

Federal Wage System Job Grading Standards for Electric Power Controlling, 5407

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WORK COVERED

This standard covers nonsupervisory work involved in controlling the generation or distribution of electric power. The jobs are located at power generating plants, power distribution centers, and substations. This work requires the ability to anticipate load changes due to such items as work schedules and weather in order to engage or cut out power sources, to interpret wiring diagrams for a complete primary power system in order to plan routings and locate failures, and to determine the need for and, if warranted, follow emergency procedures in order to insure safety and provide continuous electric service. Employees know how to operate electric power generating and controlling equipment such as high voltage generators, rotary converters, transformers, motor-generators, and remotely operated switches and circuit breakers.

WORK NOT COVERED

This standard does not cover work that primarily involves:

- Installing, testing, repairing, and maintaining generators, transformers, converters, and associated equipment in a powerhouse or power substation, or installing, repairing and maintaining primary overhead and underground electrical distribution systems (See [Job Grading Standard for High Voltage Electrician, 2810.](#))
- Operating boiler plants to generate steam for electrical power (See [Job Grading Standard for Boiler Plant Operating, 5402.](#))

TITLES

Jobs graded by this standard are titled *Electric Power Controller*.

GRADE LEVELS

This standard describes two grade levels, grades 8 and 10. Two typical work situations are described for grade 10. The standard does not describe all possible grades at which jobs might be established. If jobs differ substantially from the skill and knowledge and other work requirements described for the grade levels of the jobs in the standard, they may be graded above or below the levels described based upon sound job grading methods.

SPECIAL ADDITIONAL RESPONSIBILITIES

This section provides guidance for determining the grade level of certain electric power controlling situations. The Electric Power Controller Standard describes normal operation. However, employees in certain electric power controlling operations work under special circumstances. When positions clearly meet the criteria described below, one additional grade may be credited to controller positions at the full performance level whether they work alone or with a small group of electric power control employees. It is the intent of this provision that only one operator on each shift be credited with an additional grade for shift-level responsibility.

Additional grade credit will be added only to plant operators at the full performance level who are assigned shift responsibility on a regular and recurring basis. Credit will not be given to plant operators who regularly work when a shift supervisor is present or at a nearby facility. Most electric power control rooms run on a 7-day, 3-shift plan. Operators may be assigned to a specific shift or alternate working on all three shifts, including weekends. On second and third shifts and on weekends, one operator is typically designated as the "operator in charge" of the complete plant, including ancillary and stand-alone electric power controlling facilities which may be geographically dispersed, and he or she is responsible for following instructions which are typically supplied in writing from a supervisor or by the "operator in charge" on the previous shift. The "operator in charge" typically performs additional duties which are more responsible and require a slightly higher level of skill and knowledge than full performance level operators who are on duty where a supervisor is available to provide specific guidance and assistance.

The "operator in charge" must have a thorough knowledge of the entire electric power controlling system and user requirements in order to locate problems and initiate immediate corrective action to maintain adequate power distribution. He or she, in the absence of written contingency procedures, must have the responsibility to decide whether to shut down the operation or attempt to bypass the trouble until corrective action has been completed if the equipment still in operation can handle the load. Typically, the "operator in charge" has responsibility to determine what work must be done and has the authority to approve overtime or to call in necessary maintenance personnel. The operator is responsible for relaying instructions to the next shift operator including problems encountered and action taken.

While these and other similar situations do not describe supervisory responsibilities, they represent situations which indicate that individuals designated as "operator in charge" have more responsibility and a higher level of skill and knowledge than operators who have a supervisor who is available for technical advice and guidance.

ELECTRIC POWER CONTROLLER, GRADE 8

General: Grade 8 electric power controllers distribute and control electrical energy through a primary electrical distribution system connecting a moderate number of transformer and switching stations presenting limited routing possibilities. The power system serves office or residential users. The system is characterized by stable load demands and predictable degree and timing of variations. The electric power controller may be located at a central control switchboard of a moderate-sized activity or a manually controlled substation of a larger system such as at a military base or similar self-contained distribution system.

Electric power controllers at this level monitor the distribution of electric power to various consumer points. They operate switchboard controls to adjust remotely controlled circuit breakers, transformers, and switches to regulate and maintain proper voltage on the distribution lines. They report abnormal operating conditions and reroute power through alternate feeders to user areas in case of emergency cutouts or extensive scheduled repair. They also notify repair crews of the location of failure and assure that circuits are open and tagged before work is started.

In addition, the controllers may operate switchboard controls to start, stop, cut in and out, and synchronize diesel-electric generators to provide emergency power or meet peak power demands. They keep an hourly log of meter readings and they record shutdowns, connection and disconnection of circuits, and similar occurrences.

Skill and Knowledge: Electric power controllers at this level know how to operate a control board and associated switches and circuit breakers of a system characterized by stable load demands and predictable load variations such as office or residential loads which are primarily resistive in nature. They detect improper line voltage, open circuits, or similar conditions from meter readings in the control room and adjust controls, such as changing transformer taps, or directing work crews to switch feeders in or out.

Grade 8 electric power controllers must know fundamental alternating current circuit theory, e.g., how generators and transformers function, and the inductive and capacitive reactance of power distribution lines, in order to understand the effects of changes of voltage or current on the power system. They use algebra to compute the measurement of such items as total impedances, current flow, and voltage of AC circuits with inductive and capacitive branches in order to determine whether bypass routings around outages will be able to carry the load.

Controllers at this level interpret and apply oral and written operating instructions and electrical diagrams and drawings that apply directly to the electric power distribution system. For example, they interpret operating instructions and distribution equipment operating criteria to determine when to adjust the taps on a transformer in order to maintain voltage on the feeder, when the probable alternative operating conditions and appropriate actions have been specified.

Responsibility: Grade 8 electric power controllers receive detailed oral and written instructions from their shift supervisors. Decisions made are covered by specific, well-established work

methods and procedures. In the event problems arise, controllers at this level take corrective action in accordance with instructions or notify their supervisor.

Physical Effort: Controllers at this grade level experience prolonged sitting as well as periods of walking, standing, and stooping, and lifting items weighing up to 23 kilograms (50 pounds).

Working Conditions: Controllers at this grade level primarily work inside in well-lighted, and comfortable work spaces. They may work outdoors for short periods and occasionally work in proximity to high voltages and currents. They are subject to electrical burns and shocks.

ELECTRIC POWER CONTROLLER, GRADE 10

General: Grade 10 electric power controllers distribute and control electrical energy through a primary electrical distribution system connecting numerous substations and switching stations, presenting many alternate routing possibilities. The power system serves a large activity or several closely related activities, such as military bases or other installations with similar self-contained distribution systems, which have many industrial or testing facilities that often cause wide fluctuations in load demand. Grade 10 electric power controllers:

- Schedule power for various users in order to even out demand fluctuations and minimize peak power demands and assign blocks of power. They may refuse to pick up low priority loads when operating at or near capacity.
- Control and distribute electrical power through the primary distribution system, and operate the central switchboard to actuate remotely controlled circuit breakers, transformers, and switches in order to regulate and maintain proper voltage on the distribution lines; they tie secondary circuits into the system, or prevent large loads from overloading the system by switching in parallel feeders or shifting the load to a higher capacity feeder.
- Closely monitor data from wattmeters, voltmeters and ammeters of various feeders. They observe operation of relays on feeders and remote operation of numerous substations, detect indications of deteriorating conditions, and assure that equipment is operating within safe limits.
- When malfunctions occur they determine and take actions to isolate and bypass the fault in order to maintain service or take actions to shed low priority loads when full service cannot be maintained. They inform electrical line repairers of the location of failure, cause, repairs needed, and assure that circuits are open and tagged before work is started.

Grade 10 electric power controllers may service and adjust converters, transformers, and switch gear. They may check and adjust commutators and slip rings, replace brushes and switch contacts, oil and clean rotating equipment, replace parts, make minor repairs, and calibrate telemeters at outlying substations.

Skill and Knowledge: Grade 10 electric power controllers know how to operate power distribution systems characterized by a wide variety of uses, including industrial operations which have large load changes, reactive loads requiring control of the power factor, and some peak loads which require setting up parallel networks. The controllers plan and control power distribution and can operate control boards, remote and manually controlled transformers, switches, and circuit breakers. They analyze a variety of interrelated meter indications to detect abnormal conditions such as circuit overloads, improper line voltages, and equipment temperature. They also determine the causes and make necessary corrections such as adjusting controls, balancing loads by adjusting phase relationships to improve the power factor, changing transformer taps to regulate feeder voltage, switching to other equipment, or isolating the affected circuit and dispatching repair crews.

Controllers at this level must be familiar with voltage regulation, frequency control devices, theories of high-voltage transmission, and corona loss in order to operate equipment and determine and minimize circuit losses. They must know trade mathematics in order to calculate items such as the amount of resistive and reactive loads, and phase relationships of loads in order to identify unbalanced low efficiency loads, circulating currents, or other undesirable conditions. Controllers must know the effects of reactive loads and the procedures necessary to compensate for them.

Grade 10 controllers must interpret priority lists to plan load shedding schedules, interpret load requests in order to schedule blocks of power requested by users, balance capacitance and reactive loads to achieve a good power factor, and make maximum use of purchased power. They must know how to interpret operating instructions and distribution equipment operating criteria in order to determine the proper time to switch in other feeders, tie in parallel equipment, or adjust transformer taps to keep within the specified operating ranges of voltage and current or set up the system to handle heavy loads.

They interpret circuit diagrams and equipment layout drawings to determine which items such as circuit breakers and transformers can be operated. The controllers determine what rerouting can be done to provide power to undamaged portions of the system and what circuits they should open to allow others to make repairs safely.

Responsibility: Grade 10 electric power controllers receive work assignments from a supervisor or a higher grade operator either orally or in writing. They use judgment in interpreting guidelines such as load shedding priority schedule, operating criteria of equipment, schematics, and wiring diagrams. They also determine what problems to refer to the supervisor, e.g., refusing to pick up load request when the additional load would be within the capacity of the system but anticipated weather conditions could put the system over the maximum capacity limit. Grade 10 controllers report to the supervisor all special occurrences such as emergency outages and corrective actions taken to maintain service. They anticipate unscheduled load changes, and detect early indications of equipment malfunctions in order to maintain continuous service.

Physical Effort: Same as [grade 8 level](#).

Working Conditions: Same as [grade 8 level](#).

ELECTRIC POWER CONTROLLER, GRADE 10

General: Grade 10 electric power controllers distribute and control electrical energy through a primary electrical distribution system connecting a commercial power source, Government- operated power plant, and numerous substations and switching stations. The power system serves a large activity or several closely related activities, such as military bases or other installations with similar self-contained distribution systems, which have many industrial or testing facilities that often cause wide fluctuations in load demand. Grade 10 electric power controllers:

- Operate alternating current and direct current switchboards to control and distribute electrical power through the primary distribution system, operate controls to actuate remotely controlled circuit breakers, transformers and switches in order to regulate and maintain proper voltage on the feeders, tie secondary circuits into the system, and prevent overloads on the feeders by isolating large loads on separate circuits. Operators connect, disconnect, parallel, or substitute electrical units or conductors by remote control from the control switchboard.
- Closely monitor load indicator gauges to detect large changes in load and operate turbo alternator or diesel generator controls, changing the governor setting, adapt to these load changes, and maintain the optimum demand on commercial sources. The controllers are aware of factors that will cause large changes in load such as abrupt changes in weather conditions or scheduled changes in industrial operations. They also coordinate with boiler plant operators to anticipate these changes and get boilers and turbines on or off line. They control the electrical generation and start, stop, parallel, and synchronize turboalternators and rotary converters.

Closely monitor data from wattmeters, voltmeters and ammeters of the feeders and observe operation of feeder relays and substations. When indications of deterioration or malfunction are observed, grade 10 controllers determine actions to take to isolate and bypass the order to maintain service or take actions to shed low priority loads when full service cannot be maintained. They inform electrical line repairers of the location, cause of failure, repairs needed, and assure that circuits are open and tagged before work is started.

In addition, they may operate auxiliary systems located in the power plant area such as emergency generators, air compressors, and water or sewage pumps and may perform minor maintenance of control equipment such as cleaning and adjusting relays and controls. Controllers record in log books all necessary data on electrical generation, turbine operation, electrical distribution, and similar functions.

Skill and Knowledge: Grade 10 electric power controllers know how to operate power distribution systems characterized by a wide variety of uses, including industrial operations which have large load changes, reactive loads which require control of the power factor, and some peak loads which require setting up to operate control boards, generators, remote and manually controlled transformers, switches, and circuit breakers.

They analyze a variety of interrelated meter indications to detect abnormal conditions such as circuit overloads, improper line voltages, or equipment temperature; they can determine the causes of these abnormal conditions and make necessary corrections by adjusting controls such as balancing loads by adjusting phase relationships to improve power factor, or changing transformer taps by regulating feeder voltage, switching to other equipment, or isolating the circuits affected and dispatching repair crews.

The grade 10 level electric power controllers know how to manipulate controls in power plants in order to start and stop the generator, synchronize it with the system and pick up the load, paralleling it on the bus; they know how to control generator output to clip the peak load drawn from commercial systems and keep a close relationship between peak power drawn and normal commercial purchases.

Their knowledge of electricity includes voltage regulation, frequency control devices, theories of high voltage transmission, and corona loss. They must know electrical theory and trade mathematics in order to calculate such items as the amount of resistive and reactive loads, and phase relationship of loads in order to identify unbalanced low efficiency loads, circulating currents, or other undesirable conditions. Grade 10 level controllers also know the effects of the reactive loads and what to do to compensate for them. They interpret priority lists to plan load-shedding schedules, interpret load requests to schedule blocks of power requested by users, balance capacitance and reactive loads to achieve a good power factor, and make maximum use of purchased power, including what local generating capacity will be necessary to clip peak demands. Also, they interpret operating instructions and distribution equipment operating criteria to determine the proper time to switch in other feeders, tie in parallel equipment, adjust transformer taps to keep within the specified operating range of voltage and current, or set up the system to handle heavy loads.

They know how to interpret circuit diagrams and equipment layout drawings in order to determine which electrical items such as circuit breakers and transformers can be operated, what rerouting can be done to provide power to undamaged portions of the system, and what circuits they should open to allow others to make repairs safely.

Responsibility: Grade 10 electric power controllers receive work assignments from a supervisor or a higher grade operator either orally or in writing. They use judgment in interpreting guidelines such as operating criteria of equipment, schematics and wiring diagrams and determining load priority of various industrial facilities in order to set the automatic load shedding equipment. Normally, the controllers at this level determine what problems to refer to the supervisor. However, all special occurrences, such as emergency outages and corrective actions taken to maintain service, must be reported to the supervisor. Grade 10 electric power controllers are expected to anticipate unscheduled load changes and detect early evidences of equipment malfunction in order to maintain continuous service.

Physical Effort: Same as [grade 8 level](#).

Working Conditions: Same as [grade 8 level](#).