall have its brake on or be cut off when the operator carries it for a distance greater than from tree to tree or in hazardous conditions such as slippery surfaces or heavy underbrush. The saw shall be at idle speed when carried short distances.
20. Chain saws shall be carried by their handle bar and in a manner to prevent contact with the chain and muffler.
21. Chain saw operators shall not use the saw to cut directly overhead or at a distance that would require the operator to relinquish a safe grip on the saw.
22. Each chain saw weighing more than 15 pounds (6.8 kilograms, service weight) that is used in trees shall be supported by a separate line, except when work is performed from an aerial lift and except during topping or removing operations where no supporting limb will be available.
23. Each chain saw shall be equipped with a control that will return the saw to idling speed when released.
24. Each chain saw shall be equipped with a clutch and shall be so adjusted that the clutch will not engage the chain drive at idling speed.
25. A chain saw shall be started on the ground or where it is otherwise firmly supported. Drop starting of saws over 15 pounds (6.8 kg) is permitted outside the bucket of an aerial lift only if the area below the lift is clear of employees and equipment.
26. A chain saw engine shall be started and operated only when all employees other than the operator are clear of the saw.
27. A chain saw shall not be running when the saw is being carried up into a tree by an employee.
28. Chain saw engines shall be stopped for all cleaning, refueling, adjustments, and repairs to the saw or engine, except as the manufacturer's servicing procedures require otherwise.
29. Carry the saw with the blade toward the rear so the chain will not become snagged in the underbrush.
30. Before the saw is started, be sure the chain is clear of all obstructions.
31. When operating a saw, keep both hands firmly on the saw, one on the handlebar, and the other on the handgrip.
32. Wear protective headgear and heavy nonslip shoes. Never wear loose-fitting gloves and shirts. Keep shirt buttoned and tucked in.
33. Be sure of your balance at all times. When starting a cut, always place the spikes against the wood before engaging the chain.
34. When climbing trees, workers should not rely on dead limbs for support. They should not let bark build up under the gaffs.
35. Tag lines should be used when necessary to assist the operator to control the direction in which the tree falls.
36. Be sure the muffler and exhaust system are in good condition.
37. Before saws are transported in a truck, they should be placed in boxes, cases, or otherwise secured for protection of crew members.
38. Operators should wear approved hearing protection to guard against sustained high-level noise. Protective headgear with attached hearing protectors and face screen should be worn.

Power Mower Operation

1. Do not tamper with the blade while the mower is running.
2. Disable the mower engine before inspecting, adjusting, or changing attachments.
3. Fill the fuel tank outdoors or in well-ventilated areas.
4. Do not fill the fuel tank while the engine is running or while it is still hot.
5. No smoking is permitted while filling the fuel tank.
6. Use approved and properly labeled safety cans for fuel.
7. Fuel should not be transferred from one vessel to another in the vicinity of energized highvoltage equipment.
8. Gloves should be worn when handling mower blades.
9. When making carburetor adjustments, stand to one side and keep hands and feet in the clear.
10. Keep feet away from the blade when starting the mower.
11. On mowers so equipped, the blade should not be engaged until ready to begin mowing.
12. Always stop the engine when it is necessary to leave the mower.
13. Skid boards or a hydraulic lift tailgate should be used in loading and unloading the mower.
14. The operator should keep the area of mowing operation clear of unnecessary persons.
15. The mower discharge chute should be directed away from persons.
16. Sloping or uneven terrain should be mowed horizontally with walking-type mowers if practical.
17. Riding-type mowers should not be used on steep terrain.
18. Mowers should not be used without proper guarding and operating interlock devices in place.

Shear Clearing

The bulldozer shall be equipped with roll bars and the seat belt shall be worn.

Hand Clearing

1. Kaiser blades, brush hooks, axes, and other sharp tools shall be transported and stored in designated places.
2. "Cut" resistant gloves shall be used when sharpening or repairing bladed tools.
3. File guards shall be used when sharpening tools.
4. Axes and brush hooks shall be secured while being sharpened.

Brush Chipper

1. Hearing and eye protection (face shields, goggles, or safety glasses with sideshields) and gloves shall be worn while feeding brush into a chipper.
2. Stop the engine and cutters before inspecting the discharge chute or cutters.
3. Loose clothing, rings, watches, and bracelets shall not be worn when working with the brush chipper.
4. Brush chippers shall be equipped with a locking device in the ignition system.
5. Access panels for maintenance and adjustment of the chipper blades and associated drive train shall be in place and secure during operation of the equipment.
6. Trailer chippers detached from trucks shall be chocked or otherwise secured.
7. Each employee in the immediate area of an operating chipper feed table shall wear protective eyewear.
8. Feed the large diameter end of brush into the chipper first.
9. Keep the protective flaps at the throat of the cutter in good condition.

Weed and Brush Trimmers

1. Eye protection (face shields, goggles, or safety glasses with sideshields) shall be worn when using trimmers. Hearing protection shall be worn as recommended by the trimmer manufacturer.
2. High top shoes or shin guards shall be worn when using trimmers.
3. Properly sized string or blades shall be used.
4. Trimmers shall not be used unless equipped with properly installed guards.
5. When an employee is using a motor-operated, blade-type brush trimmer, all other employees shall stay at least 10 feet (3m) away.
6. Employees should stand to the side of, rather than directly behind, when feeding brush into the chipper.

Chemical Clearing and Maintenance

1. Before using chemicals for vegetation control, read and follow the manufacturer's directions on the container labels and observe the precaution identified in the Material Safety Data Sheets (MSDS).
2. Avoid unnecessary contact of chemical mixture with skin and clothing.
3. Wear appropriate protective clothing as required. When mixing chemicals, neoprene gloves, long sleeve shirts, and eye protection should be worn.
4. Hands should be washed prior to eating or use of tobacco products when using chemicals for vegetation control.

Procedure 1210 Telecommunication Safety Requirements

TVA Safety Manual

1210 Telecommunication Safety Requirements

Procedure Number 1210

TVA Safety Procedure

Telecommunication Safety Requirements

Revision 2

July 15, 2006

Purpose

The purpose of this procedure is to establish safe work requirements for employees involved in telecommunications work.

Requirements

1. When work is performed in the vicinity of insulated ground wires, the specified minimum clearance distance for a 13-kV power circuit shall be maintained or approved rubber gloves used, or the circuit shall be grounded under a Hold Order clearance.
2. Coupling capacitor stacks shall not be climbed or used as a support for tying off employees.
3. Contact shall not be made with the carrier lead-in conductor except when using rubber gloves or when the lead-in conductor is properly grounded through the grounding switch. In the event the safety gaps are breaking down, the ground switch shall be closed before contact is made with the carrier lead-in arc gaps or line-tuning connections. If the arcing continues after proper adjustments, the capacitor may be defective.
4. Do not disconnect the carrier lead-in conductor from the line-tuning unit unless the leadin conductor is solidly grounded at the coupling capacitor using the grounding switch provided. Use a switch stick to operate the grounding switch.
5. The line end of a line trap installed in a substation shall be properly grounded to the station ground with the test equipment grounded to the same ground when tests are being made on a line trap. On other line traps, one side of the trap shall be grounded with the test equipment connected to the same ground.
6. Before tuning is begun on a carrier line-tuning unit, tests shall be made to be sure that the drain coil is not open.
7. Safety glasses shall be used during cleaning and splicing of fiber optic cable.
8. Gloves shall be worn when handling damaged or cut fiber optic cable. When cutting fiber optic cable, waste shall be properly packaged for disposal.
9. Powerline carrier work, including work on equipment used for coupling carrier current to powerline conductors, shall be performed in accordance with the requirements in TVA Safety Procedure 1203, “Energized Equipment Maintenance”.
10. Employees shall not be exposed to microwave power densities in excess of 10 milliwatts per square centimeter.
11. No employee shall look into an open wave-guide or antenna that is connected to an energized microwave source.
12. Only qualified and trained employees shall be assigned to install, adjust, and operate laser equipment.

13. Employees, when working in areas in which a potential exposure to direct or reflected laser light greater than 0.005 watts (5 milliwatts) exists, shall wear anti-laser eye protection.
14. Beam shutters or caps shall be utilized, or the laser turned off, when laser transmission is not actually required.
15. Only mechanical or electronic means shall be used as a detector for guiding the internal alignment of lasers.
16. The laser beam shall not be directed at employees.
17. Laser equipment shall bear a label to indicate maximum output.
18. Employees shall not be exposed to laser light intensities above:
    - Direct staring: 1 microwatt per square centimeter
    - Incidental observing: 1 milliwatt per square centimeter
    - Diffused reflected light: 2.5 watts per square centimeter .
19. In making standard conductor tests on telephone lines, it is necessary to make direct metallic contact with the conductor. On open-wire underbuilt construction, all conductors shall be considered and worked as energized unless they are properly grounded.
20. Only qualified and trained employees shall be assigned to install and maintain RF transmitter and antenna equipment.
21. Employees are required to report to their supervisor any RF over-exposure incidents such as RF skin burns, interference with personal medical devices, suspected overheating of the body, etc.
22. Operators of fixed or mobile radio transmitters, other than hand-held, shall ensure that no person is within reach of the radio antenna during transmission.
23. Employees shall not operate the transmitter of a portable UHF or VHF radio unless the radio antenna is at least three inches from the operator's mouth.
24. Employees climbing a tower or working in the vicinity of roof top antennas shall not stop near an active antenna.
25. Employees testing or operating high-powered transmitters shall never use a magnetic mount antenna or other portable antenna device attached to the transmitter cabinet or located in the same equipment room as the transmitter.
26. Employees shall not dismantle or service RF wave guides, coaxial transmission lines, or antennas without ensuring that the transmitter or transmitters are disabled.
27. Employees shall always return transmitter shielding covers and RF connections to normal before returning the transmitter to full service.
28. Employees who work in potentially strong RF fields should receive RF health and safety training to ensure they understand the hazards of RF exposure and the means by which these hazards are controlled.
29. Employees should not operate the transmitter of a mobile radio when someone outside the vehicle is within five (5) feet (1.5m) of the antenna.
30. Whenever possible, employees should not operate the transmitter of mobile radio with a local microphone from outside the vehicle.
31. Mobile and portable radio operators should keep transmit times to a minimum.
32. Employees climbing a tower or working in the vicinity of roof top antennas should assume that all antennas are active unless otherwise notified.
33. Whenever possible, employees climbing a tower or working in the vicinity of roof top antennas should ensure all antennas on the tower or roof top are de-energized.
34. Whenever possible, employees working in the vicinity of roof top antennas should maintain a 5-foot clearance from all active antennas.
35. When practical, employees should test with the transmitters RF shields in place and with the output terminated in an RF dummy load designed for this purpose.
36. Coupling capacitors should be connected or disconnected from the line only when the line is de-energized.
37. Ladders should not be leaned against coupling capacitors.

38. When work is performed on communication equipment, extreme care should be taken because of the dangerous voltages that may exist in some assemblies.
39. At microwave installations, the transmitter power should be turned off before dismantling the waveguide, working on the antenna feed horn, or working in the immediate area between the feed horn and the antenna reflector.
40. Employees should report to the Transmission Operator or the Network Operations Center, as appropriate, when entering a microwave repeater station or a switchhouse at a supervisory-controlled substation.
41. Special care must be exercised when preparing an optical fiber for splicing. Although the fiber is delicate and small, it can penetrate the skin. If broken off in the body, it can be difficult to remove. When clearing in preparation for splicing, the section broken away should be placed on the adhesive side of a piece of tape which should be folded to cover the fiber scrap and discarded in a suitable container.
42. Care should be exercised not to look directly into the laser light source when making tests on fiber optic systems that involve the use of laser test sources or when disconnecting the fiber from a laser transmitter.
43. Glass fibers from fiber optic clearing and splicing should be promptly removed from clothing and the surrounding work area by using tweezers or other noncontact methods, i.e., vacuuming.

Procedure 1211 Telecommunication Tower Climbing

TVA Safety Manual

1211 Telecommunication Tower Climbing

Procedure Number 1211

TVA Safety Procedure

Telecommunication Tower Climbing

Revision 1

April 18, 2008

Purpose

1. This safety procedure establishes requirements for climbing telecommunication towers. This procedure applies to TVA employees and contractors on TVA owned or leased equipment or space.
2. All tower climbing activities must be conducted in the safest manner possible by qualified employees. TVA Organizations will furnish necessary protective equipment or safety devices to their employees. Contractors are responsible for providing the necessary equipment for their employees to satisfy this procedure. Towers will be designed, built, and maintained to provide for employee safety.
3. The objectives are to provide towers which are safe for climbing and to define the qualifications for employees who climb telecommunication towers.

Qualifications for Climbing Telecommunication Towers

1. All persons who may be required to work on towers shall be physically and mentally qualified for climbing and working on telecommunication towers. Periodic physical examinations will be arranged without charge for employees who work on towers.
2. A qualified telecommunication tower climber is an employee who has completed the appropriate safety and rescue training in tower climbing and has passed a current physical examination for tower climbing. Only qualified tower climbers are permitted to ascend and descend towers, masts, antennas, and similar structures.

Medical Qualification

1. TVA will have physical examinations conducted that may include but are not restricted to the following: medical history, blood pressure, blood screens, evaluation of balance, heart and lungs, muscular/skeletal system, a general physical examination, an EKG for those more than 40 years of age. All medical results and examinations are strictly confidential.
2. Tower climbers at all ages are required to have a physical examination upon entry or placement into a job that requires tower climbing. Employees shall not climb if they do not have a current physical examination in accordance with the following:
   - For climbers 39 years of age and below, re-exam every three years.
   - For climbers 40 to 49 years of age, re-exam every two years.
   - For climbers 50 years of age and over, re-exam annually.

3. It is the responsibility of climbers to inform their supervisor of any changes in their health and physical status that adversely impacts their ability to safely climb towers.
4. TVA Occupational Health will maintain the Medical Examination Guide for determining that a climber is medically qualified.
5. The employee's organization is responsible for requesting an examination (form TVA 1444, Request for Medical Evaluation [2]) when an employee is required to have a medical evaluation for tower climbing. The organization will make the appointment at the appropriate medical service facility.
6. The service provider will return the form TVA 1444 [2] to the supervisor indicating whether or not the employee's health and physical status has been determined to be appropriate for tower climbing as a result of a medical examination. If the employee fails the physical or has temporary constraints, this will be noted on the form TVA 1441 [2].
7. If the supervisor feels there is a reasonable concern of the health or physical fitness status for climbing, then the employee in question may be requested to obtain a fitness for duty medical exam before being allowed to continue to climb. The form TVA 1441 [2] will be used to request this examination.

Safety Training

1. Tower climbing instruction is given at entry/placement, during an annual refresher and when the supervisor has reason to believe that any affected employee does not have the understanding and skill required to safely climb. Employees can not climb until the appropriate training has been satisfactorily completed.
2. Training will cover fall protection to include appropriate personal protective equipment, e.g., gloves, a hard hat, safety glasses or goggles, and suitable footwear for climbing. Climbers shall be trained on safety topics to include RF hazards and the use of personal safety RF monitors, basic first aid, CPR, tower rescue techniques, hand signals, and radio procedures. Climbers shall be trained on climbing techniques, e.g., selecting anchor points for safe tie-off, knowledge required to determine structural safety of the structure before climbing, proper climbing techniques, and what constitutes dangerous weather conditions. Climber training shall include an overview of the safety requirements of 29 CFR 1926.500 for construction and 29 CFR 1910.66 for fixed facilities. Climbers are expected to perform their work tasks within the scope of the provided tower climbing safety training.
3. Qualified climbers shall receive refresher training every year. The initial and refresher training must be conducted by a competent person as defined by ANSI Z359.2-2007 3.2.4.2
4. The competent person conducting the training must attend update training every two years to stay current with the fall protection and rescue educational industry requirements or when new fall protection systems are used or installed or new fall hazards are encountered. ANSI Z359.2-2007 3.3.4.5

Protective Equipment

1. Telecommunication towers equipped with ladders will have a climbing safety device to prevent falls while climbing. The standard ladder climbing safety device is the "cable" type. For towers without ladders, employees will be protected from falls by using a fall arrest system in accordance with 29 CFR 1926.501. At the working location on the tower, a fall arrest system or work positioning equipment will provide for fall protection to the climber on the tower. Fall protection procedures shall provide for 100% continuous fall protection.
2. Climbing equipment, fall protection and PPE must be approved and issued by TVA management and TVA Safety for use in tower climbing applications. The types of climbing equipment required depend on the type of climbing being done. Usual equipment may include items such as a ladder climbing safety device, body harness (body belts not permitted for fall arrest), connectors such as carabiners or "D" rings sewn into the body harness or choker, deceleration device such as a rip stitch lanyard or automatic self-retracting lifelines, lanyard, rope grab, snaphooks with self-locking keeper, and Anka-Lok Pole (first man up system). All climbing equipment must be properly stored to protect it from weather and deterioration when not in use.

3. Personal RF safety monitors, within calibration, shall be provided and worn at all times when working where there is a potential for RF exposure. The RF monitor is a general broadband receiver. When readings are encountered indicating RF fields too strong for humans, employees shall move to an area of safe readings. When the entire work area is inside a strong RF field the employees must contact their supervisor and report the need for the specialized RF field equipment and support staff to make specific readings as to frequency and field strength and recommendations for safe work practices and procedures in that area.
4. Supervisors are responsible for annually checking first aid kits, discarding expired items, and replacing them with fresh items, as needed. A "replacement wanted" list should be in the kit advising users to write down what they use so that it may be replaced.
5. Organizations will provide health preserving items such as drinking water, sun screen, insect repellent, hornet spray, eye wash, etc.
6. "Climbing helmets" are allowed for telecommunications structure climbing only when there are no substation or transmission electrical hazards present at that structure. Employees on the ground are required to wear the TVA approved hard hats meeting the standards for impact and di-electric strength.
7. Ropes used for climbing or rescue must be replaced at a minimum of 5 years. All ropes shall be inspected prior to each use. All climbing equipment and hardware must be inspected by the user before each use and, additionally, by a competent person other than the user at intervals of no more than one year. ANSI Z359.1-2007 6.1.1
8. Boatswains' chairs may only be used with the written approval of the responsible manager for telecommunications, TVA Safety and with the development and use of a specific JSA for the task to be performed. These approvals and analysis must be performed each time a request to use these devices is received.
9. PPE shall not be altered. No knots shall be tied in lanyards, lifelines, or anchorage connectors. Sliding hitch knots shall not be used in lieu of fall arresters. ANSI Z359.1-2007 7.2.1

Safety

1. The supervisor or person-in-charge at a tower site is charged with the responsibility of enforcing safety requirements and ensuring that safety devices are properly maintained and used. Supervisors will conduct pre-job planning in accordance with TVA Safety Procedure 218, "Pre-Job Briefing / Post-Job Review", including instruction in possible hazards and in the correct use of safety devices. The provisions of TVA Safety Procedure 1013, "Radio Frequency (RF) Safety" shall be followed.
2. At tower sites, anyone who is going to work on the tower shall get permission from the supervisor or person-in-charge before doing so. Non-TVA employees will be permitted on towers only in the performance of necessary duties and must observe the requirements of this procedure. Persons who have a history of fainting, heart trouble, or epilepsy will not climb towers.
3. Personnel will use a personal safety monitor RF warning device that will sound an alarm when the RF field exceeds allowable levels, allowing the employee time to vacate the area until the RF field is reduced to a safe level.
4. Any reported breach of safety regarding tower climbing is taken seriously. Organizations will not allow employees to climb under any circumstances, until safety deficiencies related to the tower climbing are corrected. This may mean shutting the job down, if necessary, until appropriate corrective action is taken.
5. There must be at least three persons who are qualified climbers, plus one person physically present and in communication with the climbers on site to call for help, if necessary. There shall be means to summon emergency assistance (either telephone or radio).
6. The qualified climbers tasked with rescue shall identify the resources necessary to conduct a safe and effective rescue from heights and verify that those resources are available for a prompt rescue event. Rescue equipment and personnel shall be so arranged that a rescuer is a 5 minute climb time from a rescue victim.

Contractors and Others

Any and all work to be done on TVA owned or leased towers will be done by TVA personnel unless authorized by TVA. The specifications in contracts will require that the contractor comply with all federal, state, and local regulations and this procedure when climbing TVA-owned and operated facilities, structures, and equipment.

Chapter 3 Section 13 Substation and Switchyard

Procedure 1301 General Requirements for Substation and Switchyard Work

TVA Safety Manual

1301 General Requirements for Substation and Switchyard Work

Procedure Number 1301

TVA Safety Procedure

General Requirements for Substation and Switchyard Work

Revision 1

July 15, 2006

Purpose

The purpose of this procedure is to establish general and special work requirements for substation and switchyard work

General

1. Fall protection equipment shall be used by employees working at elevated locations four (4) feet (1.2m) or more above the ground on substation or switchyard equipment, i.e., on top of transformers and oil circuit breakers.
2. Fall protection equipment shall be used by employees working in elevated locations four (4) feet (1.2m) or more above the ground on structures (i.e., lattice work) in substations and switchyards. However, the use of fall protection equipment is not required to be used by a qualified employee climbing or changing location on structures unless conditions such as ice, high winds, the design of the structure (for example, no provisions for holding on with hands), or the presence of contaminants on the structure, could cause the employee to lose his or her grip or footing.
   NOTE: Employees undergoing training are not considered "qualified employees". Unqualified employees (including trainees) are required to use fall protection any time they are four (4) feet (1.2m) or more above the ground.
3. The job discussion required by TVA Safety Procedure 6, "Plan Jobs Safely" and TVA Safety Procedure 1101, "Responsibilities and General Requirements for Transmission Employees" shall cover additional substation and switchyard subjects such as the location of energized equipment in or adjacent to the work area and the clearance boundaries of any de-energized work area.
4. Equipment operators shall take movement signals only from the designated person. The operators shall obey a stop signal from anyone.
5. Safety strap snap-ends shall be fastened in the same D-ring on the body belt while employees ascend or descend metal structures.

6. Coupling capacitor stacks and lightning arresters shall not be climbed.
7. Items capable of violating minimum clearance distances shall not be carried on the shoulder (see TVA Safety Procedure 1110, “Minimum Clearance Distances for Energized Work”).
8. Employees shall warn other employees of unsafe rigging practices they observe.
9. Precautions shall be taken to prevent the station service transformer from being energized by temporary sources during outages.
10. Sufficient access and working space shall be maintained about electrical equipment to permit ready and safe operation and maintenance.
11. When temporary power cords or safety grounds are laid in drive areas, they shall be protected from vehicular traffic.
12. Gates shall be locked when substations are unattended.
13. Use properly rated tools or gloves when installing or removing fuses with exposed parts energized at more than 50 volts or when one or both terminals are energized at more than 300 volts. When installing or removing expulsion-type fuses with one or both terminals energized at more than 300 volts, use eye protection, stand clear of the exhaust path of the fuse barrel, and use a properly rated tool.
14. Whenever practical, aerial lift equipment should be used to gain access to elevated work positions on steel structures.
15. Before leaving the ground, the employee should survey the work to be done and the best position to use on the structure to perform the work.
16. Before climbing structures, examine them to be sure they are safe to climb.
17. Workers should not work directly beneath other employees unless it is absolutely necessary.
18. Do not converse with anyone while ascending or descending structures. If conversation is necessary, stop, complete the conversation, and then continue.
19. Tools and material should not be thrown or dropped from elevations.
20. When the work supervisor deems it necessary (due to limited space), the load hook will be removed from the crane if the basket is being used to lift personnel.
21. All equipment used in rigging should be of an approved type or fabricated according to accepted industry practices.
22. Upon entering and leaving supervisory-controlled substation switchhouses, employees should report to the dispatcher.
23. Construction trailers and material stored in substations should be located so as not to interfere with buses or steel structures.
24. Ladders should not be leaned against coupling capacitors or lightning arresters.

Confined Space Entry

1. A confined space means a space that is large enough and so configured that an employee can bodily enter and perform assigned work. It has limited or restricted means for entry or exit and is not designed for continuous employee occupancy. Examples of confined spaces are power transformers, certain circuit breakers, manholes, pits, tanks, vaults, and utility tunnels. Confined spaces may be classified as either a permit-required confined space (permit space) or a non-permit confined space.
2. Permit spaces are subject to oxygen deficiency, an accumulation of flammable or toxic contaminants, containing a material that has the potential of engulfment, or having an internal construction that creates a physical hazard. Permit confined spaces shall be identified with signs reading "Danger-Permit Required Confined Space, Do Not Enter."
3. Non-permit confined spaces do not contain or have the potential to contain any hazard capable of causing death or serious physical harm.

4. No one shall enter a permit space until the person(s) entering, the attendant, and the entry supervisor are properly trained.
5. A Confined Space Entry Permit shall be completed by the entry supervisor to ensure potential hazards are considered, evaluated, and the appropriate control measures are taken prior to, during, and after entry into a permit space.
6. A properly trained entry supervisor shall determine acceptable entry conditions, authorize entry, oversee entry operations, and terminate entry of a permit space. The entry supervisor is responsible for authorizing any hot work operations, i.e., welding, cutting, heating, and burning.
7. A properly trained attendant shall stand by outside the permit space observing for hazards and monitoring the personnel through continuous communications within the space. In the event of an emergency, the attendant shall not enter the space but shall summon emergency and rescue services.
8. For permit spaces, atmospheric test and monitoring shall be conducted prior to and during the course of entry operations. If the oxygen level goes below 19.5 percent or above 23.5 percent, or if flammable gas, vapor, or mist exceeds 10 percent of the lower explosive limit (LEL), the worker(s) shall immediately exit the permit space.
9. A mechanical device shall be available to retrieve personnel from vertical type permit spaces more than five (5) feet (1.5m) deep.
10. Persons entering a permit space shall wear a full body harness with a retrieval line attached to a fixed point or a mechanical lifting device.
11. Atmospheric testing of a permit space shall be conducted using a calibrated, directreading instrument before any worker enters the space and periodically tested as necessary after the entry.
12. Testing for atmospheric hazards in permit spaces shall be completed prior to any personnel entry. The first test shall be for oxygen, followed by combustible gases and vapors, and then for toxic gases.
13. Portable electric tools, equipment, and lighting used in a permit space shall be of the low-voltage type or supplied by a ground fault circuit interrupter.
14. Before any entrance cover of a permit space is removed, it shall be determined that there are no hazardous conditions that may injure the employees removing the cover. When covers are removed from confined spaces, the opening shall be guarded by a railing, temporary cover, or other temporary barrier.
15. If a hazard-increasing work activity is to take place in a permit space (i.e., welding, painting, working with solvents and coatings), the air in the space shall be continuously tested for the presence of flammable or toxic gases and vapors or insufficient oxygen.
16. If flammable or toxic gases or vapors are detected, or if any oxygen deficiency is found, the permit space shall be continuously tested and forced ventilation shall be used to maintain oxygen at a safe level and to prevent a hazardous concentration of flammable or toxic gases or vapors.
17. Before employees are allowed to enter a permit space, all electrical and mechanical energy sources that could affect the employees working in the space shall be physically rendered inoperative, locked out, and tagged under the applicable clearance procedure. If required, the space shall be drained, vented, and cleaned.
18. Compressed-gas bottles shall not be taken into a confined space.
19. Safe access to the confined space shall be maintained at all times. If possible, all cords, hoses, leads, etc., shall be routed through an entrance other than the employee access into the space.

Reference

The following TVA Safety Procedures apply as appropriate:

- TVA Safety Procedure 305, “Fall Protection Systems”
- TVA Safety Procedure 801, “Confined Space Entry”

Procedure 1302 Capacitor Banks

TVA Safety Manual

1302 Capacitor Banks

Procedure Number 1302

TVA Safety Procedure

Capacitor Banks

Revision 1

July 15, 2006

Purpose

The purpose of this procedure is to establish safety requirements for capacitor banks.

Requirements

1. After de-energizing capacitor banks, wait 5 minutes before short-circuiting and grounding them.
2. The frame of stack-type capacitor bank installations is normally energized. The capacitor bank shall be properly cleared and the frame grounded before touching this frame.
3. On wye-connected capacitor banks the neutral may or may not be floating. If not permanently grounded, it shall be grounded before working on the bank.
4. Some capacitors contain polychlorinated biphenyl (PCB) The following requirements must be followed in the safe handling and disposal of these units:
   - If contact with PCBs is required, suitable protective clothing, including aprons and neoprene gloves, shall be used.
   - Any PCB and PCB-contaminated materials shall be disposed of in accordance with established procedures.
   - Employees should avoid breathing vapor from heated PCBs.

Procedure 1303 Gas-Insulated Switchgear

TVA Safety Manual

1303 Gas Insulated Switchgear

Procedure Number 1303

TVA Safety Procedure

Gas Insulated Switchgear

Revision 1

July 15, 2006

Purpose

The purpose of this procedure is to establish safety requirements for gas insulated switchgear.

Requirements

1. Under normal gas pressure, the distance across an open disconnect inside the gas-filled enclosure when the switch is fully opened constitutes a safe working distance.
2. Internal arcing, the operation of energized disconnect switches or lightning impulses on incoming transmission lines, generate high-frequency transients, which can result in a potential difference between grounded enclosures or other grounded components.
3. When it is necessary to operate energized disconnect switches from local controls, the operator shall stand firmly on the ground place and touch only the switch handle or control panel.
4. Do not look into viewports while switching operations are in progress, since permanent eye damage can result.
5. Before removing the grounding strap from the ground switch/test probe, a temporary ground shall be connected to the probe before connecting test leads. The temporary ground may be removed for tests.
6. When work (other than visual inspection) is performed in disconnect switch compartments, pressure in the adjacent section shall be reduced such that no differential pressure exists across the switch barrier insulator.
7. All persons should avoid unnecessary contact with structures, equipment, leads, and instruments when energized disconnect switches are operated.

Procedure 1304 Instrument Transformers

TVA Safety Manual

1304 Instrument Transformers

Procedure Number 1304

TVA Safety Procedure

Instrument Transformers

Revision 3

July 15, 2006

Purpose

The purpose of this procedure is to establish safety requirements for instrument transformers.

Requirements

1. Do not short circuit the secondary circuit of an energized-voltage transformer.
2. Do not apply voltage to a de-energized secondary circuit of a voltage transformer without being sure the primary circuit is disconnected and guarded or barricaded with orange tape.
3. The secondary of a current transformer shall not be opened while the transformer is energized. If the primary of the current transformer cannot be de-energized before work is performed on an instrument, a relay, or other section of a current transformer secondary circuit, the circuit shall be bridged so that the current transformer secondary will not be opened.

   Do not use jumpers attached by means of alligator clips to bridge the secondaries of in-service energized current transformers. A positive means must be used for attaching the jumper that bridges the secondary terminals.
4. Oil samples shall not be taken from energized current or voltage transformers.
5. During the construction of a substation, the secondary connections to a voltage transformer shall be made during the final stages of construction and shall be coordinated with maintenance personnel.

Procedure 1305 Lightning Arresters

TVA Safety Manual

1305 Lightning Arresters

Procedure Number 1305

TVA Safety Procedure

Lightning Arresters

Revision 1

July 15, 2006

Purpose

The purpose of this procedure is to establish safety requirements for lightning arresters.

Requirements

1. Lightning arresters shall not be touched by persons at ground potential until the arresters have been properly grounded.
2. Lightning arresters shall not be connected to an energized circuit unless there is a suitable shield between the arrester and the exposed workers. The buckets on an insulated aerial lift are suitable shields.

Procedure 1306 Power Circuit Breakers

TVA Safety Manual

1306 Power Circuit Breakers

Procedure Number 1306

TVA Safety Procedure

Power Circuit Breakers

Revision 2

July 15, 2006

Purpose

The purpose of this procedure is to establish requirements for power circuit breakers.

Oil Circuit Breakers

1. Tanks, bushings, pumps, and filter apparatus shall be electrically bonded to a common ground before oil is discharged into a de-energized breaker.
2. An energized circuit breaker shall not be closed with a jack or ratchet device.
3. Employees shall not enter the tank or work on the contacts of a solenoid, spring, pneumatic, or hydraulic-operated circuit breaker until the operating mechanism is isolated from all sources of power and stored energy.
4. Purge floor-mounted oil circuit breaker tanks of any possible combustible gas before employees enter the tanks. Before entering, take measures to protect against confined space entry hazards. See TVA Safety Procedure 801, “Confined Space Entry”.

Airblast Circuit Breakers

1. When grounding is required, special grounding procedures, as established in TVA Safety Procedure 1503, “Safety Grounding for Work on an Interrupter Head with Open Contacts”, shall be followed.
2. Hearing protection shall be worn by employees engaged in maintenance activities adjacent to these breakers.

SF6 Gas Circuit Breakers

1. SF6 gas in its pure state is colorless, odorless, tasteless, and nontoxic. Its principal hazard in the pure state is that it does not contain oxygen necessary to sustain life.
2. When corona discharge or electric arcing occurs in SF6 gas, decomposition products are formed which are toxic both from skin absorption and inhalation. The presence of a dangerous concentration of decomposition products in the gas will be indicated by a pungent, unpleasant odor and irritation of the upper respiratory tract and eyes.
3. Specific procedures for handling SF6 gas are contained in the TPS Substation Maintenance Manual. These procedures, used in conjunction with the specified equipment, provide proper safety and health protection.
4. Do not sniff SF6 gas except as provided in Substation Maintenance Letter No.19. See Useful Information 1611, “Procedure for Handling Faulted SF6 Gas”. SF6 gas or gas containers should never be exposed to open flames or heat in excess of 300 degrees Fahrenheit. Hazardous by-products may be generated by exposure to these conditions.
5. Tank pressure shall be reduced to zero gauge reading before breaker tanks are opened.

6. Breaker tanks shall not be entered until they have been purged of gas and filled with fresh air. The requirements of TVA Safety Procedure 801, “Confined Space Entry”, shall be observed.
7. Proper respiratory and skin protection shall be used during exposure to the arc byproducts of SF6 gas.
8. The requirements in Substation Maintenance Letter No.19 shall be strictly observed.

Procedure 1307 Power Transformers

TVA Safety Manual

1307 Power Transformers

Procedure Number 1307

TVA Safety Procedure

Power Transformers

Revision 1

July 15, 2006

Purpose

The purpose of this procedure is to establish safety requirements for power transformers.

Requirements

1. When oil is discharged into a transformer, an electric charge is built up as the oil is forced through the pump, filter, and hose. A charge of over 50,000 volts may develop as the oil spills over the windings.
2. Before oil is discharged into a de-energized transformer, all windings, tanks, pumps, and filter apparatus shall be electrically bonded to a common ground.
3. Before oil is circulated in energized transformers, all tanks, pumps, and filter apparatus shall be electrically bonded to a common ground.
4. Before entering an oil-filled transformer after the insulating oil has been lowered or completely drained, take measures to safeguard against confined space entry hazards in accordance with TVA Safety Procedure 801, “Confined Space Entry”.
5. When working inside a transformer, approved low-temperature safety lamps should be used.
6. When removing a transformer from service which is equipped with a neutral transformer, resistor, or reactor in the neutral bus, the neutral of the transformer must be disconnected, or the transformer must not be grounded and should be treated as energized equipment.

Procedure 1308 EHV Switchyards

TVA Safety Manual

1308 EHV Switchyards

Procedure Number 1308

TVA Safety Procedure

EHV Switchyards

Revision 4

July 15, 2006

Purpose

The purpose of this procedure is to establish safe work requirements for work in Extra High Voltage (EHV) switchyards.

Requirements

1. Except for the need to maintain greater clearances (see TVA Safety Procedure 1108), the same safety requirements for lower voltage stations apply also to EHV stations. However, there are special considerations that must be recognized and handled accordingly. Primarily these involve induced voltages from both 60-hertz, steady-state conditions and from the more severe transient conditions caused by arcing during the operation of 500-kV air break switches.
2. All persons shall be clear of structures, equipment, leads, and instruments involved when energized 500-kV air break switches are operated.
3. When it is necessary to operate energized 500-kV air break switches from local controls, the operator shall stand firmly on the ground plate and touch only the switch handle or control panel.
4. 500-kV breakers require special grounding procedures and shall be handled according to special instructions issued for each installation.
5. Gasoline, paint thinners, or other flammable liquids should not be transferred from one vessel to another in the vicinity of energized equipment.
6. The cap of lead-acid-type batteries should not be removed in the vicinity of energized equipment.
7. Long test leads or other conductors should be grounded when being handled.
8. Conductive-sole shoes or some other means of bonding should be used when working from an insulated aerial lift near energized equipment.
9. If ladders are used, they should be conductive.
10. Switch sticks shall be kept in good condition and stored in a dry location when not in use. They shall be inspected before each use and tested annually.
11. Long objects shall be carried through an electrical switchyard in a horizontal position. Do not carry such objects on shoulders.
12. If flammable solvents or liquids are used in the switchyard, special precautions shall be taken to control static ignition. If flammable materials are spilled on any person, that person must immediately leave the switchyard and remove the material from the body.
13. While work is being performed, energized transformers, switching equipment, and secondary pedestals are not left unattended unless secured.
14. Internal combustion engines are not refueled in the switchyard.

15. No repairs are made that would require engine fuel to be exposed.
16. Vehicle batteries that are inoperative are not “boosted” while in a switchyard unless the vehicle cannot be either towed outside the switchyard or an operative battery exchanged for the inoperative battery.
17. Electricians hired for switchyard outages are familiar and qualified for this type of work, are under the direct supervision of an individual familiar and qualified for this work, or are excluded from this work.

Switching Operations in EHV Switchyards

1. Switchyard gates shall be locked during normal operations.
2. During normal plant operations, the responsible supervisor shall request permission from the shift operation supervisor before allowing their employees to enter the switchyard. The shift operation supervisor approves entry based on work requirements. The responsible supervisor ensures that employees under his supervision work within safe boundaries.
3. During outages or heavy maintenance activities in the switchyard, the responsible supervisor notifies the shift operation supervisor of the activities being performed. The outage/maintenance supervisor is responsible for ensuring that employees under his supervision work within safe boundaries.
4. If planned switching becomes necessary while work is being performed in the switchyard, the shift operation supervisor notifies the supervisor to evacuate the switchyard.
5. When the shift operation supervisor is aware of adverse weather conditions that could cause breakers to open automatically, he notifies the responsible supervisor to evacuate the switchyard.

Use of Portable Ladders in (EHV) Switchyards

1. Each task requiring the use of ladders in an EHV switchyard will be thoroughly evaluated by responsible management and will require proper job safety planning prior to beginning work. The basic requirement is that a conductive (metal) ladder shall be used where use of a non-conductive ladder presents a greater hazard (from induced voltage) than use of a conductive ladder. The job safety plan will require a review by the responsible PSO manager. If job safety planning determines that a metal ladder is to be used the following procedures apply:
2. Prior to working in EHV switchyards from ladders, each employee is advised of the requirements of this section. Supervisory control is established to ensure that employees understand the procedures and that the procedures are strictly followed.
3. The length of the ladder used is specifically discussed with the person who will use the ladder, and the shortest ladder possible for the task is selected.
4. Metal ladders are not allowed to contact energized equipment.
5. Minimum distances between all ladders and energized circuits must conform to TVA Safety Procedure 1110, “Minimum Clearance Distances for Energized Work”. These same distances will be maintained between the person on the ladder and energized circuits.
6. Metal ladders used exclusively in EHV areas are marked for use in these areas only and are segregated from other ladders in a suitable area. A permanently attached ground lead of suitably strong extra-flexible cable shall be on the ladders.
7. When a ladder is moved in the switchyard, it is carried as low as possible and kept parallel to the ground (never carried on the shoulders).
8. When a ladder is positioned at a new location, the ladder ground is first connected to the station grounding mat. The bottom of the ladder is placed on the ground before contact is made with the metal structure.
9. If the ladder is left in position unattended, a warning sign reading, “Unauthorized persons do not use,” is posted on the ladder.
10. Employees working in EHV yards on metal ladders above ground level shall wear conductive footwear or wrist stats.

Definitions

Extra High Voltage (EHV) - 345 kV to 765 kV

Procedure 1309 Underground Electrical Installations

TVA Safety Manual

1309 Underground Electrical Installations

Procedure Number 1309

TVA Safety Procedure

Underground Electrical Installations

Revision 1

July 15, 2006

Purpose

The purpose of this procedure is to establish safety requirements for underground electrical installations.

Requirements

1. Entry into all electrical manholes over 4 feet (122 cm) deep and into unvented cable tunnels, cable chases, and cable vaults is made in compliance with confined space entry requirements.
2. A ladder or other climbing device shall be used to enter and exit a manhole or switchhouse tunnel exceeding four (4) feet (1.2m) in depth. No employee shall climb into or out of such a structure by stepping on cables or hangers.
3. Equipment used to lower materials and tools into manholes or vaults must be capable of supporting the weight to be lowered and is checked for defects before use. Before tools or materials are lowered into the opening for a manhole or vault, each employee working in the manhole or vault must move clear of the area directly under the opening.
4. When multiple cables are present in the work area, the cable to be worked on is identified by electrical means, unless its identity is obvious by reason of distinctive appearance, location, or unique identification. Cables other than those being worked on are to be protected from damage.
5. Energized cables that are to be moved must be inspected for defects.
6. Where a cable in a manhole has one or more abnormalities that could lead to or be an indication of an impending fault, the defective cable is deenergized before any employee works in the manhole, except when service load conditions and a lack of feasible alternatives require that the cable remain energized. In the latter case, employees entering the manhole are protected from the possible effects of a failure by shield or other devices that are capable of containing the adverse effects of any fault that could be anticipated.
   Note: Abnormalities such as oil or compound leaking from cable or joints, broken cable sheaths or joint sleeves, hot localized surface temperatures of cables or joints, or joints that are swollen beyond normal tolerances are presumed to lead to or be an indication of an impending fault.
7. When work is performed on cable in manholes (or buried cable),metallic sheath continuity is maintained or the cable sheath is treated as energized.
8. Reliable communications, through 2-way radios or other means, shall be maintained among all employee involved in the job.

Chapter 4 Admin / CS&M

Chapter 4 Section 14 Customer Service

Procedure 1401 Customer Service

TVA Safety Manual

1401 Customer Service

Procedure Number 1401

TVA Safety Procedure

Customer Service

Revision 0

January 6, 2003

Purpose

The purpose of this procedure is to establish requirements for customer service activities

Requirements

1. No area at any residential, commercial, or industrial facility work-site shall be entered without the verbal or written consent of a responsible representative or employee of the facility.
2. The installation and removal of special metering equipment shall be performed only by qualified employees.
3. Voltage or current measurements shall be made only by qualified employees.
4. For current transformers, disconnect the primary or remove the split core from around the conductor(s) being measured before attempting to disconnect secondary leads.
5. When the cover or door of a manhole, valve, transformer, switchgear enclosure, or other hazardous area or device is left open for any reason, the responsible person shall provide suitable warning of the hazard, such as a barricade or warning tape.
6. All equipment at a customer's facility shall be considered to be in service unless personally observed to have been rendered inoperative.
7. Operations, adjustments, and the removal of equipment covers and doors at customer facilities shall be accomplished only after obtaining the customer's authorizations.
8. When working with exposed conductors energized at 50 volts or above, methods or procedures shall be used to provide employee protection; otherwise, tested and approved rubber gloves shall be worn.
9. When opening or closing attic access coverings, employees shall use appropriate eye protection.
10. Employees shall not climb on sloped roofs where ice, snow, or similar slipping hazards are present.
11. Roofs sloped at a 7-inch, 12-pitch (30-degree angle), or greater shall not be climbed without the assistance of fall protection.
12. Conductive articles of jewelry shall not be worn if they might contact exposed, energized parts.
13. Employees shall remove neckties, dangling jewelry, rings, etc., and avoid loose-fitting clothing when working around operating machinery.
14. The provisions for safe use of ladders contained in TVA Safety Procedure 713, "Ladders-(Portable)" shall be followed when working in customer facilities.

15. Circuits should be deenergized when connecting metering equipment, if practical and permitted by plant personnel.
16. Safety rules and practices of customer facilities should be followed by TVA employees while working at those facilities.
17. TVA employees should request and comply with customer instructions associated with any special hazards in customer facilities.
18. Climbing in or on buildings should be accomplished with fully adequate lighting, a safe way of access, on adequately supported surfaces, and with appropriate use of fall protection equipment.
19. Do not climb without having a partner or notifying someone on the site where you will be climbing.
20. Proper lifting and carrying techniques should be used when lifting and transporting heavy objects.
21. Weatherproof metering cabinets should be grounded.
22. Adapters used to provide power to metering equipment should be fused.
23. Employees should use appropriate protective clothing and equipment when entering attics and/or crawl spaces.

Chapter 5 Appendix

Chapter 5 Section 15 Reference

Procedure 1501 Conductor - Characteristics

TVA Safety Manual

1501 Conductor - Characteristics

Reference Number 1501

TVA Safety Manual Appendix: Reference

Conductor - Characteristics

Revision 2

Aluminum Cable Steel Reinforced (ACSR)

Size of Conductor Cir Mils or A.W.G.	Stranding Alum	Steel	Outside Diameter in Inches	Approx. Weight Lbs. Per Foot	Approx. Current Carrying Cap.-Amps.	Copper Equil. Cir Mils or A.W.G.
2,060,000	84	19	1.724	2.400	1,570	1,250,000
2,034,500	72	7	1.681	2.164	1,540	1,200,000
1,590,000	54	19	1.545	2.044		
1,590,000	45	7	1.502	1.799	1,390	1,000,000
1,351,000	45	7	1.386	1.529	1,250	850,000
1,113,000	54	19	1.293	1.431	1,110	700,000
1,033,500	54	7	1.246	1.331	1,060	650,000
971,600	42	7	1.166	1.0490	1,025	600,000
954,000	45	7	1.165	1.075	1,010	600,000
795,000	26	7	1.108	1.094	900	500,000
636,000	26	7	0.099	0.875	780	400,000
477,000	26	7	0.858	0.6566	670	300,000
397,500	26	7	0.783	0.5472	590	250,000
336,400	26	7	0.721	0.463	530	4/0
266,800	26	7	0.642	0.3673	460	3/0
4/0	6	1	0.563	0.2911	340	2/0
3/0	6	1	0.502	0.2309	300	1/0
2/0	6	1	0.447	0.1831	270	1
1/0	6	1	0.398	0.1452	230	2

Conductor Characteristics - Copper Conductors

Size of Conductor Circular Mils	A.W.G.	Stranding	Outside Diameter in Inches	Weight in Lbs. Per Foot	Approx. Current Carrying Cap.Amp.
500,000	-	37	.814	1.544	840
400,000	-	19	.726	1.235	730
350,000	-	19	.679	1.081	670
300,000	-	19	.629	0.926	610
250,000	-	12	.600	0.772	540
211,600	4/0	7	.522	0.653	480
211,600	4/0	Solid	.460	0.641	380
167,000	3/0	7	.464	0.518	420
133,100	2/0	7	.414	0.411	360
133,100	2/03	Solid	.365	0.403	325
105,600	1/0	7	.368	0.326	310
105,600	1/0	Solid	.325	0.320	240
83,690	No. 1	7	.328	0.258	270
83,690	No. 1	Solid	.289	0.253	210
66,360	No. 2	Solid	.258	0.201	220
52,620	No. 4	Solid	.204	0.126	170

Procedure 1502 Construction Design Distances for New Lines

TVA Safety Manual

1502 Construction Design Distances for New Lines

Reference Number 1502

TVA Safety Manual Appendix: Reference

Construction Design Distances for New Lines

Revision 1

Minimum Vertical Clearances of Conductors Over Water Areas

Where Conductors Cross Over	Minimum Vertical Clearance in Feet					
	46 kV	69 kV	115 kV	161 kV	230 kV	500 kV
1. Water areas not suitable for sailboating or where sailboating is prohibited.	19.2	19.6	20.6	21.6	23.0	27.3
2. Water areas suitable for sailboating including lakes, ponds, reservoirs, tidal waters, rivers, streams, and canals with an unobstructed surface area of: a. Less than 20 acres	22.7	23.1	24.1	25.1	26.5	30.8
b. 20-200 acres	30.7	31.1	32.1	33.1	34.5	38.8
c. 200-2000 acres	36.7	37.1	38.1	39.1	40.5	44.8
d. Over 2000 acres	42.7	43.1	44.1	45.1	46.5	50.8
3. Public or posted private land and water areas for rigging or launching sailboats.	Clearance above ground shall be six feet greater than in Item 2 above for the type of water areas served by the launching site.					

The clearances above apply under the following conditions. The sag conditions of the conductor shall be as defined in either item a or b below, whichever provides the greater sag, computed for the crossing span.

- Final sag at a conductor temperature of 32 degrees Fahrenheit, no wind, with 1/4 inch of radial ice, or,
- Final sag at a conductor temperature of 212 degrees Fahrenheit, no wind.

Minimum Vertical Clearances of Conductors Above Ground

Nature of Surface Underneath Conductors	Minimum Vertical Clearance in Feet					
	46 kV	69 kV	115 kV	161 kV	230 kV	500 kV
1. Track rails of railroads						
a. *NESC	26.7	27.1	28.1	29.1	30.5	34.8
b. TVA	29.7	30.1	31.1	32.1	33.5	37.8
2. Interstate highways						
a. NESC	18.7	19.1	20.1	21.1	22.5	26.8
b. TVA	21.7	22.1	23.1	24.1	25.5	29.8

3. Roads, streets, alleys, parking lots, residential driveways, commercial areas, cultivation, forests, orchards, and pasture lands.						
a. NESC	18.7	19.1	20.1	21.1	22.5	26.8
b. TVA	21.7	22.1	23.1	24.1	25.5	29.8
4. Spaces or ways accessible to pedestrians only.						
a. NESC	14.7	15.1	16.1	17.1	18.5	22.8
b. TVA	17.7	18.1	19.1	20.1	21.5	25.8

The clearances above apply under the following conditions. The sag conditions of the conductor shall be as defined in either Item a or b below, whichever provides the greater sag, computed for the crossing span.

- Final sag at a conductor temperature of 32 degrees Fahrenheit, no wind, with 1/4 inch of radial ice, or,
- Final sag at a conductor temperature of 212 degrees Fahrenheit, no wind.

*NESC - National Electrical Safety Code

Minimum Vertical Crossing Clearances Between Conductors Carried on Different Supporting Structures

Upper Level	Minimum Vertical Clearance in Feet						
kV:	0*	46	69	115	161	230	500
Lower Level							
1. Communication conductors, cables, and messengers.							
a. NESC**	2.0	6.2	6.6	7.6	8.5	9.9	15.9
b. TVA	6.0	7.0	7.0	10.0	10.0	11.0	16.0
2. Insulated and/or shielded supply cables and messengers, open supply service drops, guys, pan wires, neutral conductors, and lightning protection wires.							
a. NESC	2.0	4.2	4.6	5.6	6.5	7.9	13.9
b. TVA	6.0	6.0	6.0	10.0	10.0	11.0	15.0
3. Open supply conductors.							
a. Distribution voltages (13 kV)							
1. NESC	4.0	2.2	2.6	3.6	4.5	5.9	11.9
2. TVA	6.0	6.0	6.0	10.0	10.0	11.0	15.0
b. Transmission voltages							
1. 46-kV							
NESC	4.0	2.3	2.7	3.7	4.7	6.1	11.9
TVA	6.0	6.0	6.0	10.0	10.0	11.0	15.0
2. 69-kV							
NESC	4.0	--	3.2	4.2	5.1	6.5	11.9
TVA	6.0	--	6.0	10.0	10.0	11.0	15.0
3. 115-kV							
NESC	4.7	--	--	5.2	6.1	7.5	11.9
TVA	8.0	--	--	15.0	15.0	16.0	20.0
4. 161-kV							
NESC	5.6	--	--	--	7.0	8.4	11.9
TVA	10.0	--	--	--	15.0	16.0	20.0

5. 230-kV							
NESC	7.0	--	--	--	--	9.8	12.5
TVA	12.0	--	--	--	--	17.0	22.0
6. 500-kV							
NESC	18.0	--	--	--	--	--	17.2
TVA	15.0	--	--	--	--	--	25.0

The clearances above apply under the following conditions:

The upper conductor shall be at a temperature of 212 degrees Fahrenheit and at its final unloaded sag with no wind. The conductor temperature may be reduced to 120 degrees Fahrenheit if it is not designed to carry a current.

*To include guys, span wires, neutral conductors, and lightning protection wires.

** NESC-National Electrical Safety Code

Clearance Requirements Within the Structure for Transmission Lines
(The following clearances within the structure will be used)

	46kV	69kV	115kV	161kv	500kV
Phase-to-Phase	3'6"	5'3"	7'0"	10'5"	25'0"
Wood - Normal	1'7"	2'6"	3'6"	5'5"	
Swing	1'0"	1'7"	2'2"	3'6"	
Steel - Normal	2'0"	3'0"	4'0"	6'0"	12'0"
Swing	1'2"	2'0"	2'8"	4'0"	10'6"

Procedure 1503 Safety Grounding for Maintenance Work on an Interrupter Head with Open Contacts

TVA Safety Manual

1503 Safety Grounding for Maintenance Work on an Interrupter Head with Open Contacts

Reference Number 1503

TVA Safety Manual Appendix: Reference

Safety Grounding for Maintenance Work on an Interrupter Head with Open Contacts

Revision 1

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1. When a breaker is closed and ground cables are installed on the bus at the outboard ends of each pole, the entire breaker is effectively grounded. But, if the breaker is opened, the grounds are only effective to the outboard end of the open main contact on each head, thus, leaving the other parts of each interrupter ungrounded and, as a consequence, subject to induced voltages from adjacent energized equipment.
2. When work is to be performed on any interrupter in a breaker pole which is in the open position, the following procedure must be followed.
   - Install safety grounds and wait five minutes as outlined.
   - Connect three ground cables at the following points on each of the two interrupter heads on the pole upon which work is to be performed.
   - One cable to the central head casting.
   - One cable to the bus connection pad at the outboard end of each entrance bushing. No. 12 or No. 14 flexible insulated test lead wire should be used for this purpose. Each lead should be made up in the following manner for this particular application:
   - Cut one piece long enough to reach from the central head casting to the steel support structure.
   - Install a clip on each end of this wire.
   - Cut one piece long enough to reach from one end of the interrupter head to the other.
   - Install a clip on each end of this wire.
   - Connect the center point of this wire to the first wire (T-fashion) so that, with one clip fastened to the steel structure, one to the central head casting, and one to the connector pad on each entrance bushing, all parts of the interrupter will be grounded.
3. We recommend that 12 ground clusters, as described above, be made up for each substation. They can also be used for grounding during timing operations by connecting the clip on the long end of the lead to the head casting and leaving the other three clips on the end toward the steel support structure.
4. NOTE: When dismantling an interrupter head, it may be necessary to move the grounding leads or use short clip leads to keep all components grounded as parts are removed.
5. Reference: Substation Maintenance Manual

Procedure 1504 Safety Grounds and Field Test Procedure for Safety Grounds

TVA Safety Manual

1504 Safety Grounds and Field Test Procedure for Safety Grounds

Reference Number 1504

TVA Safety Manual Appendix: Reference

Safety Grounds and Field Test Procedure for Safety Grounds

Revision 5

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1. The standard safety ground cables are 1/0, 2/0 or 4/0, yellow thermo-plastic elastomer (TPE) jacketed, copper cable.

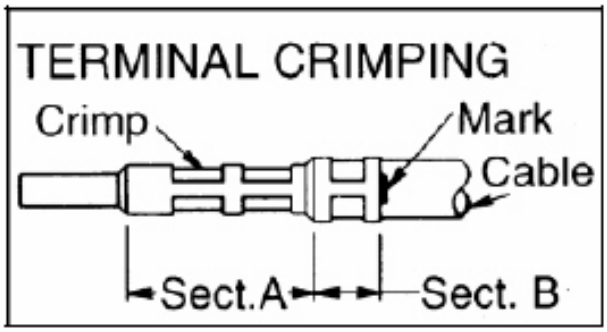
   TIIC Number (1/0) AJT-559P

   TIIC Number (2/0) CEB-747E

   TIIC Number (4/0) CGX-189D

   TIIC Number (250 MCM) CJR-824M

2. It is possible for the TPE-jacketed, copper-cable safety ground cables to be defective, although outward appearances indicated that they are in good condition. After considerable use, the conductor in the cable may deteriorate to such an extent that the cable is no longer safe for service. A suitable field-test procedure has been developed which can be used to check the condition of these ground cables. Such tests can be satisfactorily performed using an instrument capable of testing resistance in the range of 50 to 1,000 microhms. A “microhmer” or A. B. Chance Safety Ground Tester can be used for this purpose.
3. **Tables 1 and 2 Maximum DC Resistance Values for Safety Ground Sets Including Ground Clamps** (see pages 2 and 3) provides DC resistance values for various sizes of cables used in temporary safety ground assemblies. The DC resistance values include a 5% increase for ground assemblies that have been in service (used). A pass/fail criterion of a temporary safety ground assembly is based on the resistance value of the assembly (cable, ferrules and clamps). Resistance values for the cable sizes in Table 1 are based on temperature since a ±9°F change in ambient temperatures will cause a ±2% change in the measurement of resistance values. The values in Tables 1 and 2 are used to determine whether a safety ground assembly passes the resistance testing in accordance with the applicable tables in ASTM Standard F2249-03, “Standard Specification for In-Service Test Methods for Temporary Grounding Jumper Assemblies Used on De-Energized Electric Power Lines and Equipment”.
4. Prior to testing, temporary safety grounds must be inspected for defects. If any of the following defects are observed, the safety ground shall be removed from service:
   - Cracked or broken ferrules and clamps,
   - Exposed broken strands,
   - Cut or badly mashed or flattened cable,
   - Extensively damaged cable-covering material (outer jacket),
   - Swollen cable jacket or soft spots, indicating internal corrosion
   - Cable strands with black deposit on them
   - Loose connections in the clamps and ferrules
   - Improperly crimped ferrules (ferrules must have two (2) crimps in section A and one (1) crimp in section B)



Before temporary safety grounds can be placed back in service, they must be re-inspected and pass the requirements stated above.

Table 1 Maximum DC Resistance Values (mΩ) for Safety Ground Sets Including Ground Clamps

Cable Length, ft	1/0 Cable			2/0 Cable		
	5^0C (41^0F)	20^0C (68^0F)	35^0C (95^0F)	5^0C (41^0F)	20^0C (68^0F)	35^0C (95^0F)
1	0.417	0.423	0.429	0.397	0.402	0.407
2	0.514	0.526	0.538	0.474	0.484	0.493
3	0.611	0.630	0.648	0.551	0.565	0.580
4	0.708	0.733	0.757	0.628	0.647	0.667
5	0.805	0.836	0.866	0.705	0.729	0.753
6	0.902	0.939	0.975	0.782	0.811	0.840
7	0.999	1.043	1.084	0.859	0.893	0.926
8	1.096	1.146	1.194	0.936	0.974	1.013
9	1.193	1.249	1.303	1.013	1.056	1.100
10	1.290	1.352	1.412	1.090	1.138	1.186
11	1.387	1.455	1.521	1.167	1.220	1.273
12	1.484	1.559	1.630	1.244	1.302	1.360
13	1.581	1.662	1.740	1.321	1.383	1.446
14	1.678	1.765	1.849	1.398	1.465	1.533
15	1.775	1.868	1.958	1.474	1.547	1.619
16	1.872	1.971	2.067	1.551	1.629	1.706
17	1.969	2.075	2.176	1.628	1.711	1.793
18	2.066	2.178	2.286	1.705	1.792	1.879
19	2.163	2.281	2.395	1.782	1.874	1.966
20	2.260	2.384	2.504	1.859	1.956	2.053
25	2.746	2.900	3.050	2.244	2.365	2.486
30	3.231	3.416	3.596	2.629	2.774	2.919
35	3.716	3.933	4.142	3.014	3.183	3.352
40	4.201	4.449	4.688	3.399	3.592	3.785
45	4.686	4.465	5.234	3.783	4.001	4.218
50	5.171	5.481	5.780	4.168	4.410	4.651
55	5.656	5.997	6326	4.553	4.819	5.084

60	6.141	6.513	6.872	4.938	5.228	5.518
65	6.626	7.029	7.418	5.323	5.637	5.951
70	7.111	7.545	7.964	5.708	6.046	6.384
75	7.597	8.061	8.510	6.092	6.455	6.817
80	8.082	8.577	9.056	6.477	6.864	7.250
85	8.567	9.093	9.602	6.862	7.273	7.683
90	9.052	9.609	10.148	7.247	7.682	8.116
95	9.537	10.125	10.694	7.632	8.091	8.549
100	10.022	10.642	11.240	8.017	8.500	8.983

This table is based on ASTM F2249-03, Table 2. **Table 2 Maximum DC Resistance Values (mΩ) for Safety Ground Sets Including Ground Clamps**

Cable Length, ft	**4/0 Cable**			**250 MCM Cable**		
	5^0C (41^0F)	20^0C (68^0F)	35^0C (95^0F)	5^0C (41^0F)	20^0C (68^0F)	35^0C (95^0F)
1	0.638	0.371	0.374	0.364	0.367	0.369
2	0.417	0.423	0.429	0.408	0.413	0.419
3	0.465	0.474	0.483	0.452	0.460	0.468
4	0.514	0.526	0.538	0.496	0.507	0.518
5	0.562	0.577	0.592	0.540	0.554	0.567
6	0.610	0.629	0.647	0.584	0.600	0.617
7	0.659	0.680	0.701	0.628	0.647	0.666
8	0.707	0.732	0.756	0.672	0.694	0.716
9	0.756	0.783	0.810	0.716	0.741	0.765
10	0.804	0.835	0.865	0.760	0.787	0.815
11	0.852	0.886	0.919	0.804	0.834	0.864
12	0.901	0.937	0.974	0.848	0.881	0.913
13	0.949	0.989	1.028	0.892	0.927	0.963
14	0.998	1.040	1.083	0.936	0.974	1.012
15	1.046	1.092	1.137	0.980	1.021	1.062
16	1.094	1.143	1.192	1.024	1.068	1.111
17	1.143	1.195	1.246	1.068	1.114	1.161
18	1.191	1.246	1.301	1.112	1.161	1.210
19	1.240	1.298	1.355	1.156	1.208	1.260
20	1.288	1.349	1.410	1.200	1.255	1.309
25	1.530	1.606	1.682	1.420	1.488	1.556
30	1.772	1.864	1.955	1.640	1.722	1.804
35	2.014	2.121	2.227	1.860	1.955	2.051
40	2.256	2.378	2.500	2.080	2.189	2.298
45	2.498	2.635	2.772	2.300	2.423	2.545
50	2.740	2.893	3.045	2.520	2.656	2.793

55	2.982	3.150	3.317	2.740	2.890	3.040
60	3.224	3.407	3.590	2.960	3.124	3.287
65	3.466	3.664	3.862	3.180	3.357	3.535
70	3.708	3.922	4.135	3.400	3.591	3.782
75	3.950	4.179	4.407	3.620	3.824	4.029
80	4.192	4.436	4.680	3.840	4.058	4.276
85	4.434	4.693	4.952	4.060	4.292	4.524
90	4.676	4.951	5.225	4.280	4.525	4.771
95	4.918	5.208	5.497	4.500	4.759	5.018
100	5.161	5.465	5.770	4.720	4.993	5.266

This table is based on ASTM F2249-03, Table 2

Procedure 1505 Substation Locations Requiring Multiple Sets of Safety Grounds (FY 2008)

TVA Safety Manual

1505 Substation Locations Requiring Multiple Sets of Safety Grounds (FY 2008)

Reference Number 1505

TVA Safety Manual Appendix: Reference

Substation Locations Requiring Multiple Sets of Safety Grounds (FY 2008)

Revision 4

Station Bus	Available Fault Current (amperes)	Safety Grounds
ALLEN FP 161	44,268	2-1/0
ALCOA SS 161	26,373	1-2/0 or 2-1/0
BARKLEY 161	26,250	1-2/0 or 2-1/0
BATESVILLE 161	27,176	1-2/0 or 2-1/0
BRADLEY 161	31,918	1-2/0 or 2-1/0
BRADLEY 500	26,102	1-2/0 or 2-1/0
BROWNS FERRY NP 500	34,282	1-4/0 or 2-2/0
BULL RUN FP 161	51,478	2-2/0
CALVERT 161	34,502	1-4/0 or 2-2/0
CHICKAMAUGA HP 161	34,418	1-4/0 or 2-2/0
COLBERT FP 161	51,024	2-2/0
COLUMBIA 161	27,902	1-2/0 or 2-1/0
CONCORD 161	33,560	1-4/0 or 2-2/0
CORDOVA 1 161	45,077	2-1/0
CORDOVA 2 161	40,585	1-4/0 or 2-2/0
CORDOVA 500	28,806	1-2/0 or 2-1/0
CUMBERLAND 500	30,583	1-2/0 or 2-1/0
DAVIDSON 161	30,354	1-2/0 or 2-1/0
DAVISON 2 161	34,003	1-4/0 or 2-2/
DAVISON 500	29,345	1-2/0 or 2-1/0
EAST CALVERT 161	27,283	1-2/0 or 2-1/0
FINLEY 161	37,859	1-4/0 or 2-2/0
FORT LOUDOUN HP 161	28,606	1-2/0 or 2-1/0
FRANKLIN 161	38,902	1-4/0 or 2-2/0
FREEPORT 161	47,195	2-2/0
GALLATIN FP 1 - 161	32,713	1-2/0 or 2-1/0

GALLATIN FP 2 - 161	30,415	1-2/0 or 2-1/0
GALLATIN (TIED) - 161	50,622	2-2/0
JACKSON 161	26,802	1-2/0 or 2-1/0
JOHNSONVILLE FP 161	32,127	1-2/0 or 2-1/0
JOHN SEVIER 1 - 161	28,564	1-2/0 or 2-1/0
JOHN SEVIER 2 - 161	26,588	1-2/0 or 2-1/0
KENTUCKY HYDRO	29,038	1-2/0 or 2-1/0
KINGSTON FP 161	30,198	1-2/0 or 2-1/0
KNOX 161	27,086	1-2/0 or 2-1/0
LIMESTONE 161	33,323	1-4/0 or 2-2/0
LOWNDES 161	37,518	1-4/0 or 2-2/0
MARTHA 161	27,433	1-2/0 or 2-1/0
MADISON 1 - 161	29,489	1-2/0 or 2-1/0
MADISON 2 - 161	28,245	1-2/0 or 2-1/0
MARSHALL 161	45,171	2-1/0
MAURY 161	31,136	1-2/0 or 2-1/0
MOCCASIN 161	37,471	1-4/0 or 2-2/0
MONTGOMERY 161	29,143	1-2/0 or 2-1/0
NORTH KNOXVILLE 161	32,677	1-2/0 or 2-1/0
PARADISE 161	33,654	1-4/0 or 2-2/0
PHIPPS BEND 161	35,185	1-4/0 or 2-2/0
PIGEON FORGE 161	36,380	1-4/0 or 2-2/0
PIN HOOK 161	41,845	1-4/0 or 2-2/0
RACCOON HP 161	38,147	1-4/0 or 2-2/0
RADNOR 161	33,952	1-4/0 or 2-2/0
RATLIFF 161	49,767	2-2/0
ROANE 161	36,089	1-4/0 or 2-2/0
SHAWNEE FP 161	62,268	1-250mcm or 2-4/0
SHELBY 1 161	38,536	1-4/0 or 2-2/0
SHELBY 2 161	39,716	1-4/0 or 2-2/0
SHELBY 500	25,632	1-1/0
SOUTH CALVERT	26,452	1-2/0 or 2-1/0
SOUTH NASHVILLE 161	33,088	1-4/0 or 2-2/0
SQNP 161	55,377	2-2/0
SQNP 500	35,766	1-4/0 or 2-2/0
SULLIVAN 161	28,368	1-2/0 or 2-1/0
TRINITY 161	56,742	2-2/0
TRINITY 500	27,339	1-2/0 or 2-1/0
VOLUNTEER 1 - 161	34,221	1-4/0 or 2-2/0

VOLUNTEER 2 - 161	33,620	1-4/0 or 2-2/0
WATTS BAR 1 - 500	28,194	1-2/0 or 2-1/0
WATTS BAR 2 - 500	28,328	1-2/0 or 2-1/0
WEAKLEY 161	26,297	1-2/0 or 2-1/0
WEST NASHVILLE 161	33,363	1-4/0 or 2-2/0
WEST POINT 161	33,524	1-4/0 or 2-2/0
WIDOWS CREEK FP 1 161	36,755	1-4/0 or 2-2/0
WIDOWS CREEK FP 2 161	45,138	2-1/0
WILSON 161	43,773	2-1/0
WILSON HYDRO 161	28,374	1-2/0 or 2-1/0
WINCHESTER 161	26,178	1-2/0 or 2-1/0

Procedure 1506 Transmission Lines Requiring Multiple Sets of Safety Grounds (FY 2008)

TVA Safety Manual

1506 Transmission Lines Requiring Multiple Sets of Safety Grounds (FY 2008)

Reference Number 1506

TVA Safety Manual Appendix: Reference

Transmission Lines Requiring Multiple Sets of Safety Grounds (FY 2008)

Revision 4

Tranemission Line/Voltage	Structure Number(s)	Avail. Fault Cur.	No./Size Grounds
Allen FP-Horn Lake - 161	To Mississippi State Line	44,268	2-1/0
Alcoa SS-Alcoa #2 - 161	1-2	26,373	1-2/0 or 2-1/0
Alcoa SS-Alcoa #3 - 161	1-2	26,373	1-2/0 or 2-1/0
Alcoa SS-Alcoa #4 - 161	1-2	26,373	1-2/0 or 2-1/0
Alcoa SS-Nixon Road No. 2 - 161	334	26,373	1-2/0 or 2-1/0
Barkley-Dover - 161	7	26,250	1-2/0 or 2-1/0
Barkley-Hopkinsville - 161	20	26,250	1-2/0 or 2-1/0
Batesville-Blue Goose - 161	1-4	27,176	1-2/0 or 2-1/0
Batesville-Coffeeville - 161	1040-1038	27,176	1-2/0 or 2-1/0
Batesville-Oxford - 161	582-580	27,176	1-2/0 or 2-1/0
Batesville-W. Batesville - 161	1-5	27,176	1-2/0 or 2-1/0
Bradley-Concord No. 1	168-167	33,560	1-4/0 or 2-2/0
Bradley-Concord No. 1	166-156, 54-61	33,000	1-2/0 or 2-1/0
Bradley-Concord No. 2	134-133	33,560	1-4/0 or 2-2/0
Bradley-Concord No. 2	132-126, 1-7	33,000	1-2/0 or 2-1/0
Bradley-East Cleveland	71-65	31,918	1-2/0 or 2-1/0
Bradley-South Bradley	54-61, 652-653	31,918	1-2/0 or 2-1/0
Bradley-Consauga - 500	83	26,102	1-2/0 or 2-1/0
Bradley-Sequoyah - 500	87, 1-26	26,102	1-2/0 or 2-1/0
Brown Ferry-Limestone - 500	196-195	34,282	1-4/0 or 2-2/0
Brown Ferry-Limestone - 500	194-170	33,000	1-2/0 or 2-1/0
Brown Ferry-Madison No. 1 - 500	183-180	34,282	1-4/0 or 2-2/0
Brown Ferry-Madison No. 1 - 500	179-156	33,000	1-2/0 or 2-1/0
Brown Ferry-Maury - 500	1, 1A-1C	34,282	1-4/0 or 2-2/0
Brown Ferry-Maury - 500	1D-1Z, 2, 2A-2D	33,000	1-2/0 or 2-1/0
Brown Ferry-Trico - 500	1-4	34,282	1-4/0 or 2-2/0
Brown Ferry-Trico - 500	5-25	33,000	1-2/0 or 2-1/0
Brown Ferry-Trinity No. 1 - 500	1-4	34,282	1-4/0 or 2-2/0
Brown Ferry-Trinity No. 1 - 500	5-27	33,000	1-2/0 or 2-1/0
Brown Ferry-Union - 500	1-5	34,282	1-4/0 or 2-2/0
Brown Ferry-Union - 500	6-23	33,000	1-2/0 or 2-1/0
Brown Ferry-West Point - 500	176-179	34,282	1-4/0 or 2-2/0
Brown Ferry-West Point - 500	180-197	33,000	1-2/0 or 2-1/0
Bull Run-Alcoa SS- 161	1-8	51,478	2-2/0
Bull Run-Alcoa SS - 161	9-19, 127, 126	33,000	1-2/0 or 2-1/0
Bull Run-Elza - 161	53-46	51,478	2-2/0
Bull Run-Elza - 161	45-29	33,000	1-2/0 or 2-1/0
Bull Run-Lonsdale No. 1 - 161	1-8	51,478	2-2/0
Bull Run-Lonsdale No. 1 - 161	9-19	33,000	1-2/0 or 2-1/0
Bull Run-Lonsdale No. 2 - 161	1-9A	51,478	2-2/0
Bull Run-Lonsdale No. 2 - 161	10-18	33,000	1-2/0 or 2-1/0
Bull Run-N. Knox No. 1 - 161	1-9A	51,478	2-2/0
Bull Run-N. Knox No. 1 - 161	10-18, 55-50	33,000	1-2/0 or 2-1/0
Bull Run-N. Knox No. 2 - 161	1-8	51,478	2-2/0
Bull Run-N. Knox No. 2 - 161	9-24, 100-94	33,000	1-2/0 or 2-1/0
Bull Run-Norris HP - 161	1-8	51,478	2-2/0

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Procedure 1507 Notes on Using Multiple Sets of Safety Grounds

TVA Safety Manual

1507 Notes on Using Multiple Sets of Safety Grounds

Reference Number 1507

TVA Safety Manual Appendix: Reference

Notes on Using Multiple Sets of Safety Grounds

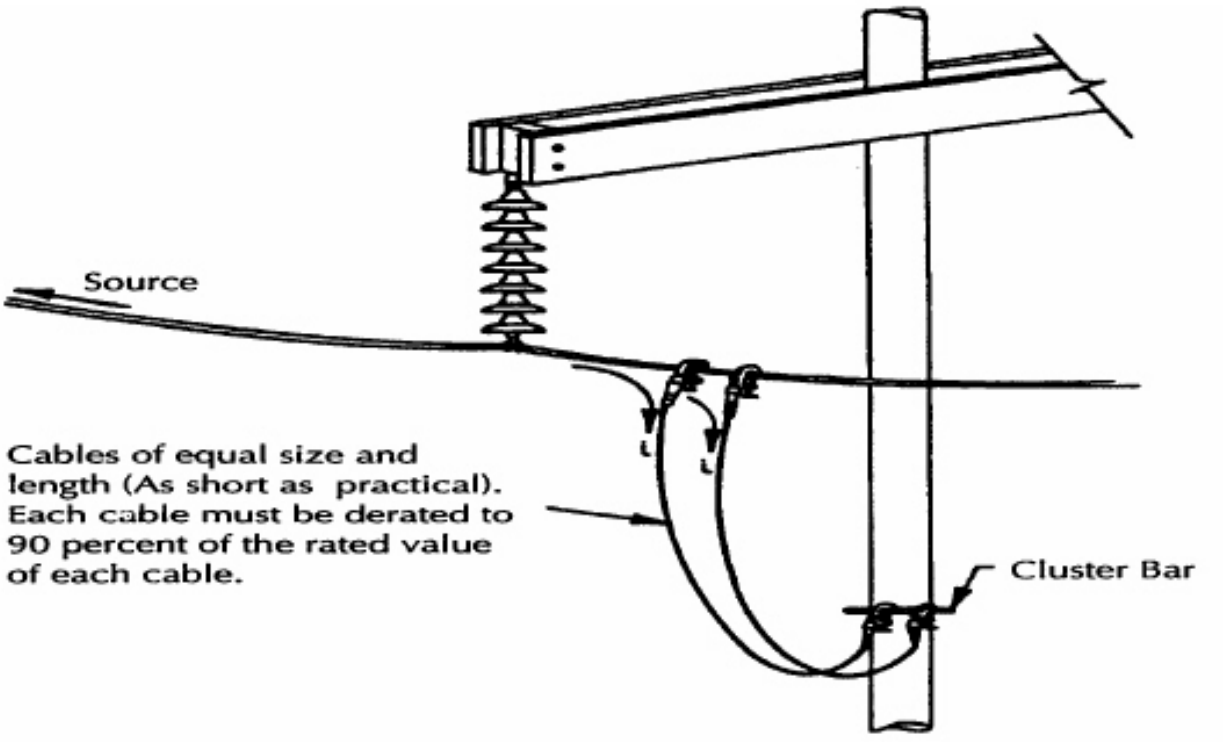
Revision 4

1. Available fault current was based on calendar year 2005 power system configuration and obtained from transmission planning data. Fault current is either three phase or phase-toground, whichever is higher. This data will be updated annually.
2. Sets of safety grounds required are based on ultimate capacity current at 15 cycles clearing time. A 90% de-rating factor is used for multiple grounds. Multiple safety ground cables must be of equal size and length and connected to the conductor and ground as close to the same point as possible.

Safety Ground	Single	Multiple (90% de-rated)
1/0 Copper	26,000	23,400
2/0 Copper	33,000	29,700
4/0 Copper	43,000	38,700

   The cables must be tied together to restrain the mechanical forces should the conductor be inadvertently energized (see figure 1 below).
3. In addition to the above list, structures requiring multiple safety ground sets should be marked with tags stating the required number of grounds.
4. Only the number of safety grounds shown in Section 15, procedure number 1505, “Substation Locations Requiring Multiple Sets of Safety Grounds” and procedure number 1506, “Transmission Lines Requiring Multiple Sets for Safety Grounds” should be used. A single 2/0 ground may only be substituted for a set of “two” 1/0 grounds where it is indicated in the charts. In the other situations, the single 2/0 ground is not sufficient.

Figure 1


Source
Cables of equal size and length (As short as practical). Each cable must be derated to 90 percent of the rated value of each cable.
Cluster Bar

Procedure 1508 Rigid Bus Current Carrying Capacity (Amperes)

TVA Safety Manual

1508 Rigid Bus Current Carrying Capacity (Amperes)

Reference Number 1508

TVA Safety Manual Appendix: Reference

Rigid Bus Current Carrying Capacity (Amperes)

Revision 1

COPPER TUBULAR BUS		
Size of Tube IBS	**Standard Pipe Size (Schedule 40) 50°C. Rise**	**Extra Heavy Pipe Size(Schedule 80) 50°C. Rise**
¾	860	980
1	1090	1270
1 ¼	1430	1620
1 ½	1620	1850
2	2000	2350
2 ½	2550	3050
3	3260	3750
3 ½	3900	4300
4	4350	4900

ALUMINUM TUBULAR BUS, ALLOY 6063-T6, 53% CONDUCTIVITY		
Size of Tube IBS	**Standard Pipe Size (Schedule 40) 50°C. Rise**	**Extra Heavy Pipe Size (Schedule 80) 50°C. Rise**
¾	624	
1	790	
1 ¼	1036	
1 ½	1175	
2	1450	
2 ½	1850	
3	2360	
3 ½	2825	3122
4	3150	3555
5	3900	4610
6	4740	5690

Rigid Bus Current Carrying Capacity (Amperes)
(Continued)

ALUMINUM ROUND CONDUCTOR, ALLOY 6101-T6, 56% CONDUCTIVITY, e = 0.50	
	50°C Rise
8" Outside Diameter - ½" Wall	7875

ALUMINUM INTEGRAL WEB CHANNEL BUS, ALLOY 6101-T6, 56% CONDUCTIVITY	
	50^0C. Rise
4" X 4"	4000
4" X 6"	5160
6" X 6"	7120
8" X 8"	9340
11" X 11"	12550

ALUMINUM BUS BAR, ALLOY 6106-T6, 58% CONDUCTIVITY			
Number Bars	Size	Configuration	50^0 Rise
1	¼" x 4"	Vertical	1410
1	¼" x 4"	Horizontal	1365
2*	¼" x 4"	Vertical	2455
2*	¼" x 4"	Horizontal	2350
3*	¼" x 4"	Vertical	3160
3*	¼" x 4"	Horizontal	3015
1	3/8" x 5"	Vertical	2170
1	3/8" x 5"	Horizontal	1970
1	3/8" x 8"	Vertical	3060
1	3/8" x 8"	Horizontal	2675

Bars spaced ¼ inch apart.

ALUMINUM UNIVERSAL ANGLE BUS, 3 ¼" X ¼", ALLOY 6101-T6, 56% CONDUCTIVITY	
	50^0 Rise
One Angle	1600
Two Angles Spaced 3/8" Apart	3000

Procedure 1509 Minimum Net Clearances from Live Parts Through Air

TVA Safety Manual

1509 Minimum Net Clearances from Live Parts Through Air

Reference Number 1509

TVA Safety Manual Appendix: Reference

Minimum Net Clearances from Live Parts Through Air

Revision 1

MINIMUM NET CLEARANCES FROM LIVE PARTS THROUGH AIR
Table 1

		OUTDOOR				
Nominal System Voltage (kV)	BIL (kV)	Open Switch Gap (S)* m (inches)	Phase to Ground (A)*‡ m (inches)		Between Phases (B)* m (inches)	
			Recommended	Minimum	Recommended	Minimum
7.2	95	0.178 (7)	0.191 (7.5)	0.152 (6) ‡	0.254 (10)	0.178 (7)
14.4	110	0.254 (10)	0.254 (10)	0.178 (7)	0.406 (16)	0.305 (12)
23	150	0.305 (12)	0.305 (12)	0.254 (10)	0.508 (20)	0.381 (15)
26	150	0.457 (18)#	0.330 (13)	0.274 (11)	0.533 (21)	0.406 (16)
26	200	0.457 (18)#	0.381 (15)	0.330 (13)	0.607 (24)	0.457 (18)
34.5	200	0.457 (18)	0.381 (15)	0.330 (13)	0.607 (24)	0.457 (18)
46	250	0.559 (22)	0.457 (18)	0.432 (17)	0.686 (27)	0.533 (21)
69	350	0.813 (32)	0.737 (29)	0.635 (25) ‡	0.914 (36)	0.787 (31)
115	550	1.27 (50)	1.193 (47)	1.067 (42) ‡	1.524 (60)	1.350 (53)
138	650	1.52 (60)	1.333 (52.5)	1.270 (50) ‡	1.676 (66)	1.600 (63)
161	750	1.73 (68)	1.562 (61.5)	1.473 (58) ‡	2.134 (84)	1.830 (72)
230	900	2.13 (84)	1.930 (76)	1.803 (71)	2.670 (105)	2.260 (89)
230	1050	2.64 (104)	2.299 (90.5)	2.108 (83)	3.023 (119)	2.670 (105)
345	1050	2.64 (104)	2.299 (90.5)	2.130 (84)	3.023 (119)	2.670 (105)
345	1300	3.05 (120)	2.692 (106)	2.642 (104)	3.429 (135)	3.020 (119)
500	1800	4.73 (186) •	3.962 (156)†	3.658(144)	6.096 (240)	•

‡ This dimension was increased from the previous design manual. For substations designed prior to 1996, please refer to Table 2 below.

• Values are not yet established by national standards.

† Ground clearances for 500 kV should be selected based on the system switching surge levels. See ANSI C2.

This open switch gap value results from the use of 34.5 kV insulation for 26 kV operating voltage.

* Dimensions are shown pictorially on Drawing HC-16024.

Table 2

Substations Designed Prior to 1996

	OUTDOOR
Nominal System Voltage (kV)	Phase to Ground (A) m (inches) Minimum*
7.2	0.127(5)
69	0.607(24)
115	1.016(40)
138	1.168(46)
161	1.397(55)

MINIMUM NET CLEARANCES FROM LIVE PARTS THROUGH AIR

Table 3

	INDOOR		
Nominal System Voltage (kV)	Phase to Ground (A) m (inches)	Between Phases (B) m(inches)	Phases to Barriers m(inches)
7.2	0.102(4)	0.152(6)	0..76(3)
14.4	0.165(6.5)‡	0.229(9)	0.127(5)
23	0.191(7.5)	0.330(13)	0.178(7)
26	0.203(8)	0.356(14)	0.203(8)
34.5	0.330(13)‡	0.457(18)	0.254(10)

‡ This dimension was increased from the previous standard. For substations designed prior to 1996, refer to Table 4.

Table 4

	INDOOR
Nominal System Voltage (kV)	Phase to Ground (A) m (inches)
14.4	0.152(6)‡
34.5	0.305(12)

Procedure 1510 Poles Average Weights

TVA Safety Manual

1510 Poles Average Weights

Reference Number 1510

TVA Safety Manual Appendix: Reference

Poles Average Weights

Revision 1

Poles-Average Weights of Oil-Treated

It should be understood that poles, even within the same class, vary in diameter and hence weight. Also, the moisture content of a pole changes under various conditions. Therefore, the weights given in this table should be taken as average values only, but they should prove sufficiently reliable.

Creosote Pine Pole 10 Pound Treatment									
Length (feet)	Class								
	1	2	3	4	5	6	7	9	10
30	1197	1013	862	733	618	515	424	347	270
35	1467	1257	1082	939	807	695	605		
40	1763	1518	1312	1141	991	862	755		
45	2080	1789	1557	1351	1193	1042	914		
50	2688	2303	2002	1754	1554				
55	3113	2670	2288	2011					
60	3916	3338	2850	2480					
65	4555	3791	3193	2787					
70	5242	4290	3567	3099					
75	5897	4805	3978	3427					
80	6656	5377	4410						
85	7488	5975	4878						
90	8466	6661	5366						
95	9485	7363	5803						
100	10764	8237	6365						

Average Weight of Steel Poles (pounds)									
Length (feet)	Class 1			H2			H4		
	Section			Section			Section		
	Top	Middle	Bottom	Top	Middle	Bottom	Top	Middle	Bottom
40			836						
45			968						
50			1106						
55			1250						
60	968		506	1150		599			
65	968		659	1150		778			
70	968		818	1150		964			
75	1216		751	1445		881	1610		1028
80	1216		922	1445		1081	1610		1264
85	1216		1099	1445		1288	1610		1509
90	1216		1283	1445		1502	1610		1763
95	1216		1473	1445		1723	1610		2026
100	1216		1669	1445		1951	1610		2298
105	1216		1871	1445		2186	1610		2579
110	1216	1281	916	1445	1503	1253	1610	1762	1510
115	1216	1281	1126	1445	1503	1538	1610	1762	1854
120	1216	1281	1343	1445	1503	1832	1610	1762	2208
125	1216	1280	1561	1446	1503	2133	1533	1230	2791
130	1216	1280	1790	1444	1885	1767	1535	1724	2670
135	1216	1280	2025	1447	1504	2760	1524	1945	2832
140	1216	1280	2266	1504	1515	2621	1529	1955	3200

Procedure 1511 Aluminum Bus Weights

TVA Safety Manual

1511 Aluminum Bus Weights

Reference Number 1511

TVA Safety Manual Appendix: Reference

Aluminum Bus Weights

Revision 0

The following tables provide weights for aluminum pipe conductors.

Table 1 ASA Schedule 40 Aluminum Pipe Conductors	
Nominal Pipe Size (inches)	Weight / Foot lbs / foot
1	0.581
1 ½	0.940
2	1.264
2 ½	2.004
3	2.621
3 ½	3.151
4	3.733
5	5.057
6	6.564
8 (O.D.)	13.850

Table 2 ASA Schedule 80 Aluminum Pipe Conductors	
Nominal Pipe Size (inches)	Weight / Foot lbs / foot
1	0.751
1 ½	1.256
2	1.737
2 ½	2.650
3	3.547
3 ½	4.326
4	5.183
5	7.188
6	9.884

Procedure 1512 Transmission Line Insulated Lifting Devices

TVA Safety Manual

1512 Transmission Line Insulated Lifting Devices

Reference Number 1512

TVA Safety Manual Appendix: Reference

Transmission Line Insulated Lifting Devices

Revision 0

Chance Strain Link Stick

Overall Length	Pole Dia and Length	Jaw Opening M"	Jaw Opening Max.	Max. Work Load, lb.	Approx. Wt., lb
4'-9"	1¼" x 4'	.22	.75	3500	3¾
7'-3"	1¼"x 6'	.22	.75	3500	5¼
9'-3"	1¼"x 8'	.22	.75	3500	6
11'-3"	1¼"x 10'	.22	.75	3500	6¾
13'-3"	1¼"x 12'	.22	.75	3500	7½
15'-3"	1¼"x 14'	.22	.75	3500	8¼
3'-3"	1½"x 2'	.44	1.06	6500	4¾
4'-9"	1½"x 4'	.44	1.06	6500	5¾
6'-9"	1½"x 6'	.44	1.06	6500	6¾
8'-9"	1½"x 8'	.44	1.06	6500	7¾
10'-9"	1½"x 10'	.44	1.06	6500	8¾
12'-9"	1½"x 12'	.44	1.06	6500	9¾
5'-0"	1½"x 4'	.72	1.50	6500	9⅞
7'-2"	1½"x 6'	.72	1.50	6500	11⅞
5'-2"	1½"x 4'	1.00	2.50	6500	11⅛
7'-2"	1½"x 6'	1.00	2.50	6500	13
9'-2"	1½"x 8'	1.00	2.50	6500	15
11'-2"	1½"x 10'	1.00	2.50	6500	17
13'-2"	1½"x 12'	1.00	2.50	6500	19

Chance Spiral Link Stick

Overall Length	Pole Dia and Length	Maximum Conductor Size	Max. Work Load, lb.	Approx. Wt., lb
27½"	1¼" x 15.4"	1510.5 kcmil ACSR	3500	3½
57½"	1¼" x 42"	1510.5 kcmil ACSR	3500	4½

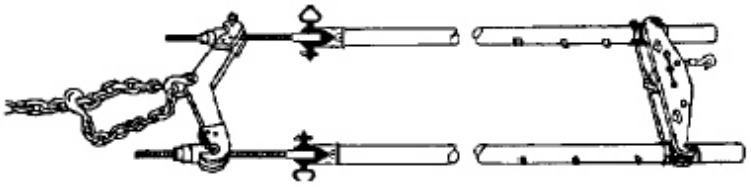
Overall Length	Pole Dia and Length	Maximum Conductor Size	Max. Work Load, lb.
58"	1¼" x 4'	605 kcmil ACSR	1000
82"	1¼" x 6'	605 kcmil ACSR	1000

Chance Adjustable Strain Poles

7,500-lb. maximum load rating (2"-diameter Epoxiglass pole)

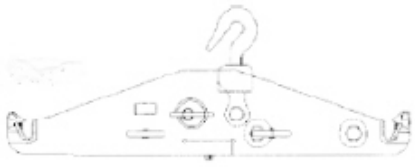
Description	Maximum Voltage Use	Insulated Section	Overall Length
6-ft. Strain Pole	72.5 kV	39 " (91.44cm)	7 ft.-8 "
7-ft. Strain Pole	169 kV	48 " (121.92cm)	8 ft.-8 "
8-ft. Strain Pole	242 kV	63 " (160.02 cm)	9 ft.-11 "
10-ft. Strain Pole	302 kV	84 " (213.36 cm)	11 ft.-8 "
12-ft. Strain Pole	362 kV	102 " (259.8 cm)	13 ft.-2 "
14-ft. Strain Pole	552 kV	135 " (342.9 cm)	15 ft.-11 "
18-ft. Strain Pole	765 kV	180 " (457.2 cm)	19 ft.-8 "

Chance Two - Poles Strain Carriers



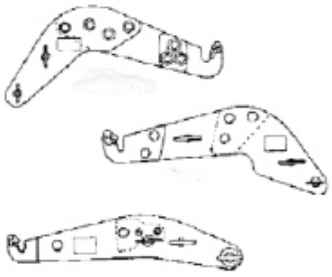
Maximum load rating for each of the strain carrier assemblies is 15,000 lb. per insulator string.

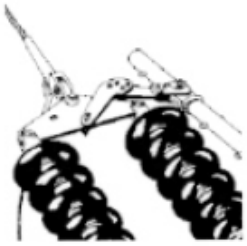
Chance Two - Poles Yoke



Maximum load ratings are 15,000 lb. per insulator string.

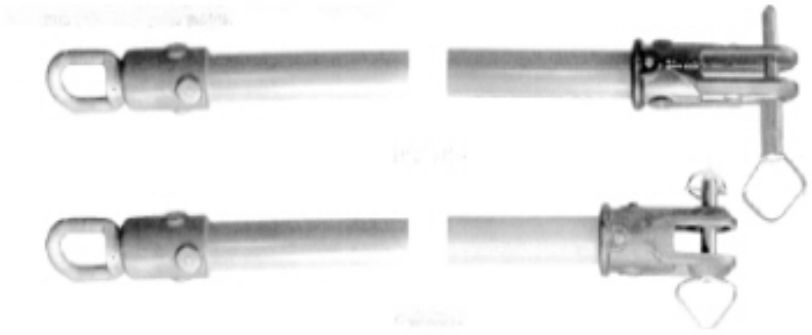
Chance Single – Poles Strain Carrier Yoke





All of these yokes are rated at 15,000 lb. maximum load per insulator string.

Chance Strain Poles for Bundle Conductor Yoke Plates



Description	Working Length	Maximum Load lb.
Clevis 3.35" x 1"	113"	12,000 lb.
Clevis 1.56" x 1"	113"	12,000 lb.
Clevis 1.56" x 1"	114"	12,000 lb.

Chance Suspension Link Stick

The Maximum load is 6,500 pounds

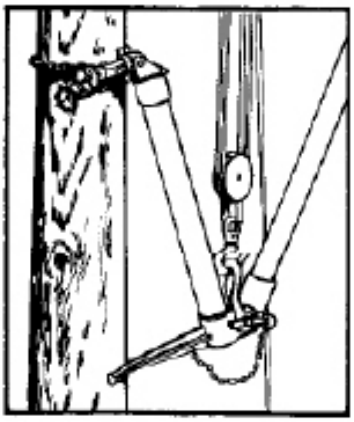
Chance Wire–Tong Saddle

The Maximum load is 1000 pounds

Chance Lever-Lift Wire Tong Support

Description	Working Load Per Tong
Single Type Lever Lift	1000 lb.
Double Type Lever Lift	750 lb.

Chance Epoxiglas Lever Lift

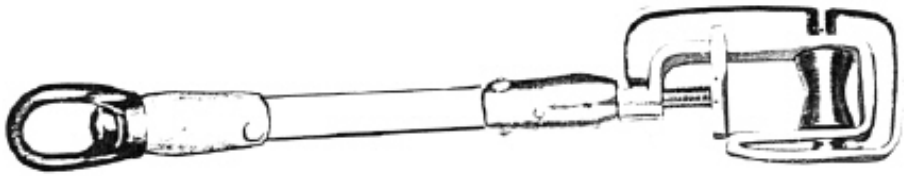


Description	Working Load Per Tong
Epoxiglas Lever Lift	1000 lb.

Hastings Strain Link Stick

Fiberglass Pole Diameter and Length	Overall Length	Maximum Wire Size	Maximum Working Load
1-1/4" x 2'	3'	1.38"	3000 lb.
1-1/4" x 4'	5'	1.38"	3000 lb.
1-1/2" x 4'	5'	1.38"	4000 lb.
1-1/2" x 4'	5'	1.75"	4000 lb.
1-1/2" x 6'	7'	1.75"	4000 lb.
1-1/2" x 6'	7' 4"	2.50"	4000 lb.
1-1/2" x 8'	9' 4"	2.50"	4000 lb.
2"x 6'	7' 4"	2.50"	5000 lb.
2"x 8'	9' 4"	2.50"	5000 lb.

Hastings Roller Link Stick



Fiberglass Pole Diameter and Length	Overall Length	Maximum Working Load
1-1/4" x 2'	3' 6"	1000 lb.
1-1/4" x 4'	5' 6"	1000 lb.

Hastings Spiral Link Stick (Heavy Duty)

F6 Pole Diameter and Length	Overall Length	Maximum Wire Size	Maximum Working Load
1" x 12"	24"	795 ACSR	2000 lb.
1" x 24"	36"	795 ACSR	2000 lb.
1" x 36"	48"	795 ACSR	2000 lb.
1" x 48"	60"	795 ACSR	2000 lb.

Chapter 5 Section 16 Useful Safety Information

Useful Information 1601 Definitions

TVA Safety Manual

1601 Definitions/Safety Terms

Useful Information Number 1601

TVA Safety Manual Appendix: Useful Information

Definitions/Safety Terms

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Useful Safety Information [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

References

[1] http://sharepoint.tva.gov/sites/osfg/3/Safety%20Toolbox/Forms/AllItems.aspx?RootFolder=%2fsites%2fosfg%2f3%2fSafety%20Toolbox%2fUseful%20Safety%20Information&FolderCTID=&View=%7bF5A58F54%2dF3C5%2d48A6%2dB49E%2dDBCC8901DD4B%7d

Useful Information 1602 Hand Signals for Controlling Crane Operations

TVA Safety Manual

1602 Hand Signals for Controlling Crane Operations

Useful Information Number 1602

TVA Safety Manual Appendix: Useful Information

Hand Signals for Controlling Crane Operations

Revision 2

Notice

This procedure has been canceled.

This information remains available in the Useful Safety Information [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Useful Information 1603 Hand Signals for Helicopter Operations

TVA Safety Manual

1603 Hand Signals for Helicopter Operations

Useful Information Number 1603

TVA Safety Manual Appendix: Useful Information

Hand Signals for Helicopter Operations

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Useful Safety Information [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Useful Information 1604 Hand Signals for Railroad Operations

TVA Safety Manual

1604 Hand Signals for Railroad Operations

Useful Information Number 1604

TVA Safety Manual Appendix: Useful Information

Hand Signals for Railroad Operations

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Useful Safety Information [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Useful Information 1605 Hand Signals for Wire Stringing Operations

TVA Safety Manual

1605 Hand Signals for Wire Stringing Operations

Useful Information Number 1605

TVA Safety Manual Appendix: Useful Information

Hand Signals for Wire Stringing Operations

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Useful Safety Information [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Useful Information 1606 Metric Conversion Units

TVA Safety Manual

1606 Metric Conversion Units

Useful Information Number 1606

TVA Safety Manual Appendix: Useful Information

Metric Conversion Units

Revision 2

Notice

This procedure has been canceled.

This information remains available in the Useful Safety Information [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Useful Information 1608 Color Code for Marking Physical Hazards and the Identification of Certain Equipment

TVA Safety Manual

1608 Color Code for Marking Physical Hazards and the Identification of Certain Equipment

Useful Information Number 1608

TVA Safety Manual Appendix: Useful Information

Color Code for Marking Physical Hazards and the Identification of Certain Equipment

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Useful Safety Information [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Useful Information 1610 TVA Medical Constraints Codes

TVA Safety Manual

1610 TVA Medical Constraints Codes

Useful Information Number 1610

TVA Safety Manual Appendix: Useful Information

TVA Medical Constraints Codes

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Useful Safety Information [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Useful Information 1611 Procedure for Handling Faulted SF6 Gas

TVA Safety Manual

1611 Procedure for Handling Faulted SF_6 Gas

Useful Information Number 1611

TVA Safety Manual Appendix: Useful Information

Procedure for Handling Faulted SF_6 Gas

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Useful Safety Information [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Useful Information 1612 Public Safety Operating Machines or Equipment Proximate to Power Lines

TVA Safety Manual

1612 Public Safety Operating Machines or Equipment Proximate to Power Lines

Useful Information Number 1612

TVA Safety Manual Appendix: Useful Information

Public Safety Operating Machines or Equipment Proximate to Power Lines

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Useful Safety Information [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Chapter 5 Section 17 Safety Permits

Safety Permit Spec 1701 Confined Space Entry Permit

TVA Safety Manual

1701 Confined Space Entry Permit

Safety Permit Spec 1701

TVA Safety Manual Appendix: Safety Permits

Confined Space Entry Permit

Revision 3

Notice

This procedure has been canceled.

This information remains available in the Safety Permits [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

References

[1] http://sharepoint.tva.gov/sites/osfg/3/Safety%20Toolbox/Forms/AllItems.aspx?RootFolder=%2fsites%2fosfg%2f3%2fSafety%20Toolbox%2fSafety%20Permits&FolderCTID=&View=%7bF5A58F54%2dF3C5%2d48A6%2dB49E%2dDBCC8901DD4B%7d

Safety Permit Spec 1702 Cutting, Welding, Open Flame and Spark Production Permit

TVA Safety Manual

1702 Cutting, Welding, Open Flame and Spark Production Permit

Safety Permit Spec 1702

TVA Safety Manual Appendix: Safety Permits

Cutting, Welding, Open Flame and Spark Production Permit

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Permits [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Permit Spec 1703 Drilling or Chipping in Concrete Permit

TVA Safety Manual

1703 Drilling or Chipping in Concrete Permit

Safety Permit Spec 1703

TVA Safety Manual Appendix: Safety Permits

Drilling or Chipping in Concrete Permit

Revision 2

Notice

This procedure has been canceled.

This information remains available in the Safety Permits [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Permit Spec 1704 TVA Excavation Permit

TVA Safety Manual

1704 TVA Excavation Permit

Safety Permit Spec 1704

TVA Safety Manual Appendix: Safety Permits

TVA Excavation Permit

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Permits [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Permit Spec 1705 High Hazard Lift Plan

TVA Safety Manual

1705 High Hazard Lift Plan

Safety Permit Spec 1705

TVA Safety Manual Appendix: Safety Permits

High Hazard Lift Plan

Revision 2

Notice

This procedure has been canceled.

This information remains available in the Safety Permits [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Permit Spec 1706 Radiography Authorization

TVA Safety Manual

1706 Radiography Authorization

Safety Permit Spec 1706

TVA Safety Manual Appendix: Safety Permits

Radiography Authorization

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Permits [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Permit Spec 1707 Scaffold Permit and Log

TVA Safety Manual

1707 Scaffold Permit and Log

Safety Permit Spec 1707

TVA Safety Manual Appendix: Safety Permits

Scaffold Permit and Log

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Permits [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Chapter 5 Section 18 Safety Forms

Safety Forms 1801 Accident Investigation and Reporting

TVA Safety Manual

1801 Accident Investigation and Reporting

Safety Forms Number 1801

TVA Safety Manual Appendix: Safety Forms

Accident Investigation and Reporting

Revision 3

Notice

This procedure has been canceled.

This information remains available in the Safety Forms [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

References

[1] http://sharepoint.tva.gov/sites/osfg/3/Safety%20Toolbox/Forms/AllItems.aspx?RootFolder=%2fsites%2fosfg%2f3%2fSafety%20Toolbox%2fSafety%20Forms&FolderCTID=&View=%7bF5A58F54%2dF3C5%2d48A6%2dB49E%2dDBCC8901DD4B%7d

Safety Forms 1802 Administrative and Program

TVA Safety Manual

1802 Administrative and Program

Safety Forms Number 1802

TVA Safety Manual Appendix: Safety Forms

Administrative and Program

Revision 2

Notice

This procedure has been canceled.

This information remains available in the Safety Forms [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Forms 1803 Committees and Teams

TVA Safety Manual

1803 Committees and Teams

Safety Forms Number 1803

TVA Safety Manual Appendix: Safety Forms

Committees and Teams

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Forms [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Forms 1804 General Purpose

TVA Safety Manual

1804 General Purpose

Safety Forms Number 1804

TVA Safety Manual Appendix: Safety Forms

General Purpose

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Forms [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Forms 1805 Inspections and Audits

TVA Safety Manual

1805 Inspections and Audits

Safety Forms Number 1805

TVA Safety Manual Appendix: Safety Forms

Inspections and Audits

Revision 2

Notice

This procedure has been canceled.

This information remains available in the Safety Forms [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Forms 1806 Hazard Assessments

TVA Safety Manual

1806 Hazard Assessments

Safety Forms Number 1806

TVA Safety Manual Appendix: Safety Forms

Hazard Assessments

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Forms [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Forms 1807 Equipment Inspections

TVA Safety Manual

1807 Equipment Inspections

Safety Forms Number 1807

TVA Safety Manual Appendix: Safety Forms

Equipment Inspections

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Forms [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Chapter 5 Section 19 Safety Tools

Safety Tools Procedure 1901 Chemical Inventory List

TVA Safety Manual

1901 Chemical Inventory List

Safety Tools Number 1901

TVA Safety Manual Appendix: Safety Tools

Chemical Inventory List

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Tools [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

References

[1] http://sharepoint.tva.gov/sites/osfg/3/Safety%20Toolbox/Forms/AllItems.aspx?RootFolder=%2fsites%2fosfg%2f3%2fSafety%20Toolbox%2fSafety%20Tools&FolderCTID=&View=%7bF5A58F54%2dF3C5%2d48A6%2dB49E%2dDBCC8901DD4B%7d

Safety Tools Procedure 1902 Horizontal Lifeline Load Estimator

TVA Safety Manual

1902 Horizontal Lifeline Load Estimator

Safety Tools Number 1902

TVA Safety Manual Appendix: Safety Tools

Horizontal Lifeline Load Estimator

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Tools [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Tools Procedure 1903 Injury Rate Calculator

TVA Safety Manual

1903 Injury Rate Calculator

Safety Tools Number 1903

TVA Safety Manual Appendix: Safety Tools

Injury Rate Calculator

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Tools [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Tools Procedure 1904 Injury Rate Goal Estimator

TVA Safety Manual

1904 Injury Rate Goal Estimator

Safety Tools Number 1904

TVA Safety Manual Appendix: Safety Tools

Injury Rate Goal Estimator

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Tools [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Tools Procedure 1905 Interlocking Audit Tracking

TVA Safety Manual

1905 Interlocking Audit Tracking

Safety Tools Number 1905

TVA Safety Manual Appendix: Safety Tools

Interlocking Audit Tracking

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Tools [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Tools Procedure 1906 Respirator Fit Test Tracking

TVA Safety Manual

1906 Respirator Fit Test Tracking

Safety Tools Number 1906

TVA Safety Manual Appendix: Safety Tools

Respirator Fit Test Tracking

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Tools [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Tools Procedure 1907 Safety Self-Assessments

TVA Safety Manual

1907 Safety Self-Assessments

Safety Tools Number 1907

TVA Safety Manual Appendix: Safety Tools

Safety Self-Assessments

Revision 2

Notice

The information included in TVA Safety Tools 1907, “Safety Self Assessments” is established in TVA Safety Procedure 222, “Safety Self Assessments”.

TVA Safety Tools 1907, “Safety Self Assessments” is cancelled.

This procedure number may be re-assigned in a future revision to the TVA Safety Manual

Safety Tools Procedure 1908 Safety Tools Procedure 1908 Template for Safety Awareness Bulletins

TVA Safety Manual

1908 Template for Safety Awareness Bulletins

Safety Tools Number 1908

TVA Safety Manual Appendix: Safety Tools

Template for Safety Awareness Bulletins

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Tools [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Tools Procedure 1909 Template for Safety Meeting Topics

TVA Safety Manual

1909 Template for Safety Meeting Topics

Safety Tools Number 1909

TVA Safety Manual Appendix: Safety Tools

Template for Safety Meeting Topics

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Tools [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Tools Procedure 1910 Template for Safety Training Materials Development

TVA Safety Manual

1910 Template for Safety Training Materials Development

Safety Tools Number 1910

TVA Safety Manual Appendix: Safety Tools

Template for Safety Training Materials Development

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Tools [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Tools Procedure 1911 Template for TVA Safety Procedures

TVA Safety Manual

1911 Template for TVA Safety Procedures

Safety Tools Number 1911

TVA Safety Manual Appendix: Safety Tools

Template for TVA Safety Procedures

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Tools [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Tools Procedure 1912 Health and Safety Training Requirements Assessment

TVA Safety Manual

1912 Health and Safety Training Requirements Assessment

Safety Tools Number 1912

TVA Safety Manual Appendix: Safety Tools

Health and Safety Training Requirements Assessment

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Tools [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Tools Procedure 1913 OSHA Cold Stress Equation

TVA Safety Manual

1913 OSHA Cold Stress Equation

Safety Tools Number 1913

TVA Safety Manual Appendix: Safety Tools

OSHA Cold Stress Equation

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Tools [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Tools Procedure 1914 OSHA Heat Equation

TVA Safety Manual

1914 OSHA Heat Equation

Safety Tools Number 1914

TVA Safety Manual Appendix: Safety Tools

OSHA Heat Equation

Revision 1

Notice

This procedure has been canceled.

This information remains available in the Safety Tools [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Tools Procedure 1915 Heat Stress Management Work Guide

TVA Safety Manual

1915 Heat Stress Management Work Guide

Safety Tools Number 1915

TVA Safety Manual Appendix: Safety Tools

Heat Stress Management Work Guide

Revision 2

Notice

This procedure has been canceled.

This information remains available in the Safety Tools [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Tools Procedure 1916 Respirator Regulator + SCBA Cylinder Testing Tracking

TVA Safety Manual

1916 Respirator Regulator + SCBA Cylinder Testing Tracking

Safety Tools Number 1916

TVA Safety Manual Appendix: Safety Tools

Respirator Regulator + SCBA Cylinder Testing Tracking

Revision 0

Notice

This procedure has been canceled.

This information remains available in the Safety Tools [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Tools Procedure 1917 Template for Annual Industrial Hygiene Plan

TVA Safety Manual

1917 Template for Annual Industrial Hygiene Plan

Safety Tools Number 1917

TVA Safety Manual Appendix: Safety Tools

Template for Annual Industrial Hygiene Plan

Revision 0

Notice

This procedure has been canceled.

This information remains available in the Safety Tools [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Safety Tools Procedure 1918 Arc Flash Incident Energy Calculator

TVA Safety Manual

1918 Arc Flash Incident Energy Calculator

Safety Tools Number 1918

TVA Safety Manual Appendix: Safety Tools

Arc Flash Incident Energy Calculator

Revision 0

Notice

This procedure has been canceled.

This information remains available in the Safety Tools [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Chapter 5 Section 20 How To

Procedure 2001 Calculate Work Injury / Illness Rates

TVA Safety Manual

2001 Calculate Work Injury / Illness Rates

How To Procedure Number 2001

TVA Safety Manual Appendix: How To

Calculate Work Injury / Illness Rates

Revision 2

Notice

This procedure has been canceled.

This information remains available in the How To [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

References

[1] http://sharepoint.tva.gov/sites/osfg/3/Safety%20Toolbox/Forms/AllItems.aspx?RootFolder=%2fsites%2fosfg%2f3%2fSafety%20Toolbox%2fHow%20To&FolderCTID=&View=%7bF5A58F54%2dF3C5%2d48A6%2dB49E%2dDBCC8901DD4B%7d

Procedure 2003 Conduct a Safety Inspection

TVA Safety Manual

2003 Conduct a Safety Inspection

How To Procedure Number 2003

TVA Safety Manual Appendix: How To

Conduct a Safety Inspection

Revision 1

Notice

This procedure has been canceled.

This information remains available in the How To [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Procedure 2004 Conduct a Safety Meeting

TVA Safety Manual

2004 Conduct a Safety Meeting

How To Procedure Number 2004

TVA Safety Manual Appendix: How To

Conduct a Safety Meeting

Revision 1

Notice

This procedure has been canceled.

This information remains available in the How To [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Procedure 2005 Find Material Safety Data Sheet

TVA Safety Manual

2005 Find Material Safety Data Sheet

How To Procedure Number 2005

TVA Safety Manual Appendix: How To

Find Material Safety Data Sheet

Revision 1

Notice

This procedure has been canceled.

This information remains available in the How To [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Procedure 2006 Find OSHA Information

TVA Safety Manual

2006 Find OSHA Information

How To Procedure Number 2006

TVA Safety Manual Appendix: How To

Find OSHA Information

Revision 1

Notice

This procedure has been canceled.

This information remains available in the How To [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Procedure 2007 Find Safety Information

TVA Safety Manual

2007 Find Safety Information

How To Procedure Number 2007

TVA Safety Manual Appendix: How To

Find Safety Information

Revision 1

Notice

This procedure has been canceled.

This information remains available in the How To [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Procedure 2008 Guidelines for Posting Information on Health and Safety Bulletin Boards

TVA Safety Manual

2008 Guidelines for Posting Information on Health and Safety Bulletin Boards

How To Procedure Number 2008

TVA Safety Manual Appendix: How To

Guidelines for Posting Information on Health and Safety Bulletin Boards

Revision 1

Notice

This procedure has been canceled.

This information remains available in the How To [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Procedure 2009 Handling Drums

TVA Safety Manual

2009 Handling Drums

How To Procedure Number 2009

TVA Safety Manual Appendix: How To

Handling Drums

Revision 1

Notice

This procedure has been canceled.

This information remains available in the How To [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Procedure 2010 Handle an OSHA Visit

TVA Safety Manual

2010 Handle an OSHA Visit

How To Procedure Number 2010

TVA Safety Manual Appendix: How To Handle an OSHA Visit

Revision 1

Notice

This procedure has been canceled.

This information remains available in the How To [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Procedure 2011 Grinding Wheel "Ring" Test

TVA Safety Manual

2011 Grinding Wheel “Ring” Test

How To Procedure Number 2011

TVA Safety Manual Appendix: How To

Grinding Wheel “Ring” Test

Revision 1

Notice

This procedure has been canceled.

This information remains available in the How To [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Procedure 2012 Sharpen Lineman's Climber's

TVA Safety Manual

2012 Sharpen Lineman’s Climber’s

How To Procedure Number 2012

TVA Safety Manual Appendix: How To

Sharpen Lineman’s Climber’s

Revision 1

Notice

This procedure has been canceled.

This information remains available in the How To [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Procedure 2013 Instructions for Conducting Regulatory Workplace Compliance Inspections

TVA Safety Manual

2013 Instructions for Conducting Regulatory Workplace Compliance Inspections

How To Procedure Number 2013

TVA Safety Manual Appendix: How To

Instructions for Conducting Regulatory Workplace Compliance Inspections

Revision 1

This procedure is cancelled

Information is now included in TVA-SPP-18.011 [1]

Procedure 2014 Obtain a Medical Examination

TVA Safety Manual

2014 Obtain a Medical Examination

How To Procedure Number 2014

TVA Safety Manual Appendix: How To

Obtain a Medical Examination

Revision 1

Notice

This procedure has been canceled.

This information remains available in the How To [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Procedure 2015 Obtain Industrial Hygiene Services

TVA Safety Manual

2015 Obtain Industrial Hygiene Services

How To Procedure Number 2015

TVA Safety Manual Appendix: How To

Obtain Industrial Hygiene Services

Revision 1

Notice

This procedure has been canceled.

This information remains available in the How To [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Procedure 2016 Check for Lead

TVA Safety Manual

2016 Check for Lead

How To Procedure Number 2016

TVA Safety Manual Appendix: How To

Check for Lead

Revision 0

Notice

This procedure has been canceled.

This information remains available in the How To [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Procedure 2017 Conduct Assessment of Confined Spaces

TVA Safety Manual

2017 Conduct Assessment of Confined Spaces

How To Procedure Number 2017

TVA Safety Manual Appendix: How To

Conduct Assessment of Confined Spaces

Revision 0

Notice

This procedure has been canceled.

This information remains available in the How To [1] folder of the Safety Toolbox which may be located on the Safety Programs SharePoint site.

Procedure 2018 Boost Vehicle Battery

TVA Safety Manual

2018 Boost Vehicle Battery

How To Procedure Number 2018

TVA Safety Manual Appendix: How To

Boost Vehicle Battery

Revision 0

Vehicle (autos, trucks, SUVs, etc.) type batteries emit hydrogen, a highly explosive gas, through vents in their cell caps. Any electric spark occurring when making a connection to the battery can set off an explosion. Safety practices are essential whenever a “live” battery in one vehicle is used to boost a “dead” battery in a disabled vehicle. Always use the correct step sequence when boosting a vehicle battery. Starting a vehicle using improper connections or out of sequence steps is dangerous to the individual and can damage the vehicles involved.

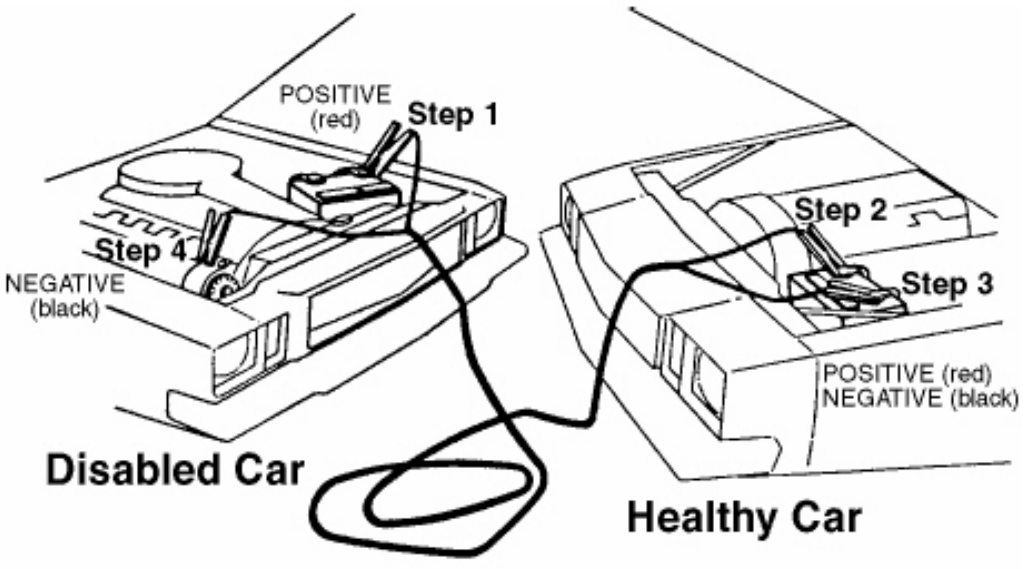
1. Make sure vehicles are not touching and that the booster cables will reach both vehicles.
2. Remove rings, wristwatches and other jewelry **before working on the batteries.**
   WARNING: A battery vents explosive hydrogen gas, especially when discharged and being jump-started. Keep all sparks and flames away from a battery. Do not smoke.
3. When boosting a battery in a TVA or TVA rented vehicle, you must wear TVA-approved eye protection (safety glasses with side-shields or goggles). When boosting your or someone else’s private vehicle, the use of safety goggles or safety glasses with sideshields is highly recommended.
4. Remove the cell caps from the dead battery, when possible. Some batteries are sealed and the caps cannot be removed; if so, move on to the next step. If the caps are removable, check the electrolyte level and add distilled water, if needed. Replace the caps if they are the vented type, otherwise cover the cell holes with a damp cloth. If temperatures are below freezing, check for ice in the dead battery. Never try to boost a frozen battery, replace it or thaw it completely.
5. Rinse with clear water promptly if battery electrolyte contacts your skin.
6. Make sure that both batteries are the same voltage. Do not attempt to boost a 6-volt battery with a 12-volt battery or a 12-volt battery with a 6-volt battery. One of the two vehicles may be damaged in the process.
7. Turn off the ignition and all accessories in both vehicles.
8. Put both vehicles in park or neutral with parking brakes set. The vehicles must not touch each other, but should be close enough that the booster cables will reach without stretching or crossing over the engine compartments.
9. Decide which cable of the booster cables will be positive and which will be negative; usually red or yellow is assigned to be positive and black is assigned to be negative. **An** illustration showing all connections is shown in Figure 1.
   CAUTION: Observe correct electrical system polarity when connecting jumper cables. The positive (+) cable must be connected to the positive (+) terminals of both batteries. The negative (-) cable must be connected to the negative (-) terminal of the booster battery and to a clean metal ground point on the engine of the disabled vehicle. Reversing the jumper cable connections will severely damage the electrical systems of one, or both, vehicles.
10. Attach one end of the positive (red or yellow) booster cable to the positive terminal of the disabled battery. Attach the other end of the (red or yellow) positive booster cable to the positive terminal of the healthy battery. Good metal-to-metal contacts are necessary. Sometimes, wiggling the cable clamp slightly will help to insure a good contact. However, don't over do it. **Warning:** Do not allow the ends of both positive and negative cables to

touch while attached to the batteries; sparks and short circuits will result!

11. Attach one end of the black negative cable, to the negative terminal of the booster battery. Before making this connection, be certain that the opposite end of the negative cable is not contacting either the positive cable or any part of either vehicle. Again, be sure of good metal-to-metal contact.
12. Connect the remaining end of the black negative cable to the engine block or thick metal frame of the vehicle with the dead battery. Do not connect it to sheet metal or any rotating part; damage will result. The connection should be made at a level lower than the battery and as far away from it as possible, but still under the hood. This will reduce the possibility of igniting any hydrogen gas that may be present above the dead battery.
13. Start the engine of the vehicle that has the booster battery. Let the engine for a few minutes with the cables attached. Then try to start the engine of the vehicle with the dead battery. Do not use the starter motor more than 30 seconds at a time. **Warning!** Cranking the engine for more than 30 seconds at a time may overheat the starter motor and damage it.
14. After the boosted engine starts, disconnect the booster cable connections in the reverse order of attaching them. **See Figure 1.**
    - Remove the black negative cable from the block or frame of the disabled vehicle.
    - Remove the black negative cable from the booster battery of the healthy vehicle.
    - Remove the red or yellow positive cable from the booster battery of the healthy vehicle.
    - Finally, remove the red or yellow positive cable from the battery of the disabled vehicle.
15. If you removed the vent caps from the boosted battery, replace them.
16. Use the accessories on the boosted vehicle sparingly until the battery is fully charged. If the engine stops before the battery is fully charged, it may require another boost.

Figure 1 Illustration of All Boosting Connections.

Attach cables in the sequence of Step 1 to 4 and detach cables in the sequence of Step 4 to 1.



Procedure 2019 Set-up OSHA Injury Recordkeeping

TVA Safety Manual

2019 Set-up OSHA Injury Recordkeeping

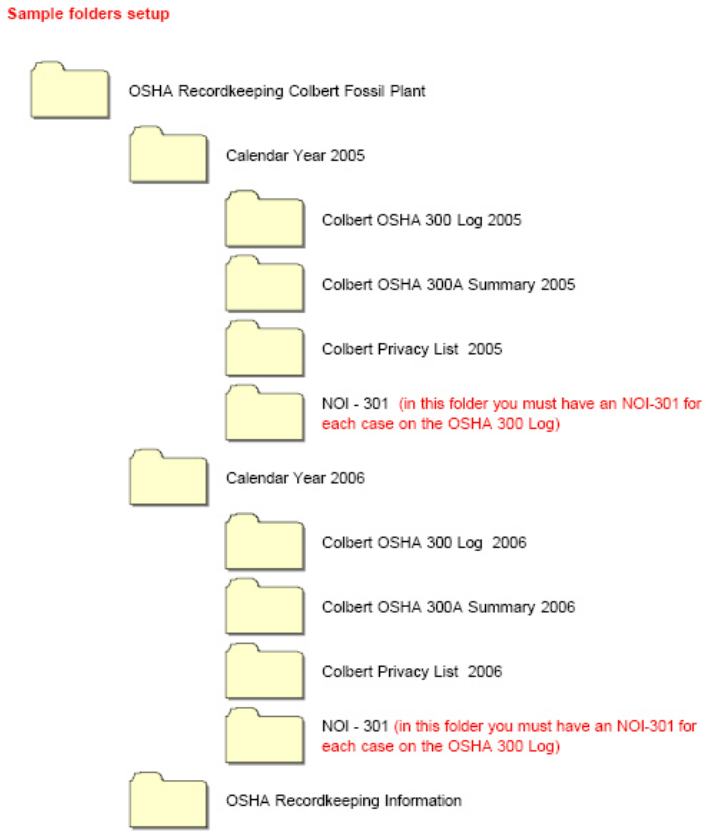
How To Procedure Number 2019

TVA Safety Manual Appendix: How To

Set-up OSHA Injury Recordkeeping

Revision 0

Following is a suggested arrangement of folders used for maintaining OSHA 300 Logs, OSHA 300A Annual Summary, OSHA 301-NOI forms and related information.



Procedure 2020 Elements of a Job Safety Plan

TVA Safety Manual

2020 Elements of a Job Safety Plan

How To Procedure Number 2020

TVA Safety Manual Appendix: How To

Elements of a Job Safety Plan

Revision 0

The following guidelines are designed to assist Technical Contract Managers (TCM) and prospective vendors and contractors working on TVA projects in establishing job safety plans for work performed. This does not include vendors simply making deliveries to sites.

Establishment of a job safety plan is essential to provide an environment free from recognized hazards and achieve the goal of zero accidents.

These guidelines address two areas: Job Plans for Low Hazard Work and Job Plans for High Hazard Work.

The TCM is encouraged to obtain assistance from the assigned TVA Safety Consultant to discuss which category a job qualifies for since every type of job cannot be included in this guideline.

Job Plans for Low Hazard Work:

Low hazard jobs are jobs that normally do not subject workers to potential injuries, that have not been associated with a recordable or lost time accidents or have the potential to result in such an injury due to the circumstances of the job. Consideration should be given to the environment where work is performed to assure that hazards are not present that could classify the task as high hazard. Examples include grass cutting, pressure washing, concrete finishing, sweeping, mopping, changing light bulbs, administrative work etc.

The job safety plan should include:

1. Description of the task or job
2. Expected duration of the job
3. List of hazards associated with the task
4. Specific abatement techniques developed to mitigate hazards such as engineering methods, administrative controls or personal protective equipment (PPE).
5. Training required for workers
6. Requirements for a pre job briefings of workers to discuss job scope and requirements for PPE and other safety precautions necessary to avoid injury.
7. Names and contact numbers of interfaces responsible for the job.
8. Controls needed to protect employees not assigned to the job, i.e. barricades, flagging etc.

Job Plans for High Hazard Work:

This category of jobs include activities that subject employees to high hazards or activities that have or resulted or have potential to result in lost time or recordable injuries. Some examples of high hazard jobs are working from elevation, rigging and lifting heavy materials, handling dangerous chemicals, working on high voltage equipment.

The job plan should include:

1. Description of each major evolution included in the job scope
2. Safety goals for the task
3. Techniques used to prepare for pre and post job briefings and methods to document these requirements
4. Procedure or method used to establish a written Job Safety Analysis for the task. A typical Job Safety Analysis as a minimum would include the scope of work, a list of all individual tasks performed to complete the task, all hazards associated with the task and methods used to mitigate the hazards.
5. Industrial hygiene plan of activities and precautions whenever the job involves working near hazardous chemicals or substances, (i.e., lead, asbestos, mercury etc.)
6. Work area access control and protection of personnel not associated with the task if needed
7. Names and contact numbers of interfaces responsible for the job
8. Training required for the workforce and the location of training record documentation
9. Accident investigation and reporting process
10. Emergency response and treatment plans for accidents
11. Discipline process for safety non conformances and unacceptable human performance issues resulting in an accident
12. Safety meeting requirements