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Manual

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This Manual provides procedures for planning, designing, and constructing Major facilities modernization or construction programs.

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NOTE: Highlighted words or phrases are defined in the Glossary.

1. AUTHORITIES

- ! 7 USC 2250
- ! Public Law 99-198, Food Security Act of 1983
- ! Public Law 92-582, The Brooks Act

2. INTRODUCTION

The purpose of this manual is to define major facilities construction and outline the process for managing major facilities construction projects. This manual prescribes the necessary steps and sequence of the responsibilities of key participants in the process.

A major facilities construction project is one which provides for the construction of a new facility or provides for the major renovation (modernization) of a facility.

A major facilities construction project is generally designated by the following:

- New Congressional appropriation (usually above \$1 million)
- Agency or Congressionally-funded modernization (usually above \$1 million)

The objective of major facilities construction project management is to effectively develop, coordinate, design and construct fully functional and usable facilities to fulfill the Agency's mission. To meet this objective, it is ARS policy to follow the procedures in this manual for the following:

- Expression of program needs and objectives in accordance with the Agency's mission.
- Understanding methods of meeting program objectives through the acquisition of planning, design, and construction services.
- Establishment of roles, responsibilities, authorities, and accountability for management of major facilities construction projects.

3. ABBREVIATIONS

Project Team Titles:

A-E - Architect-Engineer

AOE - Area Office Engineer

ASHM -	Area Safety and Health Manager
CIC -	Construction Inspection Contractor
CO -	Contracting Officer
COR -	Contracting Officer's Representative
DR -	Design Reviewer
EPM -	Engineering Project Manager
LM -	Location Monitor
NPSR -	National Program Staff Representative
RPM -	Research Program Manager
RPMB -	Real Property Management Branch
RPR -	Research Program Representative
SHEMB -	Safety, Health and Environmental Management Branch

Other Titles:

AAO -	Area Administrative Office
ABFO -	Area Budget and Fiscal Office
AD -	Area Director
LAO -	Location Administrative Office
LC -	Location Coordinator
LD -	Laboratory Director
RL -	Research Leader
RPO -	Real Property Office

Organizational Titles:

ADMIN -	Administrator
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AITD -	Administrative Information and Technology Division, AFM
BPMS -	Budget and Program Management Staff, ARS
FD -	Facilities Division, AFM
FMD -	Financial Management Division, AFM
LS -	Legislative Staff, ARS
NPS -	National Program Staff, ARS
OBPA -	Office of Budget and Program Analysis, USDA
OMB -	Office of Management and Budget

4. ROLES AND RESPONSIBILITIES

There are three distinct areas of project management: 1) Program Management is ensuring that all program requirements are articulated and included in the project; 2) Contract Management is being responsible for final development of applicable contract terms and conditions, ensuring all terms and conditions are contractually enforceable and enforcement of all contract terms and conditions; and 3) Engineering Project Management is ensuring all technical and program management issues are addressed and incorporated into the project. Project management is accomplished by the Project Team.

The Project Team is a diverse group of ARS professionals contributing their skills, talent, and knowledge to plan, design, and construct a research facility in support of the Agency's research mission within a specified budget and schedule. The Project Team is generally established at the time the project requirements are determined. The priority of each member of the Project Team is the accomplishment of the group's common goal--to plan, design, and construct the best facility possible within the time and monetary resources available. In this team relationship, individual members 1) perform different tasks and responsibilities as needed by the group, 2) jointly share responsibility for ensuring team results, 3) develop clear strategies and approaches for achieving their team goal, 4) help each other in achieving their common purpose, and 5) recognize individual achievements with team accomplishments. This approach needs to be followed by all team members on a consistent and effective basis through all phases of an ARS major facilities construction project.

Under each phase of this process, specific responsibilities of the Project Team members are discussed. The members of the Project Team are essential for the successful planning and completion of major facilities construction projects. The members of the Project Team are accountable for the successful and timely execution of the project.

The general roles and responsibilities of each Project Team member are as follows:

Research Program Manager (RPM):

The RPM is usually the Area Director. The RPM is responsible for establishing the research program requirements and selecting the RPR. The RPM retains final authority for decisions on program issues of the project, but this authority is frequently delegated to the RPR. The RPM relies upon various Project Team members for technical engineering and contracting support during the design and construction process. The RPM approves the Functional Statement developed by the RPR and is involved in the development of the Action Plan and Fact Sheet. Any deviations from the Action Plan and Fact Sheet must have the approval of the RPM and be communicated to the Project Team for appropriate action that will ensure that such deviations are reflected in the final contract documents. The RPM has final approval authority of the preliminary Program of Requirements (POR) developed by the Research Program Representative (RPR) and Engineering Project Manager (EPM), ensuring that it is consistent with the Action Plan and Fact Sheet approved by the Administrator. The RPM, together with the RPR, ensure that the proposed and constructed facility satisfies program criteria for a complete and usable facility to support research, and satisfies special requirements of any Cooperator.

The RPM and RPR, with the Facilities Division, approve the final POR and the final design, ensuring that they are consistent with the approved Action Plan and Fact Sheet. The RPM is responsible for compliance with the National Policy Act (NEPA) as it relates to the project (Ref. 7 CFR 520 - USDA-ARS and 40 CFR 1508 - Council of Environmental Quality). The RPM is the fund holder for the project and is responsible for AD-700 requisition approval and issuance. The RPM may delegate authority to approve and issue AD-700's. The RPM should be directly involved in the orientation meeting, provide guidance during development of the POR, concept and final design reviews, as well as major issues related to program changes such as project scope, budget, and schedule. The RPM is accountable to the Administrator, and will keep him/her informed on project developments such as program related problems/decisions, budget issues, political issues, Congressional contacts, and cooperator interface problems/issues.

Research Program Representative (RPR):

The RPR represents the RPM. The RPR is selected by the RPM and is usually the Location Coordinator, Research Leader, or Laboratory Director. The RPR prepares the Functional Statement for RPM approval, and prepares and coordinates the project's program requirements with the EPM to formulate a specific statement for the preliminary POR's. The RPR serves as the primary source of program criteria information and any special location criteria, and works closely with the Facilities Division in their preparation of the Action Plan and Fact Sheet. The RPR recommends POR approval to the RPM.

During the design phase, the RPR is a member of the Architect-Engineer (A-E) Evaluation Board for selection of the A-E. The EPM, RPR, and Design Reviewer (DR) ensure that the final design prepared by the A-E complies with the POR and confirm this to the Contracting Officer (CO) for final acceptance of the contract. The RPR coordinates the review of designs among the other researchers and any Cooperators involved in the requirements and provides consolidated review comments on the proposed design to the EPM. The RPR, with other Project Team members, is responsible for reviewing and approving all design submissions with primary emphasis on function, program, and special local issues/interest. The RPR will provide written concurrence with the final design documents. Implementation of research program needs is the major objective of the project.

During the construction phase, the RPR participates in regular construction progress meetings, clarifies established program criteria information, is always consulted for concurrence on construction changes that relate to research program requirements, and is informed of all other changes. The RPR serves as a resource to the Project Team and maintains a liaison with the Construction Inspection Contractor (CIC) during the construction process. All written correspondence with the CIC and contractors must be coordinated with the EPM. The RPR is expected to notify the Contracting Officer's Representative (COR) or the CO if he/she becomes aware of unusual or important circumstances pertinent to the construction project. The RPR has no responsibility for construction inspection or supervision, and is not expected to evaluate contractor performance. The RPR may, however, provide observation comments to the appropriate Team Members to assist in maintaining a quality, timely project. As part of the final inspection, closeout, and acceptance procedures of the contract, the RPR, EPM, and CIC will: 1) verify that the construction contractor has provided key personnel with demonstrations and training on operation of new equipment; 2) participate in the final inspection; and 3) recommend acceptance/rejection of the project.

The RPR, with the Area Office, will arrange for maintenance contracts for facility systems and equipment and the establishment of contracts to install telephone systems, moveable equipment, etc. The RPR will coordinate occupancy of the facility and, if applicable, any ceremonial activities. During the warranty period following completion of the project, the team members will provide the RPR with assistance in solving any contractual or construction problem that may arise.

The RPR is responsible for informing the Project Team members of all communications concerning the project.

National Program Staff Representative (NPSR):

The NPSR is assigned to the project team as the Agency's principal representative to provide information regarding the location's current and projected research mission, program and staffing levels. The NPSR, with the RPR, is responsible for developing the Functional Statement and the preliminary POR.

Engineering Project Manager (EPM):

The EPM is an ARS architect or engineer whose primary responsibility, with other Project Team members, is to ensure Agency needs are met within the approved scope, budget, and schedule. The EPM provides technical oversight and direction and is assigned to the project early in its conception during the time of establishing the project scope and budget. The EPM role will continue throughout the planning, design, and construction phases of the project. The EPM will serve as the lead point of contact and shall disseminate information to the appropriate Project Team members for their action or involvement. It is a responsibility of the EPM to see that all Project Team members are kept advised of the actions, plans, and progress of the project. All Project Team members will keep the EPM advised of their needs and concerns. The EPM also is the lead point of contact between the Project Team and contractors for day-to-day business, working within the terms of the contracts.

During the planning phase, the EPM will coordinate the development and review of the Action Plan and Fact Sheet which summarizes the general scope, budget, and schedule for the project for approval by the Administrator. The EPM will work closely with the RPR in the development of the preliminary POR's for the project. After consulting with other Project Team members, the EPM will prepare a design statement of work (SOW) for the project, and a cost estimate for all professional services. The EPM will chair the A-E Evaluation Board to evaluate and recommend the A-E selection for a particular project.

During the predesign and design phases, the EPM will be designated as the COR and will act as the principal liaison with the A-E firm. The EPM will coordinate A-E visits with the members of the Project Team, conduct design progress meetings and design reviews, review all A-E submittals, and make recommendations to the CO for approval of payment. During the development of the POR, the EPM will ensure that the project complies with the approved Action Plan and Fact Sheet. Should POR requirements change during the course of design, the EPM will ensure, after consultation with the Project Team, that the Action Plan and Fact Sheet is revised and resubmitted for approval by the Administrator. The EPM will take the lead to ensure that all Project Team members, including the A-E and the DR, incorporate all project requirements of the POR and that the documents are in compliance with applicable codes and safety standards. The EPM provides evaluations of A-E performance at the end of the design.

During the construction phase, the EPM may act as the COR. If it is necessary to have a COR on site during construction, the COR may be the AOE or Facility Engineer. The EPM is still responsible for general project management and will work closely with the Project Team to provide such information as needed to support the roles of the other team members.

Area Office Engineer (AOE):

The AOE serves as the technical advisor and resource to the Project Team during the planning, design, and construction phases of all projects within his/her Area. It is the responsibility of the AOE to see that the Area and Location personnel are advised of the actions and status of projects during all phases. The AOE is responsible for coordinating the involvement of Area and Location personnel, such as the Area Safety and Health Manager (ASHM), Location Monitor (LM), Location Administrative Officer (LAO), and others as appropriate. The AOE will assist the Project Team by addressing location specific technical questions, and coordinating the review comments from the Area and location personnel.

During the planning phase, the AOE may serve as a member of the A-E Evaluation Board. The AOE is usually involved in the development and review of the POR, Investigative Report, and SOW for A-E services.

During the design phase, the AOE will review the design submittal with particular emphasis on location specific issues such as utility requirements or unique location requirements.

During the construction phase, the AOE will provide assistance to the Project Team, and is invited to participate in progress meetings, equipment testing, and final inspections. He/she will assist the RPR in arranging maintenance contracts for facility systems and equipment and the establishment of contracts to install telephone systems, moveable equipment, etc. The AOE may serve as the COR on some projects.

Contracting Officer (CO):

The CO is an ARS Contract Specialist and the legal government representative to the contractors, authorized to enter, administer, and terminate contracts on behalf of the Government. The CO is the only member of the Project Team with the authority to obligate government funds or change the contract. The CO may delegate certain contractual authority not affecting the contract scope, performance time, or cost.

The CO is assigned to the project early in its conception and will continue with this role through planning, design, construction, and close out of the project. The CO will assist other members of the Project Team in meeting project goals and objectives. The CO is responsible for ensuring that all planned or existing contractual activities or instruments comply with all applicable laws and regulations, and that all activities are conducted in a fair, impartial, and equitable environment. The CO shall ensure that sufficient funds are identified by the fundholder for obligation.

The CO assists/participates with the Project Team in developing the Action Plan and Fact Sheet. The CO officially designates the A-E Evaluation Board and provides regulatory and procedural guidance to ensure appropriate selection activities and reports. The CO makes final selection approval recommendations, and is the liaison between the A-E Evaluation Board and the selection official.

The CO is responsible for guiding the Project Team through the contractual and business management aspects of the project. The CO is responsible for ensuring that contract performance complies with all contractual provisions including, but not limited to, scope, budget, and schedule. The CO is responsible to ensure adequate contract performance and contract management, monitor contract performance and budgetary events, conduct and participate in project meetings, oversee and conduct negotiations, and other actions necessary to assure adequate progression and protection of the Government's interest.

The CO will request and consider the advice of specialists in audit, law, engineering, and other fields as appropriate, and the advice of the Project Team members. This advice will cover technical, legal, budgetary, reporting, and reprogramming activities.

The CO is responsible for informing Project Team members of all communications concerning the project.

Contracting Officer's Representative (COR):

The COR has a separate and distinct role and is usually the EPM. The assignment as COR is made at the beginning of the contract by an official designation letter from the CO, outlining the responsibilities, authority, and limitations. A copy of this designation letter will be provided to both the contractors and the Project Team members.

The COR is responsible for interpreting technical data in the A-E, construction, and CIC contracts. The COR is responsible for the review of progress and pay requests for these contracts and making acceptance/rejection recommendations to the CO. The COR may approve minor changes to the project that do not affect the program requirements, price, scope, or performance time of the contracts. Such changes will be documented and communicated to the Project Team.

The COR will provide the CO technical and administrative recommendations and documentation regarding changes to terms and conditions of these contracts.

The COR is responsible for discussing and resolving routine contract performance concerns with the A-E, construction, and CIC contractors. The COR is responsible for

immediately notifying the CO of all concerns which may affect contract progress, cost, or scope and providing recommendations to the CO for resolution of these matters.

The COR is responsible for ensuring that all team players are kept advised of the actions and progress of the project. The COR is usually the primary point of contact between the Project Team and A-E, construction, and CIC contractors for day-to-day business, working within the terms of their delegation.

The COR shall recognize that the EPM is still the lead point of contract for the Project Team and shall work closely with the EPM to assure that information is provided, as needed, to support the roles of the other Team Members.

Safety, Health, and Environmental Management Branch: (SHEMB)

The SHEMB representative is a Facilities Division staff member and is a resource to the Project Team for safety, health and environmental issues during the planning, design, and construction of projects. Throughout the project, the SHEMB representative may be consulted to provide safety, health, and environmental project requirements during the development of the SOW. The SHEMB representative may also be consulted during construction to address safety, health, and environmental matters. The SHEMB representative will participate, as required, in project meetings, and serve as the primary decision maker concerning waiver requests.

Real Property Management Branch: (RPMB)

The representative of RPMB is a Facilities Division staff member responsible for ensuring that all realty interest associated with the project have been completed, including Federal-ownership of the property or lease agreement sufficient to cover the Federal Government's investment in the property. The RPMB representative is responsible for ensuring that easements, right-of-ways, or other land use agreements for roads and utilities in support of the project have been executed. The RPMB representative will review each project to assure compliance with approved Master Plans, National Historic Preservation Act, and Threatened and Endangered Species Act.

Area Safety and Health Manager (ASHM):

The ASHM serves as the safety, health, and environmental advisor and resource to the Project Team during the planning, design, and construction phases on projects within their Area. The ASHM shall be consulted on safety, health, and environmental issues.

During the planning phase, the ASHM may be consulted to provide input on developing the POR and the SOW for design. The ASHM will assist in the preparation of the variances on safety, health, and environmental issues during the planning and site

investigation phases. Also, the ASHM may assist in prioritizing safety, health, and environmental items to be incorporated in the SOW for design.

During the design phase, the ASHM may, as assigned, review the design submittal and develop priority for safety, health, and environmental items to be incorporated into the contract documents.

During the construction phase, the ASHM is to ensure all appropriate safety, health, and environmental management related regulations are in place. The ASHM may participate in final inspection and acceptance of the project.

Location Monitor (LM):

The LM is an ARS representative at the construction site (or nearby location) formally designated by the CO, who serves as a point of contact for either the A-E, CIC, or the construction contractor to provide information regarding location rules and regulations. The LM designation, which is approved by the AAO, is normally made to the location Facilities Manager/maintenance engineer, LAO, or Location Coordinator. The LM has no responsibility for construction inspection or supervision, and is not expected to evaluate contractor performance. The LM acts an observer and is expected to notify the COR or the CO if he/she becomes aware of unusual or important circumstances pertinent to the contract. Examples of the situations in which the LM may get involved are: 1) designating parking areas for contractor's employees; 2) coordinating use of Government facilities, restrooms, and utilities; 3) coordinating utility shutdowns and connections; and 4) coordinating authorization for contractor to work beyond normal work hours. The LM may participate in the design review stages and construction progress meetings to provide familiarity with the scope of the project and keep abreast of any changes.

Cooperator:

A Cooperator is a State or Federal agency or private organization having a mutual interest in agricultural research that has entered into a valid and legal Memorandum of Understanding, Cooperative Agreement, long-term lease, or similar document demonstrating that a proposed cooperative effort is of benefit to people of the United States. A Cooperator is not always involved in all major construction projects.

Architect Engineer (A-E):

The A-E is a private contractor who provides professional services of an architectural-engineering nature with primary emphasis on the design of research facilities, laboratory support facilities, and administrative facilities. The design is performed under the supervision of a registered or licensed professional architect or engineer as required in the State where the project is located. The A-E also provides investigative studies, assists in quality assurance of the construction project, assists in project management, reviews submittals during construction, and provides consultative services as needed. The A-E will contact the EPM for day-to-day business, working

within the terms of the contract. Adjustments to the contract will remain under the authority of the CO.

During the planning phase, the A-E finalizes the POR, prepares the Environmental Assessment (EA) and other investigative reports as may be required.

During the design phase, the A-E develops conceptual drawings and provides a preliminary cost estimate. After approval of the conceptual plans, the A-E is tasked with preparation of the final design and working drawings in a manner which incorporates the various adjustments approved through the design review process. Upon approval, various submittals of plans, specifications, and cost estimates are submitted for program, technical, and budget review through completion of final design. The A-E may formally conduct presentations at the various stages of design development and shall provide complete documentation of all such meetings. The A-E keeps the EPM and the CO advised of the status and progress of the project during design.

During the post-design and construction phase of the project, the A-E may be required to participate in the pre-bid, pre-construction, and other meetings. The A-E may be tasked to review and approve shop drawings, material submittals, review and comment on construction contract modifications, and other related activities as directed by the Government. The Government may confirm construction compliance with design intent through a separate inspection contract, or may contract for these services through the design A-E firm.

Design Reviewer (DR):

The DR is an independent contractor who provides professional services to review the design submittals prepared by the design A-E. The design reviewer is required to perform services under the supervision of a registered or licensed professional architect or engineer.

The DR is to provide assurance to the government that the design A-E is proceeding in accordance with the project requirements. The DR will review the major design submittals including cost estimates, referencing project requirements cited in the design A-E contract, (i.e. final POR), geo-technical study, applicable Codes and Industry Standards, and good practices of design. The DR will use the ARS Design Review Check List as part of their review, but will be responsible to see that all project requirements are being satisfied.

The DR will be tasked to perform Value Engineering studies for major construction projects, when required. The DR may be tasked to perform the services of a CIC for major construction contracts.

Construction Inspection Contractor (CIC):

The CIC is an independent contractor, generally an A-E firm, whose primary role is to provide Quality Assurance that the construction project is being constructed as designed, and to provide oversight to the Quality Control Plan of the construction contractor. The CIC will consist of a CIC manager that has access to a technical staff that can report to the project site in a timely manner on an as needed basis. For major construction projects, the CIC responsibility may be assigned as a task order to a construction management firm or an A-E firm separate from the design A-E.

The CIC will monitor the Quality Control Plan of the construction contractor and ensure that special test results, material certifications, etc., are obtained as required. In cases where test results or certifications, etc., are not satisfactory, the CIC will take immediate actions to notify the construction contractor's Superintendent and the COR. Keeping the COR informed of these findings will enable corrective actions to be implemented by the CO if necessary.

The CIC is to report to the COR all findings, observations, and communications with the construction contractor. A daily construction log will be maintained by the CIC, and daily "Quality Assurance" reports will be submitted concurrently to the CO and COR. If it is identified that the construction contractor has made deviations from the plans, the CIC will document these observations and bring them to the attention of the construction contractor's Superintendent, the CO, and the COR. Keeping the CO and COR informed will enable corrective actions to be implemented by the CO or other appropriate Project Team members.

The CIC will assist the CO and COR in analyzing and categorizing construction contract changes.

Construction Contractor:

The Construction Contractor is an independent firm, hired under Government contract, to provide those professional construction services defined by Federal Acquisition Regulations, Part 36. The specific work to be performed by the Construction Contractor shall be set forth in writing in the specific contract document. The Construction Contractor's team may consist of the Prime Contractor, who has direct contractual relationship with the Government, and various subcontractors and suppliers. No contract exists between the subcontractors, suppliers and the government. The Construction Contractor shall have full responsibility for the construction Project Team including coordination of work, performance, material delivery and storage, permits, licenses, protection of property and all other elements of construction. The Construction Contractor shall maintain a competent Superintendent at the work site at all times during performance of the contract.

The Contractor shall contact the CO or the COR directly on all matters of the contract affecting changes to the contract provisions, contract scope performance time or cost.

The CO is the legal Government representative authorized to enter, administer, and terminate contracts, and is the only member of the Project Team with the authority to obligate Government funds or change the contract. The COR is usually the primary point of contact for the Construction Contractor for day-to-day business, working within the terms of the contract.

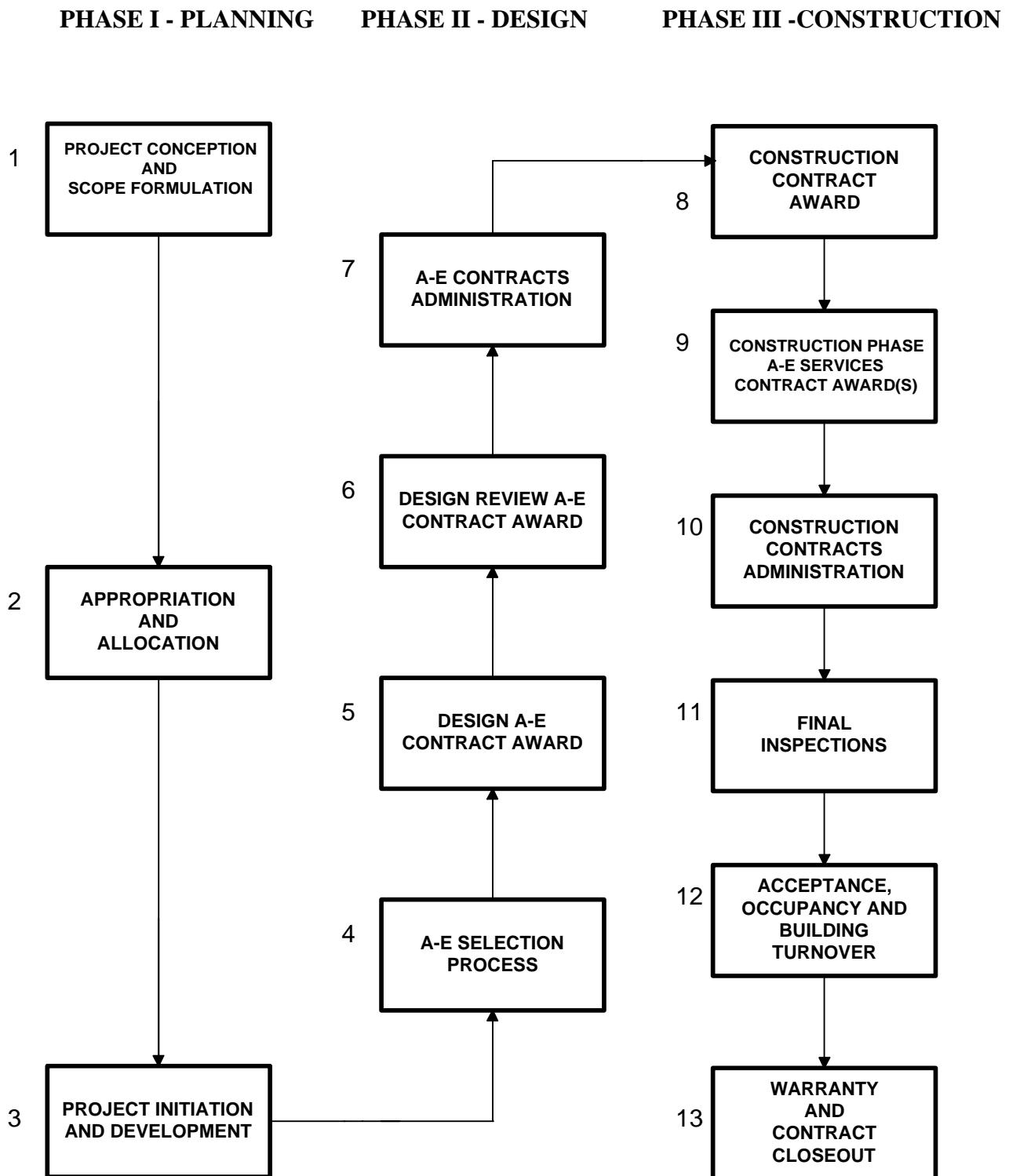
In order to most effectively accomplish the construction contract, the Government may form a partnership with the Construction Contractor, in a concept known as Partnering. Partnering would strive to draw on strengths of all parties in an effort to achieve a quality project completed within budget, and on schedule. Partnering would be bilateral in make-up and participation is totally voluntary. Partnering is not a contractual agreement, nor does it create any legally enforceable rights or duties to either party.

The Construction Contractor must prepare and maintain a suitable Quality Control Plan. The Construction Contractor shall develop a progress schedule for approval by the CO and adhere to this schedule throughout the contract. In accordance with OSHA regulations, the Construction Contractor will assure that safety is maintained on the job site at all times. Proposed change orders must be coordinated with the CO, COR, and CIC. The Construction Contractor is responsible for maintaining as built documents on the job site to show the construction of a particular structure or work as actually completed under contract. The Construction Contractor shall submit shop drawings as required by the contract documents. The Construction Contractor must attend all scheduled progress meetings and report the progress of the project as required.

During the close out and warranty phase of the contract, the Construction Contractor will in accordance with the contract, prepare operation and maintenance manuals, ensure systems are fully functioning, provide system demonstration to the RPR, COR, and other individuals as designated by the CO. During the warranty phase, the Construction Contractor is required to respond promptly to requests for warranty service, and shall be responsible to coordinate corrective actions as necessary to mediate government concern.

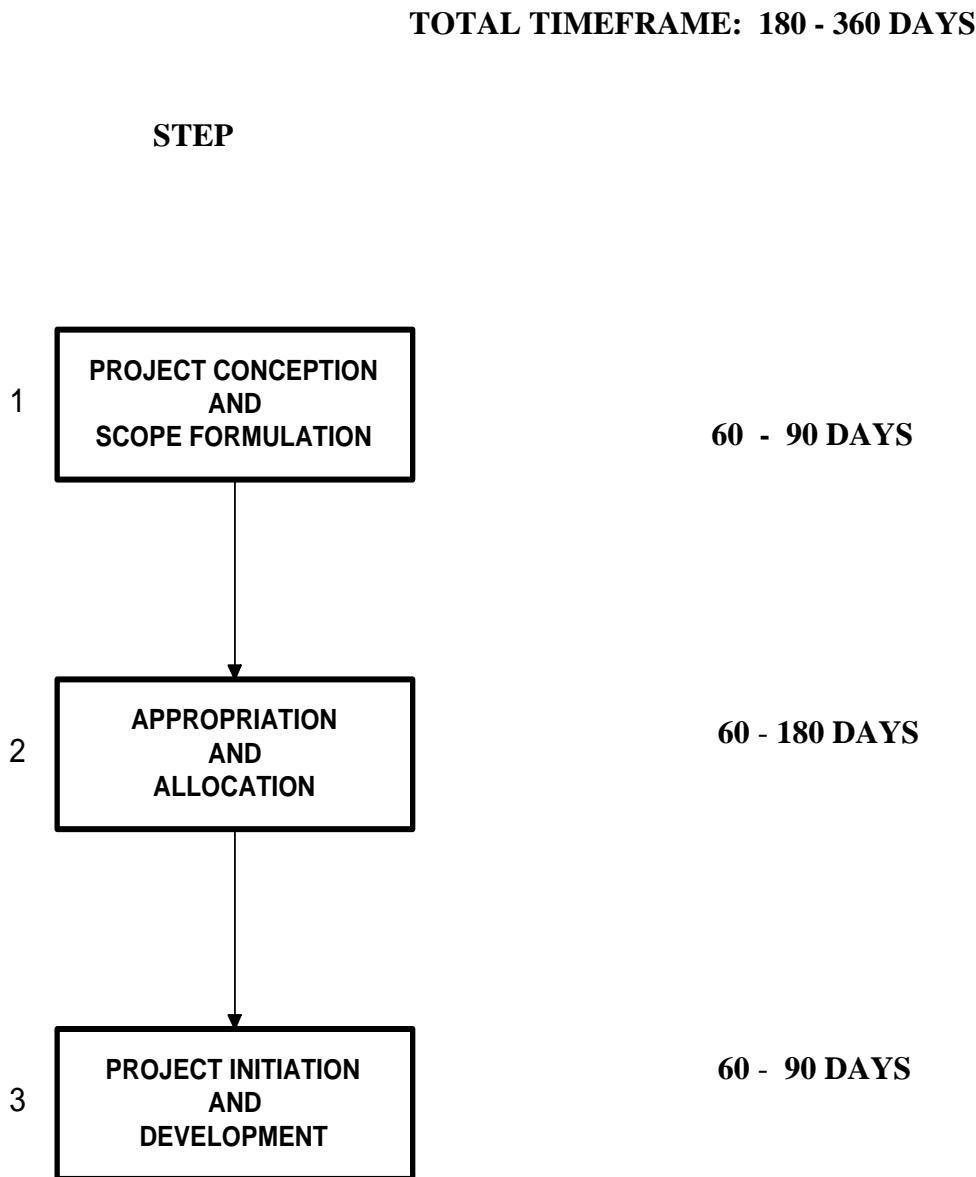
5. PHASES AND STEPS

This flowchart depicts each phase and step in the Major Facilities Construction Process.



PHASE I - PLANNING

This flowchart depicts the approximate timeframes involved in each step of Phase I.



STEP 1 - PROJECT CONCEPTION AND SCOPE FORMULATION

AD	Identifies need for project through Annual Resource Management Plan (ARMP) process or directly to NPS.
NPSR	Recommends approval of project and obtains ADMIN approval. Initiates appropriate Congressional contacts.
ADMIN	Approves project.
AD	Provides leadership in development of facility and program needs - program mission - number of scientist years (SY's) - types of space and quantity of space - fixed equipment
	Selects proposed site. Develops preliminary assessment of environmental feasibility. Develops and evaluates alternatives to accomplish mission goals. The AAO/AOE may participate. Consults NPS and FD for recommendations.
FD	Assists AD in the development of preliminary project data, design alternatives, site selection, budget estimate, schedule, realty, environmental, safety and health, and other construction management issues. Develops estimate of total project budget cost (planning, design, and construction). Reviews need for contract services for studies (i.e. site selection, environmental, estimating).
NPSR	REVIEWS/APPROVES preliminary project data, site selection, and budget estimate.

STEP 2 - APPROPRIATION REQUEST AND ALLOCATION OF FUNDS

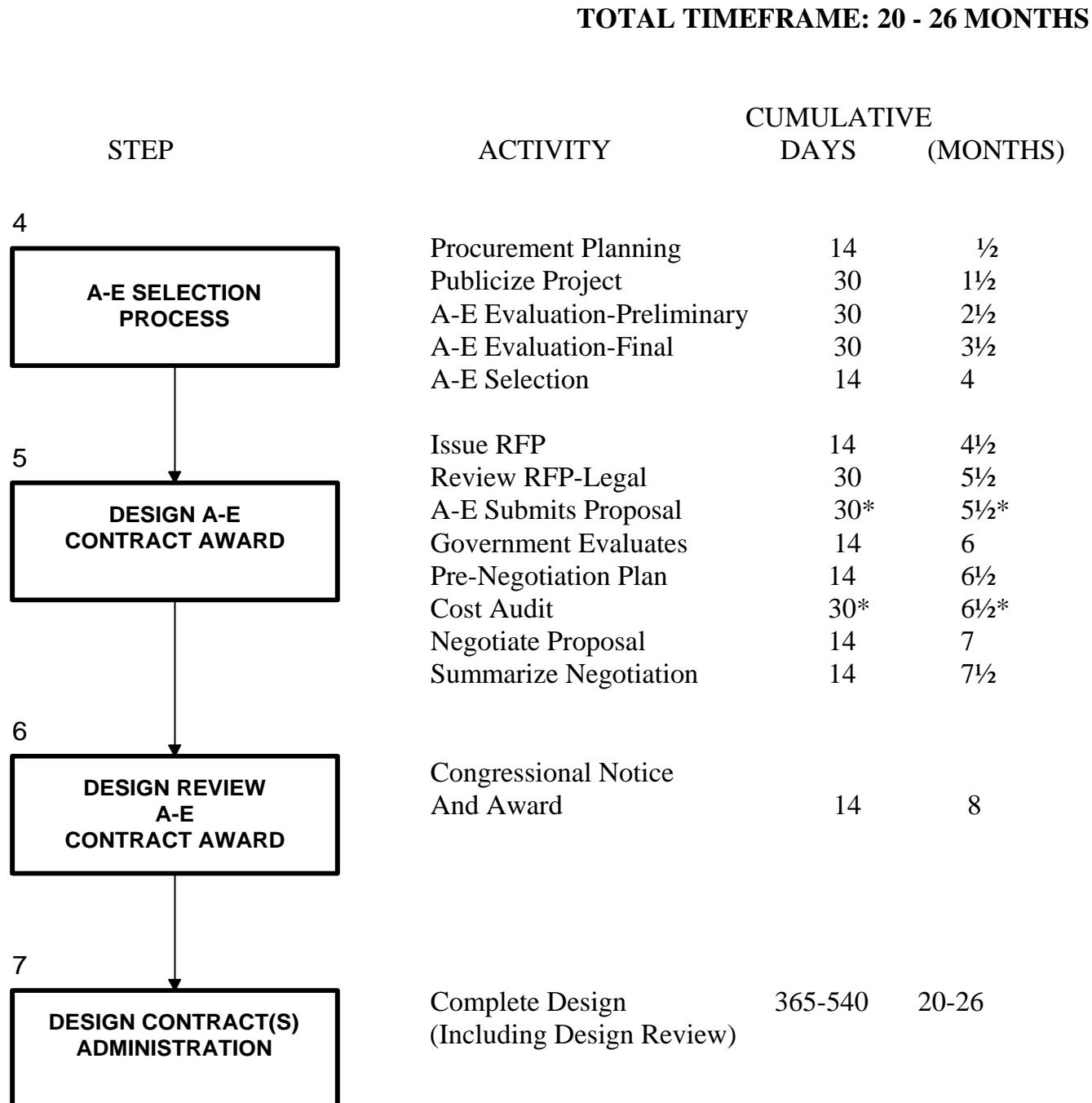
FD	Develops/submits Justification Statement to NPS.
NPSR	Initiates appropriation request through BPMS.
BPMS	Submits project and Justification Statement to OBPA. Incorporates in ARS budget request. Serves as liaison with OBPA and Congress.
OBPA	Approves project and Justification Statement. Incorporates project as line item in USDA budget request to OMB.
OMB	Approves/incorporates USDA budget request in Federal budget request.
Congress	Appropriates funds.
OMB	Provides apportionment of funds through OBPA.
BPMS	Provides written notification of Congressional appropriations. Provides allocation of funds to AD.
AAO/ ABFO/ FMD	Establishes accounting code/provides accounts maintenance services for fundholder.

STEP 3 - PROJECT INITIATION AND DEVELOPMENT

FD	Consults with NPSR and AD to establish project team.
RPM	RPM is usually the AD. Selects RPR.
FD	Prepares written Action Plan/Fact Sheet (see EXHIBITS 1 and 2) identifying project team members and defining responsibilities. Obtains ADMIN approval of AP/FS through NPSR. Begins planning by preparing tentative schedule and preliminary budget for design and construction . Coordinates with AOE and advises NPS and RPM of any schedule or budget concerns.
NPSR/ RPM	Concurs with Action Plan/Fact Sheet. Recommends ADMIN approval.
ADMIN	Approves Action Plan/Fact Sheet.
RPM/ NPSR/ RPR	Develops project Functional Statement (see EXHIBIT 2) preliminary Program of Requirements (POR). Consults AITD for telecommunications advice.
EPM	Review/refines preliminary POR to insure consistency between project scope and project budget and schedule. Finalizes preliminary POR. Consults with AOE, as appropriate.
NPSR/ RPM	APPROVES final preliminary POR

PHASE II - DESIGN

This flowchart depicts the approximate timeframes involved in each step of Phase II.



* Performed simultaneously with preceding activity.

STEP 4 - A-E SELECTION PROCESS

Project Team	Participates in project Orientation Session .
RPM	Submits approved preliminary POR to FD. Submits funded Procurement Request (AD-700) for A-E services to CO.
CO	Reviews AD-700. Prepares Procurement Plan . Appoints A-E Evaluation Board.
EPM	Prepares/Submits Statement of Work (SOW) for A-E services, project Estimated Construction Cost (ECC) , and A-E evaluation criteria to CO.
CO	Reviews SOW, ECC, and evaluation criteria. Publicizes project and evaluation criteria. Advises A-E Evaluation Board of guidelines for integrity and fairness. Receives A-E Qualification Statements (Forms SF-254 and SF-255) from interested A-E firms. Participates in evaluation.
Board (EPM, RPR, AOE)	Evaluates SF-254/SF-255 and submits preliminary evaluation report of most highly qualified A-E firms (minimum of three) to CO.
CO	Reviews preliminary evaluation report and invites most highly qualified firms for interview process.
Board	Interviews A-E firms and evaluates technical qualifications. Prepares/submits final report with order of preference to CO.
CO	Prepares/submits final selection report.
FD	SELECTS A-E.

NOTE: For some Modernization projects, STEP 4 may be eliminated by using FD's pre-established indefinite quantity A-E contractor.

STEP 5 - DESIGN CONTRACT AWARD

CO	Prepares/issues Request for Proposals (RFP) for A-E services for predesign and design. Obtains required advice and reviews (i.e. legal)
EPM	Updates SOW for A-E services. Prepares/Submits Government estimate of A-E services fees.
RPMB	Finalizes realty acquisition prior to design award.
RPR	Assists in updating SOW, if necessary.
CO	Issues RFP for A-E services and receives A-E proposal. Obtains EPM, RPM, RPR, AOE, and audit advice on proposal as required. Evaluates proposal and prepares Pre-negotiation Plan.
EPM	Provides/coordinates assistance in technical/cost evaluation of A-E proposal.
RPR	May provide program assistance during evaluation.
CO	Conducts negotiations with A-E firm.
EPM	Provides and coordinates technical assistance and price support to CO during negotiations.
RPR	May provide program assistance during negotiations with A-E.
RPM	Resolves program discrepancies if necessary.
CO	Notifies LS or others, as required, prior to award. Notifies/debriefs unsuccessful firms. AWARDS DESIGN CONTRACT

STEP 6 - DESIGN REVIEW CONTRACT AWARD

- EPM Prepares/submits SOW for Design Review (DR)/**Value Engineering (VE)**.
- CO Prepares/issues RFP for DR and VE to existing Indefinite Quantity A-E Contractor.
- EPM Prepares/submits Government Estimate for DR/VE services to CO.
- CO Receives/evaluates DR/VE Proposal. Obtains EPM, RPM, RPR, AOE, and audit advice.
- EPM Provides/coordinates assistance in technical and cost evaluation of DR/VE proposal.
- RPR Provides program guidance if necessary.
- CO Conducts negotiations with DR/VE firm.
- EPM Provides and coordinates technical assistance and price support to CO during negotiations.
- RPR Provides program guidance if necessary.
- CO AWARDS DESIGN REVIEW/VALUE ENGINEERING CONTRACT.

STEP 7 - DESIGN CONTRACT ADMINISTRATION

CO	Appoints COR (usually EPM). Gives notice to proceed. Monitors compliance with contract provisions and schedules.
A-E	BEGINS PREDESIGN. Finalizes POR. Completes environmental documentation and other predesign deliverables.
EPMP/ COR	Coordinates Project Team and DR A-E (if necessary) review of predesign submissions. Approves predesign and cost estimate submissions, and design review contractor submissions. Reviews and provides recommendations on proposed changes from a technical and cost standpoint. Coordinates program review of proposed changes. Provides recommendations on contractor payment requests. Provides recommendation to proceed to next phase.
RPM	Makes final decision on environmental documentation. Approves final POR and final predesign. Resolves and approves program deviations.
RPR	Assures final POR complies with Program. Reviews and comments on predesign submissions. Approves predesign.
AAO/ AOE/ ASHM	May review and comment on predesign submissions.
CO	Evaluates and authorizes contract changes considering technical and program advice. Approves contractor payment requests. Gives notice to proceed to next phase. Monitors compliance with contract provisions and schedules.
A-E	BEGINS DESIGN. Makes various stages of submissions including cost estimates (15%, 35%, 50%, 95%, 100%)

STEP 7 - DESIGN CONTRACT ADMINISTRATION (continued)

DR	<p>BEGINS DESIGN REVIEW.</p> <p>Conducts Value Engineering (VE) Workshop at the 35% design stage.</p>
EPM/ COR	<p>Coordinates Project Team and DR A-E review of design submissions.</p> <p>Approves A-E design and cost estimate submissions and performance.</p> <p>Approves design review contractor's submissions and performance.</p> <p>Participates in VE Workshop. Coordinates and provides recommendations for incorporation of VE proposals.</p> <p>Reviews and provides recommendations on proposed changes from a technical and cost standpoint. Coordinates program review of proposed changes. Participates in 50% Design Review Board briefing.</p> <p>Provides recommendations on contractor payment requests.</p>
RPR	<p>Reviews and comments on design submissions. Participates in VE Workshop. Reviews and provides recommendations on proposed changes from a program standpoint. Assures final design complies with POR.</p> <p>Approves final design.</p>
RPM	<p>Reviews and comments on design submissions. May participate in VE Workshop. Resolves and approves program deviations.</p> <p>Approves final design.</p>
AAO/ AOE/ ASHM	<p>May review and comment on design submissions.</p> <p>May participate in VE Workshop.</p>
CO	<p>Participates in design review and VE Workshop.</p> <p>Coordinates 50% Design Review Board activities.</p> <p>Evaluates and authorizes contract changes with technical and program advice.</p> <p>Approves contractor payment requests.</p>
EPM	<p>Coordinates sign-off and ACCEPTANCE OF FINAL DESIGN documents.</p>

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PHASE III - CONSTRUCTION

This flowchart depicts the approximate timeframes involved in each step of Phase III.

TOTAL TIMEFRAME: 24 MONTHS

STEP	ACTIVITY	DAYS	CUMULATIVE (MONTHS)
8	Presolicitation	30	1½*
	Solicitation	45	2
	Evaluation	14	2 ½
9	Awards	14	3
	Bonds	14	3 ½
	Notice to Proceed	14	4
10	Begin Construction	14*	4*
	Complete Construction	540	22
11	Final Inspection	14*	22*
	Punchlist	30	23
12	Accept	14	23 ½
	Occupy	14*	24*
	Turnover*	*	*
APPROXIMATE TOTAL TIME: 24 MONTHS			
13	Warranty and Closeout	12	

* Performed simultaneously with preceding activity.

STEP 8 - CONSTRUCTION CONTRACT AWARD

- RPM/RPR Submits funded Procurement Request (AD-700) for construction services to CO and begins coordination of **Ceremonial Activities**.
- EPM Forwards approved **specifications, drawings**, cost estimate, etc. to CO.
- CO Reviews AD-700, specifications, drawings, and cost estimate. Prepares Procurement Plan. Publicizes project and performs other presolicitation activities. Develops solicitation document and coordinates issuance of solicitation for construction bids.
- A-E Issues/distributes solicitation documents.
- CO/EPM/RPR
- COR/A-E Conducts **pre-bid (preproposal) conference** and site visit. AAO/AOE/ASHM may participate.
- CO Coordinates issuance of solicitation amendments.
- EPM Coordinates and approves technical aspects of solicitation amendments.
- RPR Coordinates and approves program aspects of solicitation amendments.
- A-E Prepares/issues solicitation amendments. Provides written responses to bidders' questions. Corrects specifications and drawings as necessary.
- CO Receives and evaluates bids.
- EPM/A-E Assists in technical aspects of bid evaluation.
- RPR Assists in program aspects of bid evaluation.
- CO Prepares construction contract award documentation and provides pre-award notifications to LS and others, as required.
AWARDS CONSTRUCTION CONTRACT.

STEP 9 - CONSTRUCTION PHASE SERVICES CONTRACT AWARDS

EPM	Prepares/submits SOW for A-E Construction Management(CM) services and/or Construction Inspection Contractor(CIC) services to CO.
CO	Prepares/issues RFP for A-E CM services and/or CIC services.
EPM	Prepares/submits government estimate for A-E CM services and/or CIC services to CO.
CO	Receives/evaluates A-E CM/CIC proposal. Obtains EPM, RPM, RPR, AOE, and audit advice, as required.
EPM	Provides and coordinates assistance in technical and cost evaluation of A-E/CM/CIC proposals.
RPM/ RPR	Provides program guidance if necessary.
CO	Conducts negotiations with A-E/CIC firms.
EPM	Provides and coordinates technical assistance and price support to CO during negotiations.
RPM/ RPR	Provides program guidance if necessary.
CO	AWARDS A-E CM SERVICES and/or CIC CONTRACT(S)

STEP 10 - CONSTRUCTION CONTRACTS ADMINISTRATION

CO	Appoints COR (usually EPM) and Location Monitor(LM). Receives Performance and Payment Bonds from contractor. Gives Notice to Proceed. Participates in Partnering Conference and Quality Coordination Meeting. Conducts Preconstruction Conference . Approves Construction Progress/Payment Schedule.
EPM/COR	Participates in Partnering Conference/Quality Coordination Meeting. Provides technical information at Preconstruction Conference. Coordinates/recommends approval of Construction Progress/Payment Schedule.
RPR	Participates in Partnering Conference and Preconstruction Conference.
AAO/ AOE/LM ASHM	May participate in Partnering Conference and Preconstruction Conference.
A-E/ CIC	Provides recommendations on Construction Progress/Payment Schedule. Participates in Partnering Conference, Preconstruction Conference, and Quality Coordination Meeting. Acts as quality assurance agent for Government and monitors construction contractor's quality control program. Approves shop drawings, submittals, and schedules. Monitors and coordinates construction progress, reports, meetings, tests, and inspections. Reviews and provides recommendations on proposed changes and costs. Provides recommendations on contractor payment requests.

STEP 10 - CONSTRUCTION CONTRACTS ADMINISTRATION (continued)

EPM/COR	Monitors construction progress, quality assurance, and prepares reports. Coordinates review of proposed changes from a technical and cost standpoint and provides recommendations. Coordinates program review of proposed changes. Provides recommendations on contractor(s) payment requests.
RPR	Coordinates program changes if necessary. Concurs in necessity for program change orders. Reviews and provides recommendations on proposed changes from a program standpoint.
RPM	Resolves and approves program deviations if necessary. Obtains ADMIN approval if necessary.
CO	Monitors compliance with contract provisions and schedules. Evaluates and authorizes changes with technical and program advice. Negotiates and executes change orders . Approves contractor payments. RESOLVES CONTRACT DISPUTES AND ISSUES FINAL DECISIONS.

STEP 11 - FINAL INSPECTIONS

- RPR/
RPM Begins planning and coordination of Ceremonial Activities.
- EPM/COR Observes **commissioning**. Coordinates the conduct of inspections.
(Punch-out Inspection, Pre-final Inspection, **Final Inspection**)
AOE/LM may participate.
- A-E/
CIC Participates in all inspections. Monitors commissioning activities.
Reviews and approves contractor's Test and Balance (TAB) reports,
Operation and Maintenance (O&M) manuals and training, **warranty**
documentation, and **as-built drawings**.
- CO Obtains written certification from the construction contractor that project is
complete and ready for Final Inspection.
- EPM/COR
A-E/CIC Confirms that project is ready for Final Inspection and coordinates
Final Inspection.
- CO/
EPM/COR
A-E/CIC Conducts Final Inspection.
- RPR/LM Participates in Final Inspection.
AAO/AOE/ASHM may participate.
- A-E/CIC Records deficiencies during Final Inspection and provides list of
deficiencies to CO as a "**Punchlist**".
- EPM/COR Coordinates "Punchlist" review and submission to CO.
- CO Issues official "Punchlist". Specifies date for completion of "Punchlist" if
different than contract completion date.
- CO/
EPM/COR
A-E/CIC MONITORS "PUNCHLIST" COMPLETION

STEP 12 - ACCEPTANCE, OCCUPANCY, AND FACILITY TURNOVER

EPM/COR Notifies CO of “Punchlist” completion.
A-E/CIC

EPM/
COR Coordinates/provides recommendations for acceptance of Facility to CO.

RPR Recommends acceptance of Facility. Coordinates Occupancy of Facility.
Arranges for establishment of maintenance contracts for facility
systems and equipment. AAO/AOE/ASHM may assist.

CO Upon completion of “Punchlist”, officially accepts Facility and authorizes
occupancy. Conducts Post-Acceptance Conference to turnover Facility to
RPR in accordance with established procedures.
Provides instructions on Warranty issues to RPR.

EPM/COR/
RPR/AOE Participates in Post-Acceptance Conference.
A-E/CIC

RPM/
RPR Conducts Ceremonial Activities.
OCCUPY FACILITY.

STEP 13 - WARRANTY AND CONTRACT CLOSEOUT

CO	Finalizes outstanding contract change orders, payments, claims. Monitors warranty performance. Coordinates contract closeout activities in accordance with established procedures.
EPM/ COR	Provides technical recommendations on final change orders, payments and claims. Coordinates/provides technical advice on warranty issues. Participates in closeout activities. Prepares Performance Evaluation Reports on contractors.
RPR	Provides program recommendations on final change orders, payments and claims. Notifies EPM of technical problems. Requests warranty service directly with subcontractors/suppliers in accordance with instructions in Turnover package. Notifies CO of warranty performance problems.
A-E/ CIC	Provides recommendations on final change orders, payments and claims. Processes record drawings from contractors as-builts and submits record drawings to the Government.
AAO/ AOE	Accepts record drawings.
AAO/ RPO	Participates in facilities capitalization in real property records.
AAO/ ABFO FMD	Participates in reconciliation of financial issues.
CO	Reconciles all contractual and financial issues. MAKES FINAL PAYMENT.

6. GLOSSARY

Action Plan/Fact Sheet: A plan developed for major construction projects and approved by the Administrator. The Action Plan specifies the roles and responsibilities of the Project Team during the planning, design and construction of the Project. The Action Plan contains a Fact Sheet which describes the project in terms of scope, budget, and schedule. See Exhibits 1 and 2.

AD-700, Procurement Request: Form required for requesting procurement of predesign, design, construction, and related services. Request includes the description of work, amount of funds, accounting/appropriation information, suggested source of supply, and signature of fund holder.

A-E Services: Professional services of an architectural or engineering nature associated with research, development, planning, design, construction, alteration, or repair of real property. Services are required to be performed by a registered or licensed architect or engineer as described in the Federal Acquisition Regulation (FAR). See Article in Section 8.

Allocation: The process of BPMS depositing the appropriated and apportioned funds into a usable account from which obligations can be made.

Apportionment: Approval by the OMB of the total funds available based on an appropriation. Funds are apportioned on an annual basis for the full amount available. The amount of funds apportioned sets the limit on the amount available for allocation.

Appropriation: Statutory authority for ARS to incur obligations and make payments in specific amounts and for specific projects or purposes. The amount of funds available for each project becomes the legal dollar limitation for fund control under Antideficiency Act regulations.

As-built Drawings: Drawings and specifications which have been marked-up by the construction contractor to indicate actual changes, deviation, and additions to the original construction contract documents. As-built Drawings are used to prepare Record Drawings.

Commissioning: A process involving an extra level of inspection for major building systems (i.e., HVAC, electrical) to verify and document that these systems will operate as designed. See Article in Section 8.

Construction: Any construction, alteration, or repair (including dredging, excavating, and painting) of buildings, structures, or other real property. For purposes of this definition, the terms “buildings, structures, or other real property” include, but are not limited to, improvements of all types, such as bridges, dams, power plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, cemeteries, pumping stations, railways, airport facilities, terminals, docks, piers, wharves, lighthouses, buoys, jetties, breakwaters, levees, canals, and channels.

Contingency Funds: Funds set aside prior to or upon award of a construction contract to use for modifications resulting from changes in the drawings, specifications, site conditions, etc., or for any required special testing. In the construction of special purpose facilities or renovations, contingency funds may be equivalent to **7-10 percent** of the construction contract cost. In new facilities, contingency funds may be equivalent to **5 percent** of the construction contract cost. Design contingency funds are usually budgeted to be **1(one) percent**. See Article on Project Budget Elements in Section 8.

Changes/Change Order Request/Change Order Proposal: Verbal or written request to CO from construction contractor, A-E, EPM, Program Official, or COR, to modify the terms of the contract. Only the CO has authority to change or modify the contract.

Design: That phase of facility development activity which transforms Program of Requirements (POR) into architectural and engineering concepts resulting in a set of construction contract plans/drawings and specifications. These documents will permit construction bids to be solicited, received, and evaluated.

Drawings/Plans: A two-dimensional graphic representation of the design, location, elements, and dimensions of a project, normally seen in a horizontal plane viewed from above. Also contains details, sections, legends for symbols, abbreviations, and materials, and special tables called "Schedules" which identify doors, windows, hardware, mechanical and electrical equipment, and finishes. Drawings are fully detailed, accurately dimensioned, and cross-referenced.

Environmental Documentation: The findings and determinations of a project's potential impacts on the environment, as required by the National Environmental Policy Act (NEPA). Issuance 230.0 includes a detailed discussion of this subject. The Area Director is responsible for making and documenting NEPA decisions. The following are the possible reviews/documents:

- Categorical Exclusion (CATEX): The environmental review which finds that a proposed action has no potential to significantly affect the environment or be controversial. An Environmental Assessment would not be required. Modernization projects involving one-for-one replacement and no new programming may be categorized under this exclusion. New facilities can not be categorized under this exclusion. New facilities must have an Environmental Assessment.
- Environmental Assessment (EA): A public document that facilitates considerations of environmental factors and incorporates measures to mitigate or minimize the environmental impact, if any, of the proposed project/action. The resulting document is a Finding of No Significant Impact (FONSI) or an Environmental Impact Statement (EIS).
- Environmental Impact Statement (EIS): A public document, resulting from an EA, which presents a detailed evaluation and analysis of all factors relevant to the determination that a proposed ARS action may significantly affect the quality of the human environment.
- Finding of No Significant Impact (FONSI): A public document, resulting from an EA, declaring that the decision maker (the AD) has evaluated the potential environmental impacts of a proposed action and any related/connected actions identified by a qualified individual, and found them to be insignificant.

Estimated Construction Cost (ECC): All labor, material, and fixed equipment costs associated with actual onsite construction of the facility. This does not include Contingency Fund costs.

Fixed Equipment: Permanently installed and affixed equipment such as air conditioning equipment, fume hoods, laboratory casework, water coolers, cage washers, and similar equipment which is normally capitalized as part of the building or structure. These items are normally part of the construction contract. (Does not normally include portable scientific apparatus.) See Article on Appropriate Use of Buildings and Facilities Funds in Section 8.

Functional Statement: A detailed description of the activities to be performed at a facility. This includes an organization breakdown, program objectives, summary of functions and major scientific equipment to be used by each organizational element, relationships among the various organizational elements, location and siting criteria, exposure to the public and other groups, logistical needs, staffing, and any other factors which will influence facility design. See Exhibit 3.

Gross Square Footage (gsf): The total area of a building, including all operating floors, stairways, corridors, mechanical space, basement space, and covered outdoor space, used in cost estimating. See Article on Developing the Project Scope in Section 8.

Inspection: A process in which the Government, an Architect-Engineer firm, CIC, and/or others inspect work of the construction contractor(s); inspect, test, and approve construction materials and equipment; and/or perform other designated services for the CO. See Article on Construction Monitoring, Inspection, and Reporting in Section 8.

Justification Statement: Part of the Budget Explanatory Notes, in support of the Budget Estimates, sent to the House and Senate Appropriations Committees, describing requests for construction funds. The amount of funds for each construction project is identified for land acquisition, planning and design, and construction with a description of the types of research to be conducted, the reasons the research is essential, identification of the research objectives to be achieved, gross square footage requirements, and the nature, condition, and location of any facilities currently used to perform similar research.

Life Cycle Cost Analysis: The total cost of owning, operating, and maintaining a building over the length of its useful life, including its fuel and energy costs, determined on the basis of a systematic evaluation and comparison of alternative building systems. See Article on Value Engineering in Section 8.

Mission: The broad research goals to be attained as a result of the research program planned to be performed within the facility.

Orientation: A Project Team meeting held at the beginning of a project to educate the EPM and CO about the RPR's program and research needs; and, the RPR about the ARS design and construction contracting process. See Article on Project Team Orientation in Section 8.

Partnering: A process between the Project Team and the Construction Contractor Team, structured to establish a mutually-developed strategy of communication and commitment toward the successful completion of the project. See Article in Section 8.

Planning: General term for the project phase which includes development of the preliminary Program of Requirements (POR), design criteria, budget estimates, site selection, and general preliminary project design.

Prebid/Preproposal Conference: A forum prior to bidding in which the Contracting Officer and other interested Agency personnel explain to potential bidders the nature of the work and known special conditions. The Design A-E assists in interpreting the plans and specifications. (This meeting is known as preproposal conference in negotiated procurement.)

Preconstruction Conference: A forum after contract award, in which the Contracting Officer, other Project Team members, and the construction contractor meet to discuss mobilization, construction scheduling, authorities of Government personnel, progress reports, quality assurance and inspection procedures, payroll submissions, payment procedures, Equal Employment Opportunity responsibilities, change order procedures, etc.

Predesign: The phase of planning and design in which required preliminary activities such as POR finalization, investigative reports, preliminary surveys (i.e. site, asbestos, environmental) and preliminary cost estimates are developed and approved.

Procurement Plan: A format identifying milestones of the acquisition process and projected dates.

Procurement Request: See AD-700.

Program of Requirements (POR): A detailed document describing the characteristics that a proposed facility must contain to meet the needs of the occupying organization. The POR generally includes: 1) the Functional Statement which provides a basis for review and justification of the program by the Agency, Department, OMB, and Congress; and 2), the facility space planning data and budget estimates.

Project Budget Cost: All costs associated with project implementation from planning, pre-design, design, design review, bid phase, inspection, construction, construction management. These costs also include environmental/archeological impact costs, site acquisition and clearance costs, cost for utility and other agreements, other technical services, contingency fund reserved for unforeseen conditions, and the estimated cost of construction, all adjusted for inflation and escalated for their respective dates of obligation. See Article on Project Budget Elements in Section 8.

Punch List: A list of defects and omissions officially developed during inspections which require completion or correction by the construction contractor.

Quality Assurance (QA): Government Quality Assurance is the review, inspection and testing of the Contractor's Quality Control Plan and its execution. See Article in Section 8.

Quality Control (QC): Contractor Quality Control is a formal plan to ensure the required standards of construction quality are met within the specified time and budget, through planning and inspecting. See Article in Section 8.

Record Drawings: The construction contractor's "marked-up" (As-built) drawings are submitted to the A-E after final inspection for verification and the A-E transcribes all changes onto reproducible materials and submits the documents to the Government as the permanent record.

Specifications: Written descriptions of a technical nature of materials, equipment, construction systems, standards, and workmanship. The Naval Facilities (NAVFAC) Guide Specification has been adopted for use in ARS construction projects.

Statement of Work (SOW): A translation of the POR into architectural and engineering technical requirements which serves as the scope of the design contract and provides sufficient information for an A-E firm to develop a proposed fee for services. Design criteria may also be referred to as the SOW.

Value Engineering (VE): An engineering analysis of the functions of a program, project, or system directed at improving quality, performance and costs. A VE workshop is generally conducted at the 35% design stage or earlier. See Article in Section 8.

Warranty: A legally enforceable guarantee of the assurance of the duration or quality of a product or the work performed. Warranty periods are usually for a period of 1 (one) year. Speciality items may have a longer warranty period (i.e., roofs, HVAC components, etc.) See Article on Facility Turnover in Section 8.

7. OTHER REFERENCES

Issuance 134.2 - ARS Energy Management Plan

Issuance 230.0 - Safety, Health, and Environmental Management Program
(includes environmental documentation)

Issuance 242.1 - Construction Project Design Manual (includes seismic considerations)

Issuance 242.5 - Economic Analysis and Decision for ARS Facility Modernization

Issuance 242.6 - Metric Conversion

Issuance 242.7 - Value Engineering

36 CFR 1190 - Minimum Guidelines and Requirements For Accessible Design

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8. ARTICLES ON SIGNIFICANT ISSUES

There are many important requirements, regulations, policies, and procedures applicable to major facility design and construction projects. The following articles briefly describe some of these significant issues.

- o Project Budget Elements
- o Communication of Major Project Budget Estimates
- o Appropriate Use of Buildings and Facilities Funds
- o Usable Facility
- o Realty Interest
- o Selection of RPR
- o Developing the Project Scope
- o Cooperator/Lessor Participation
- o Ceremonial Activities and Informing Congress
- o Project Team Orientation
- o Telecommunications
- o A-E Selection
- o Review of A-E Design Submittals
- o 15% Design Submission (Conceptual Presentation)
- o Value Engineering
- o Partnering
- o Construction Monitoring, Inspection, and Reporting
- o Quality Control
- o Quality Assurance
- o Commissioning
- o Use of Facility Prior to Completion
- o Facility Turnover
- o Contract Closeout

PROJECT BUDGET ELEMENTS

There are various expenditures necessary for the planning, design, and construction of a major facility construction project. These expenditures include costs for **A-E services, construction of the building, including fixed equipment, and contingency items** (i.e. changes due to unplanned or unforeseen issues or conditions.) The following table depicts typical project budget elements, percentages, and estimated costs for a new construction project. Estimated costs for a renovation project are the same, except for Construction Contingency, which will be 7½ percent (rather than 5 percent); and, the ECC reduced accordingly. Estimated costs will vary from project to project.

\$10,000,000 Appropriation for Planning /Design/Construction

<u>Planning & Design Costs</u>	% of ECC	Amount (+/-10%)
A-E Services:		
--POR Finalization	2	\$160,000
--Design	6	480,000
--Design Review	2	160,000
--Design Contingency	1	80,000
--Miscellaneous (Value Engineering, Environmental Assessment, Renderings, etc.)	<u>1</u>	<u>80,000</u>
TOTAL Planning & Design Costs	12%	\$ 960,000
<u>Construction Costs</u>		
--Construction of Facility And Fixed Equipment		
	ECC	\$ 8,080,000
<u>Other Construction Costs</u>		
--A-E Bid Phase Services	1	\$ 80,000
--A-E Inspection Services	3	240,000
--A-E Submittal/Documentation	3	240,000
--Construction Contingency	5	400,000
Subtotal Other Construction Costs	12%	960,000
TOTAL Construction Costs		\$ 9,040,000
TOTAL BUDGET (Appropriation)		\$ 10,000,000

COMMUNICATION OF MAJOR PROJECT BUDGET ESTIMATES

Project Budget Estimates are developed in many different ways. The development can be (1) a “bottom-up” estimate that is based on detailed project scope information; (2) “top down” (Congressional or Agency sponsored limitation); or, (3) a projection that is generated on short notice, usually based on square foot only information, with less than adequate information and analysis. The optimum method of developing a Project Budget Estimate is by conducting a detailed architectural-engineering study addressing programmatic, infrastructure, and environmental needs. Whether or not a project is constructed at one time or in phases impacts the estimate. Project Budget Estimates, no matter what the source, generally require annual update to reflect inflation and other industry and economic conditions. Project Budget Estimates are good for one year.

The following are the Key Communicators:

Administrator	Associate Administrator
National Program Staff	Budget Program Management Staff
Location research personnel	Area Directors
Facilities Division	Location/Area Administrative Officers

The following is the Process for Communication of Project Budget Estimates:

<u>Activity</u>	<u>Responsibility</u>
Conception of Estimate	NPS, AD, AAO, LAO, FD
Finalization/Verification of Estimate	FD
Approval of Estimate	ADMIN
Official Holder of Estimate for Next Year's Budget Cycle	BPMS
Official Contact Point for Congressional, University, Industry, or Media inquiries regarding the Estimate	BPMS
Estimate Revisions for Subsequent Budget Cycles	FD

APPROPRIATE USE OF BUILDINGS AND FACILITIES FUNDS

Buildings and Facilities Funds appropriated for Major Facility Construction Projects can be used to fund all real property and fixed equipment items necessary to make the building a usable facility.

Buildings and Facilities Funds cannot be used to fund moveable or unaffixed items that are usually accounted for as personal property, rather than real property. Unless otherwise specified, the following are examples of items which cannot be funded from a Buildings and Facilities Account:

ADP equipment	systems furniture
filing cabinets and portable safes	furnishings, including rugs
food service equipment (portable)	furniture (chairs, tables,
laboratory equipment (portable)	desks, partitions, clocks)
safety equipment (portable)	photographic equipment (portable)
shop equipment (portable)	training equipment (portable)
scientific equipment (portable)	office machines

USABLE FACILITY

A new or renovated facility must be a stand alone structure which is detached from buildings not owned by the Agency. The facility must have sufficient usable space to permit the Agency to conduct the research program defined in the functional statement. The completed facility should include the construction of the necessary buildings and other structures needed to support the planned research.

Laboratories, offices, and other buildings and structures must contain, as part of the design and construction plans, the complete installation of the necessary and fully operational utilities (i.e., heat, ventilation, air-conditioning, light, power, telecommunications, safety and health systems). The rooms in such structures must contain the necessary fixed equipment, cabinets, benches, and other items which are permanently attached to the building and capitalized as part of the building or structure. Special purpose space and utility rooms must contain the necessary safety devices, utility systems, and other fixed equipment necessary for the facility's satisfactory operations.

Support structures and buildings, such as greenhouses, headhouses, repair shops, animal facilities, and storage facilities must be completed to the extent that requirements are known during the planning stages (including heating, ventilation, air-conditioning, safety considerations, provision for appropriate water, gas, and other utility hookups).

The facility must include all necessary sidewalks, roads, vehicle parking spaces, and landscaping.

REALTY INTEREST

A contract for design of a major facility cannot be awarded until ARS has a sufficient realty interest in the land upon which the facility will be built. Realty interests are in the form of fee simple ownership, long-term lease agreements, and easements (for utilities and road construction).

The Administrator is the Government official delegated the authority to execute the agreements to acquire realty interests. FD, RPMB, is responsible for determining the type of estate to be acquired and negotiating and preparing the real estate agreements.

The real estate acquisition process can be a complex and lengthy process involving 9-12 months. Therefore, the AD/RPM/RPR should contact FD/RPMB for their involvement early in the Planning Phase. Real estate acquisition includes the following activities:

- Obtaining a boundary survey, legal description, and survey map/drawing.
- Obtaining a preliminary title report and final title insurance.
- Obtaining an appraisal report.(For fee simple land acquisitions)
- Preparation of environmental and historical documentation.
- Preparation of Real Estate Documents.

SELECTION OF RPR

The RPR performs a key role in the development and oversight of each major design and construction project. RPR assignments can require a major portion of a research scientist's time for a period of several years.

In order to maintain continuity and enhance Project Team communications, it is recommended that the responsible Research Leader (RL), Laboratory Director (LD), or Location Coordinator (LC) selected for the RPR assignment be an individual who will be available throughout the duration of the project; understands that the project will require a major portion of their time and effort; and, possesses a broad understanding of the scope of the research program.

DEVELOPING THE PROJECT SCOPE

Past experiences in administering major facility construction programs reveal a general trend in the relationship between authorized Scientific Year (SY) count and the **gross square footage** of floor space in an ARS research facility. Based on this information, the ADMIN has approved the usage of a general formula for purposes of determining the size of a research facility. FD applies this formula when developing project scope and budget estimates during the planning phase and during the development of the Action Plan/Fact Sheet.

General Formula for Developing the Project Scope:

$$\text{Number of SY} \times 3,000 \text{ gross square feet (gsf)} = \text{Size of Facility}$$

Exemptions: Research Facilities with particularly unique characteristics may be exempt from this formula. Headhouse (HH) and Greenhouse (GH) space are exempt from this formula.

Historically, the general square footage per SY ranges from 2500 gsf per SY to 3500 gsf per SY (excluding HH/GH space.) Variables such as project locality, availability of utilities, diversity of research functions, circulation and support space may significantly impact this general square foot estimate; and thus, the overall project scope and budget. Ultimately, the final project size and scope must be based on the amount of funds available to construct the facility.

COOPERATOR/LESSOR PARTICIPATION

The Cooperator/Lessor may be interested or involved in the following issues:

- Schedules: The terms of the lease cannot dictate Government time schedules which are otherwise prohibited by Federal Acquisition Regulation or policy.
- Funds: The terms of the lease cannot dictate Government budgets or Government financing of improvements beyond the boundaries of the leased premises except as documented through appropriate conveyances or easements.
- Utilities: The terms of the lease will stipulate utility access or utilization. During the design phase, consideration is given to the availability and access of utilities and telecommunications systems to determine the economy of accessing and utilizing Cooperator/Lessor vs. public utilities.

- Design Review: The Cooperator/Lessor may have the opportunity to review and comment upon the various design submittals within Government timeframes. They are often interested in the architectural and landscaping compatibility of the new facility with the surrounding facilities, site orientation, pedestrian/vehicular traffic patterns, existing vegetation, and historic preservation. The Cooperator/Lessor has no approval authority over design, particularly in program, space layout, mechanical and electrical design.
- Construction Inspection: The Cooperator/Lessor may have access to the construction site for observation but is not accountable for project inspection or acceptance.

CEREMONIAL ACTIVITIES AND INFORMING CONGRESS

Ceremonial activities are often considered appropriate for major projects, especially when specific Congressional appropriations are involved. The types of activities that have been conducted are:

- Groundbreaking ceremonies - usually occur at the beginning of the construction contract.
- Dedications - usually occur upon completion and acceptance of the construction contract.

The AD, RPM, RPR, and/or Location Leader is responsible for coordinating these activities with the ADMINISTRATOR and Under Secretary, REE, and the Legislative Staff (LS). The LS coordinates appropriate Congressional participation. It is imperative that discussions be initiated with the LS sufficiently in advance of the ceremonial activity to obtain their recommendations and coordination of Congressional attendance.

The planning time for Ceremonial Activities involving Congressional participation is a minimum of 60 days to assure coordination with the Congressional calendar. Specific dates for events cannot be predetermined by ARS. The availability of Congressional participants is the determining factor in the establishment of the date of the ceremonial activity.

PROJECT TEAM ORIENTATION

The Project Team will meet at the commencement of the project to become familiar with each others' needs, goals, roles and responsibilities, research program, and the steps in the planning, design and construction contracting process.

The Project Team orientation meeting was established to promote Team communications and understandings and share knowledges and concerns about the research program, the Federal acquisition process, the design and construction industry, and to establish mutual and common project goals.

TELECOMMUNICATIONS

Identifying the Facility's telecommunication requirements begins early in the Planning Phase. Coordination among the RPR, AAO, and AITD will ensure that telecommunications needs are identified for inclusion in the Design contract. Telecommunications costs are part of the Project Budget. There are two basic options:

Option 1: The Design A-E can design the entire telecommunications system and the construction contractor can be responsible for the entire installation, from cable trays to cabling, from purchase to installation of devices. The construction contractor will be responsible for coordinating the purchase of the complete telecommunication system and equipment and the installation.

Option 2: The Design A-E can design the distribution system allowing for a variety of telecommunications systems installations. The construction contractor will install the distribution system to the extent designed. The AAO will purchase and install the telecommunications systems and equipment. This can normally be obtained from GSA schedule. Coordination with the construction contractor will be needed to accommodate the installation of telecommunication equipment by others and tie-in to the construction contractor-installed distribution system.

A-E SELECTION

Public Law 92-582, the Brooks Act, is the Federal Government policy for procuring architectural and engineering services. It allows the Government to evaluate the qualifications and performance of A-E firms and conduct discussions to select the firm deemed to be most highly qualified. The Agency is then authorized to negotiate a contract with the most highly qualified A-E firm for a compensation determined fair and reasonable by the Government, in accordance with the procedures in the Federal Acquisition Regulation.

REVIEW OF A-E DESIGN SUBMITTALS

It is critical for the Government to assure that completed A-E designs are “constructable,” designed within the project budget, meet all applicable codes and standards, i.e., Life Safety Codes, Occupational Safety & Health Administration Standards, result in a “usable facility”, and contain minimal design deficiencies. These items are reviewed by the Design Review A-E. In addition, FD conducts a 50% Design Review Board, in which the Project Team briefs FD management to confirm that the Design A-E’s construction cost estimate at the 50% Design submission conforms to the specified construction budget and scope.

15 PERCENT DESIGN SUBMITTAL (CONCEPTUAL PRESENTATION)

During this important and interesting step, the Design A-E makes formal presentations of at least 3 design schemes which successfully integrate interior and exterior design elements with program function. Each conceptual presentation consists of:

1. Proposed “footprint” of the facility and orientation of the buildings on the site and associated site development considerations for each scheme.
2. Schematic floor plans depicting proposed spatial relationships to required functional relationships for each scheme.
3. Exterior elevations depicting architectural materials and elements for each scheme.
4. Cost estimates for each scheme considering life cycle cost analysis of proposed building systems (structural, mechanical, electrical) and exterior envelope.

The decision made as a result of the conceptual presentation defines the direction in which the A-E will proceed to further develop the design within required budgetary, technical, and programmatic restraints in a functional, aesthetic, and cost effective manner.

VALUE ENGINEERING

Value Engineering (VE) is a systematic, functional, and creative analysis of a construction requirement to achieve the best functional combination of cost, reliability, and performance, over the life-cycle of products, systems, equipment, facilities, services, and supplies. VE is performed by a team of experienced multi-disciplinary professionals and subject specialists, whose discipline and expertise match that required by the construction project. VE is usually performed by the Design Review A-E. The VE Workshop occurs at the 35% Design Stage or earlier. This process includes the following five phases:

- Information Phase - The team gathers information about the program requirements, project design, background, constraints, and projected construction costs. The team performs functional analysis of systems and sub-systems to identify high cost areas.
- Speculative/Creative Phase - The team identifies alternatives for accomplishing the function of a system or sub-system.
- Evaluation/Analytical Phase - The team evaluates alternatives to determine those with the greatest potential for cost savings and project enhancement.
- Development/Recommendation Phase - The team researches the selected alternatives and ideas and prepares descriptions, sketches and life-cycle cost estimates to support VE recommendations/proposals.
- Report Phase - The team presents VE recommendations to the Government and Design A-E orally and in writing at the conclusion of the VE workshop.

PARTNERING

Partnering is the creation of a relationship between the Government and its Contractors that promotes achievement of mutually beneficial goals. While the contract establishes the legal relationship, Partnering is a process structured to establish working relationships among the various parties through mutually-developed strategy of commitment and communication. Partnering creates an environment where trust and teamwork help to resolve project problems, prevent disputes, foster open communication and cooperation, and facilitate the successful completion of the project. A Conference is usually conducted at the commencement of the construction contract to introduce the Project Team and their relative Roles and Responsibilities and create a cooperative attitude in completing the project. To create this attitude, each party seeks to understand the roles, responsibilities, goals, objectives, and needs of the other. This Conference concludes with a Partnering Agreement or Charter which embodies the commitment to communicate in all matters affecting the project and resolve conflicts at the lowest level.

CONSTRUCTION MONITORING, INSPECTION, AND REPORTING

The following personnel are involved with the construction activity and provide varying degrees of coordination as described in the Roles and Responsibilities.

Engineering Project Manager (EPM) - The EPM provides technical oversight and general project management.

Contracting Officer's Representative (COR) - The COR monitors and reports on the performance of the construction contractor and/or the A-E contractors. The EPM is often the COR. The AOE or Facility Engineer may also be the COR.

Construction Inspection Contractor (CIC) - Inspection of ARS construction projects is usually accomplished by an on-site A-E contractor. Full-time inspection is usually required for jobs of the size and complexity of major construction. This monitoring and reporting service can be provided by the Design A-E, Design Review A-E, or a separate A-E firm.

Construction Management (CM) Services - Construction management services include shop drawing/submittal review, professional testing services, clarifications of design intent, change order proposal review, or other professional advice. This service is usually provided by the Design A-E.

Location Monitor (LM) - The LM serves as a point of contact for either the A-E, CIC, CM, or construction contractor to provide information regarding Location rules and regulations. The LM is normally the location Facilities Manager/maintenance engineer, LAO, or LC.

QUALITY CONTROL

Quality Control (QC) is the Construction Contractor's system for managing, controlling, and documenting activities to produce construction complying with contract documents.

The quality control system consists of plans, procedures, and organization necessary to manage all construction operations (onsite and offsite) and is keyed to the proposed construction sequence. The system covers at least 3 phases for all definable tasks: 1) Preparatory Phase - planning before construction begins; 2) Initial Phase - as the construction begins; and 3) Follow-up Phase - daily checks while work is being performed.

Quality Control vs. Inspection: The construction contractor is responsible for controlling the quality and inspecting the work. Quality Control is a continual system of planning future activities to prevent deficiencies. Inspection is the process of examining on-going or completed work to ensure the work complies with the contract and is not deficient. Inspection is on-going, or "after-the fact", while control is "preventive."

QUALITY ASSURANCE

Government Quality Assurance (QA) is the Government's system for protecting its interests during the construction of the project. Through reviews, inspections, and tests, he Government assures that the Contractor's Quality Control system is working effectively, and that the end product complies with the quality established by the contract. The Government is responsible for establishing and specifying standards of quality in the contract, confirming the adequacy of contractor's quality control system, performing specified tests and inspections and reporting deficiencies, determining reported deficiencies have been corrected, and assuring timely completion. Quality Assurance during the construction phase is usually performed by the CIC or Design A-E.

COMMISSIONING

Commissioning is a process to assure that the building systems have been constructed and/or installed in conformance with the contract documents, comply with design intent, and that location maintenance personnel are trained in the operation and maintenance of the system. Commissioning is an extra level of inspection, specifically designed to ensure that sophisticated building systems are properly installed and operating. The primary emphasis of commissioning is on HVAC systems, but can include electrical and/or special piping systems. The design A-E develops the commissioning specification and cost estimate. The construction contractor is responsible for performing the actual commissioning. (test and balance, system start-up, adjustments, etc.) The commissioning exercise is generally conducted with the design A-E's commissioning team to verify that the building is properly commissioned.

USE OF FACILITY PRIOR TO COMPLETION

There is a legal contractual right to occupy and use a facility before all construction work is completed and before the facility is fully accepted and fully paid for by ARS. The Contracting Officer (CO) must approve and authorize this activity.

Use and occupancy can occur only if the facility is "substantially complete". "Substantially complete" means the space can be occupied and utilized for its intended purpose. Authorization will occur only if the following conditions are met:

- All major equipment is satisfactorily installed, tested, certified, balanced, and operating properly;
- All major building systems (HVAC, water and sewer, etc.) are satisfactorily installed, tested, balanced, and operating properly;

- All major safety systems (fumehoods, fire alarms, fire suppressor systems, etc.) are satisfactorily installed, tested, certified, balanced, and operating properly;
- Uncompleted work is of a minor nature (i.e. paint touchup, ceiling/floor tile defects, door/window work, landscaping, etc.)

FACILITY TURNOVER

During the Post Acceptance Conference the CO informs the RPR of the following:

- Responsibilities of facility maintenance and security
- Procedure for dealing with facility malfunction
- Warranty periods for major building components
- Single point of contact at Location for facility occupants to report problems

The CO provides the RPR with a “Turnover” package containing the following information:

- Warranty information and documentation
- Recommended maintenance contracts
- Point of contact for warranty calls
- Approved shop drawings, record drawings, and specifications.

CONTRACT CLOSEOUT

The purpose of the contract closeout process is to assure accomplishment of the following in accordance with Federal Acquisition Regulation:

- Verification that all contract requirements have been met, all documentation received, record drawings and documents, operation and maintenance manuals, and warranty documents delivered to the appropriate recipient.
- Assurance of completion of Performance Evaluation Reports by COR.
- Notification to Facility of identification of warranty items and expiration dates
- Notification to construction contractor of identified warranty items and expiration dates; and that warranty administration has been delegated to a Location representative.
- Availability of CO to resolve warranty response problems and to follow-up with Location prior to warranty expiration dates.

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9. EXHIBITS

- EXHIBIT 1 - Action Plan (with Cover Sheet) 11 Pages
- EXHIBIT 2 - Fact Sheet 2 Pages
- EXHIBIT 3 - Functional Statement 10 Pages

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EXHIBIT 1

SUBJECT: Action Plan for the
New ARS Research Center,
Anywhere, USA

TO: Area Director, Appropriate Area
Research Program Manager

FROM: Administrator, ARS

In accordance with Directives 242.4 and 242.5, the Facilities Division has developed, and I have approved, the enclosed Action Plan and associated Fact Sheet.

The primary members of the project team are:

Research Program Manager (RPM):

Research Program Representative (RPR):

National Program Staff Representative (NPSR):

Engineering Project Manager (EPM):

Contracting Officer (CO):

Contracting Officer Representative (COR):

Area Safety And Health Manager (ASHM):

Area Office Engineer (AOE):

Architect-Engineer (A-E):

Design Reviewer (DR): To Be Determined (TBD)

Construction Inspection Contractor (CIC): TBD

Construction Contractor: TBD

The Facilities Division is responsible for coordinating this effort through the team approach by interacting with the National Program Staff, Research Program Manager, Research Program Representative, the Architect-Engineer, and the Contractors.

Should you require additional information concerning the Action Plan or Fact Sheet, please contact Director, Facilities Division.

2 Enclosures

Action Plan

Fact Sheet

ACTION PLAN

(New ARS Research Center, Anywhere, USA)

There are three distinct areas of project management. Program Management is to ensure all program requirements are articulated and included in the project. Contract Management is responsible for enforcing terms and conditions of the contract. Engineering Project Management ensures all technical and program management issues are addressed and incorporated into the project.

The Project Team is a diverse group of ARS professionals contributing their skills, talent, and knowledge to plan, design, and construct a research facility in support of the Agency research mission within a specified budget and schedule. The Project Team is generally established at the time the project requirements are determined. The priority of each member of the Project Team must be the accomplishment of the group's common goal--to plan, design, and construct the best facility possible within the time and monetary resources available. In this team relationship, individual members (1) perform different tasks and responsibilities as needed by the group,(2) jointly share responsibility for ensuring team results, (3) develop clear strategies and approaches for achieving their team goal, (4) help each other in achieving their common purpose, and (5) recognize individual achievements within team accomplishments. This approach needs to be followed by all team members on a consistent and effective basis through all phases of an ARS facilities project.

Under each phase of this process, specific responsibilities of the Project Team members are discussed. Their involvement is essential for the successful planning and completion of major facilities construction projects. They are accountable for the successful and timely execution of the project. The general roles and responsibilities of each Project Team members are:

RESEARCH PROGRAM MANAGER (RPM):

The RPM is the **Customer** and is usually the Area Director. The RPM is responsible for establishing the research program requirements and selecting the Research Program Representative (RPR). The RPM retains final authority for decisions on program issues of the project, but this authority is frequently delegated to the RPR. The RPM relies upon various Project Team members for technical engineering and contracting support during the design and construction process. The RPM approves the Functional Statement developed by the RPR and is involved in the development of the Action Plan and Fact Sheet. Any deviations from the Action Plan and Fact Sheet must have the approval of the RPM and be communicated to the Government Project Team for appropriate action that will ensure that such deviations are reflected in the final contract documents. The RPM has final approval authority of the preliminary Program of Requirements (POR) developed by the RPR and Engineering Project Manager (EPM), ensuring

that it is consistent with the Action Plan and Fact Sheet approved by the Administrator. The RPM, together with the RPR, ensure that the proposed and constructed facility satisfies program criteria for a complete and usable facility to support research, and satisfies special requirements of any Cooperator.

The RPM and RPR approve the final POR and, with the Facilities Division, the final design, ensuring that they are consistent with the approved Action Plan and Fact Sheet. The RPM is responsible for compliance with the National Environmental Policy Act (NEPA) as it relates to the project (Ref. 7 CFR 520 -USDA-ARS and 40 CFR 1508 -Council of Environmental Quality). The RPM is the fund holder for the project and is responsible for AD-700 requisition approval and issuance. The RPM may delegate authority to approve and issue AD-700's. The RPM should be directly involved in the orientation meeting, provide guidance during development of the POR, concept and final design reviews, as well as major issues related to program changes such as project scope, budget, and schedule. The RPM is accountable to the Administrator, and will keep him/her informed on project developments such as program-related problems/decisions, budget issues, political issues, congressional contacts, and cooperator interface problems/issues.

RESEARCH PROGRAM REPRESENTATIVE (RPR):

The RPR represents the RPM. The RPR is selected by the RPM and is usually the Location Coordinator, Research Leader, or Laboratory Director. The RPR prepares Functional Statement for RPM approval, and prepares and coordinates the project's program requirements with the EPM to formulate a specific statement for the preliminary POR's. The RPR serves as the primary source of program criteria information and any special location criteria, and works closely with the Facilities Division in their preparation of the Action Plan and Fact Sheet. The RPR recommends POR approval to the RPM.

During the design phase, the RPR is a member of the Architect-Engineer Evaluation Board for selection of the Architect-Engineer (A-E). The EPM, RPR, and Design Reviewer (DR) ensure that the final design prepared by the A-E complies with the POR and confirms this to the Contracting Officer (CO) for final acceptance of the contract. The RPR coordinates the review of designs among the other researchers and any Cooperators involved in the requirements and provides consolidated review comments on the proposed design to the EPM. The RPR, with other Project Team members, is responsible for reviewing and approving all design submissions with primary emphasis on function, program, and special local issues/interest. The RPR will provide written concurrence with the final design documents. Implementation of research program needs is the major objective of the project.

During the construction phase, the RPR participates in regular construction progress meetings, clarifies established program criteria information, is always consulted for concurrence on construction changes that relate to research program requirements, and is informed of all other changes. The RPR serves as a resource to the Project Team and maintains a liaison with the Construction Inspection Contractor (CIC) during the construction process. All written correspondence with the CIC and contractors must be coordinated with the EPM. The RPR is

expected to notify the Contracting Officer's Representative (COR) or the CO if he/she becomes aware of unusual or important circumstances pertinent to the construction project. The RPR has no responsibility for construction inspection or supervision, and is not expected to evaluate contractor performance. The RPR may, however, provide observation comments to the appropriate Team Members to assist in maintaining a quality, timely project. As part of the final inspection, closeout, and acceptance procedures of the contract, the RPR, EPM, and CIC will: (1) verify that the construction contractor has provided key personnel with demonstrations and training on operation of new equipment; (2) participate in the final inspection; and (3) recommend acceptance/rejection of the project. The RPR, with the Area Office, will arrange for maintenance contracts for facility systems and equipment and the establishment of contracts to install telephone systems, moveable equipment, etc. The RPR will coordinate occupancy of the facility and, if applicable, any ceremonial activities. During the warranty period following completion of the project, the team members will provide the RPR with assistance in solving any contractual or construction problem that may arise.

The RPR is responsible for informing the Project Team members of all communications concerning the project.

NATIONAL PROGRAM STAFF REPRESENTATIVE (NPSR):

The NPSR is assigned to the Project Team as the Agency's principal representative to provide information regarding the location's current and projected research mission, program, and staffing levels. The NPSR, with the RPR, is responsible for developing the Functional Statement and the preliminary POR.

ENGINEERING PROJECT MANAGER (EPM):

The EPM is an ARS Architect or Engineer whose primary responsibility, with other Project Team members, is to ensure Agency needs are met within the approved scope, budget, and schedule. The EPM provides technical oversight and direction and is assigned to the project early in its conception during the time of establishing the project scope and budget. The EPM role will continue throughout the planning, design, and construction phases of the project. The EPM will serve as the lead point of contact and shall disseminate information to the appropriate Project Team members for their action or involvement. It is the responsibility of the EPM to see that all Project Team members are kept advised of the actions, plans, and progress of the project. All Project Team members will keep the EPM advised of their needs and concerns. The EPM also is the lead point of contact between the Project Team and contractors for day-to-day business, working within the terms of the contracts.

During the planning phase, the EPM will coordinate the development and review of the Action Plan and Fact Sheet which summarizes the general scope, budget, and schedule for the project for approval by the Administrator. The EPM will work closely with the RPR in the development of the preliminary POR's for the project. After consulting with other Project Team members, the EPM will prepare a design Statement of Work (SOW) for the project, and a cost estimate for all

professional services. The EPM will chair the A-E Evaluation Board to evaluate and recommend the A-E selection for a particular project.

During the predesign and design phases, the EPM will be designated as the COR and will act as the principal liaison with the A-E firm. The EPM will coordinate A-E visits with the members of the Project Team, conduct design progress meetings and design reviews, review all A-E submittals, and make recommendations to the CO for approval of payment. During the development of the POR, the EPM will ensure that the project complies with the approved Action Plan and Fact Sheet. Should POR requirements change during the course of design, the EPM will ensure, after consultation with the Project Team, that the Action Plan and Fact Sheet is revised and resubmitted for approval by the Administrator. The EPM will take the lead to ensure that all Project Team members, including the A-E and the DR, incorporate all project requirements of the POR and that the documents are in compliance with applicable codes and safety standards. The EPM provides evaluations on the performance of the A-E at the end of the design, which becomes a permanent part of the A-E's contract records.

During the construction phase, the EPM may act as the COR. If it is necessary to have a COR on site during construction, the COR may be the Area Office Engineer or Facility Engineer. The EPM is still responsible for general project management and will work closely with the Project Team to provide such information as needed to support the roles of the other team members.

AREA OFFICE ENGINEER (AOE):

The AOE serves as the technical advisor and resource to the Project Team during the planning, design, and construction phases of all projects within their Area. It is the responsibility of the AOE to see that the Area and location personnel are advised of the actions and status of projects during all phases. The AOE is responsible for coordinating the involvement of Area and location personnel, such as the Area Safety and Health Manager (ASHM), Location Monitor (LM), Location Administrative Officer (LAO), and others as appropriate. The AOE will assist the Project Team by addressing location specific technical questions, and coordinating the review comments from the Area and location personnel.

During the planning phase, the AOE may serve as a member of the A-E Evaluation Board. The AOE is usually involved in development and review of the POR, Investigative Report, and SOW for A-E services.

During the design phase, the AOE will review the design submittal with particular emphasis on location specific issues such as utility requirements or unique location requirements.

During the construction phase, the AOE will provide assistance to the Project Team, and is invited to participate in progress meetings, equipment testing, and final inspections. He/she will assist the RPR in arranging maintenance contracts for facility systems and equipment and the establishment of contracts to install telephone systems, moveable equipment, etc. The AOE may serve as the COR on some projects.

CONTRACTING OFFICER (CO):

The CO is an ARS Contract Specialist and the legal Government representative to the contractors. He/she is authorized to enter, administer, and terminate contracts on behalf of the Government. The CO is the only member of the Project Team with the authority to obligate Government funds or change the contract. The CO may delegate certain contractual authority not affecting the contract scope, performance time, or cost.

The CO is assigned to the project early in its conception and will continue with this role through planning, design, construction, and close out of the project. The CO will assist other members of the Project Team in meeting project goals and objectives. The CO is responsible for ensuring that all planned or existing contractual activities or instruments comply with all applicable laws and regulations, and that all activities are conducted in a fair, impartial, and equitable environment. The CO shall ensure that sufficient funds are identified by the fundholder for obligation.

The CO assists/participates with the Project Team in developing the Action Plan and Fact Sheet. The CO officially designates the A-E Evaluation Board and provides regulatory and procedural guidance to ensure appropriate selection activities and reports. The CO makes final selection approval recommendations, and is the liaison between the A-E Evaluation Board and the selection official.

The CO is responsible for guiding the Project Team through the contractual and business management aspects of the project. The CO is responsible for ensuring that contract performance complies with all contractual provisions including, but not limited to, scope, budget, and schedule. The CO is responsible to ensure adequate contract performance and contract management, monitor contract performance and budgetary events, conduct and participate in project meetings, oversee and conduct negotiations, and other actions necessary to assure adequate progression and protection of the Government's interest.

The CO will request and consider the advice of specialists in audit, law, engineering, and other fields as appropriate, and the advice of the Project Team members. This advice covers technical, legal, budgetary, reporting, and reprogramming activities.

The CO is responsible for informing Project Team members of all communications concerning the project.

CONTRACTING OFFICER'S REPRESENTATIVE (COR):

The COR has a separate and distinct role and is usually the EPM. The assignment as COR is made at the beginning of the contract by an official designation letter from the CO, outlining the responsibilities, authority, and limitations. A copy of this designation letter will be provided to both the contractors and the Project Team members.

COR is responsible for interpreting technical data in the A-E, construction, and CIC contracts. The COR is responsible for the review of progress and pay requests for these contracts and making acceptance/rejection recommendations to the CO. The COR may approve minor changes to the project that do not affect the program requirements, price, scope, or performance time of the contracts. Such changes will be documented and communicated to the Project Team. The COR will provide the CO technical and administrative recommendations and documentation regarding changes to terms and conditions of these contracts.

The COR is responsible for discussing and resolving routine contract performance concerns with the A-E, construction, and CIC contractors. The COR is responsible for immediately notifying the CO of all concerns which may affect contract progress, cost, or scope, and providing recommendations to the CO for resolution of these matters.

The COR is responsible for ensuring that all Team Members are kept advised of the actions and progress of the project. The COR is usually the primary point of contact between the Project Team and A-E, construction, and CIC contractors for day-to-day business, working within the terms of their delegation.

The COR shall recognize that the EPM is still the lead point of contact for the Project Team and shall work closely with the EPM to assure that information is provided, as needed, to support the roles of the other Team Members.

SAFETY, HEALTH, AND ENVIRONMENTAL MANAGEMENT BRANCH: (SHEMB)

The SHEMB representative is a Facilities Division staff member and is a resource to the Project Team for safety, health and environmental issues during the planning, design, and construction of projects. Throughout the project, the SHEMB representative may be consulted to provide safety, health, and environmental project requirements during the development of the SOW. The SHEMB representative may also be consulted during construction to address safety, health, and environmental matters. The SHEMB representative will participate, as required, in project meetings, and serve as the primary decision maker concerning waiver requests.

REAL PROPERTY MANAGEMENT BRANCH: (RPMB)

The representative of RPMB is a Facilities Division staff member responsible for ensuring that all realty interest associated with the project have been completed, including Federal-ownership of the property or lease agreement sufficient to cover the Federal Government's investment in the property. The RPMB representative is responsible for ensuring that easements, right-of-ways, or other land-use agreements for roads and utilities in support of the project have been executed. The RPMB representative will review each project to assure compliance with approved Master Plans, National Historic Preservation Act, and Threatened and Endangered Species Act.

AREA SAFETY AND HEALTH MANAGER (ASHM):

The ASHM serves as the safety, health, and environmental advisor and resource to the Project Team during the planning, design, and construction phases on projects within their Area. The ASHM shall be consulted on safety, health, and environmental issues.

During the planning phase, the ASHM may be consulted to provide input on developing the POR and the SOW for design. The ASHM will assist in the preparation of the variances on safety, health, and environmental issues during the planning and site investigation phases. Also, the ASHM may assist in prioritizing safety, health, and environmental items to be incorporated in the SOW for design.

During the design phase, the ASHM may, as assigned, review the design submittal and develop priority for safety, health, and environmental items to be incorporated into the contract documents.

During the construction phase, the ASHM is to ensure all appropriate safety, health, and environmental management related regulations are in place. The ASHM may participate in final inspection and acceptance of the project.

LOCATION MONITOR (LM):

The LM is an ARS representative at the construction site (or nearby location) formally designated by the CO, who serves as a point of contact for either the A-E, CIC, or the construction contractor to provide information regarding location rules and regulations. The LM designation, which is approved by the Area Administrative Officer, is normally made to the Location Facilities Manager/Maintenance Engineer, LAO, or Location Coordinator. The LM has no responsibility for construction inspection or supervision, and is not expected to evaluate contractor performance. The LM acts as an observer and is expected to notify the COR or the CO if he/she becomes aware of unusual or important circumstances pertinent to the contract. Examples of the situations in which the LM may get involved are: (1) designating parking areas for contractor's employees, (2) coordinating use of government facilities, restrooms, and utilities; (3) coordinating utility shutdowns and connections; and (4), coordinating authorization for contractor to work beyond normal work hours. The LM may participate in the design review stages and construction progress meetings to provide familiarity with the scope of the project and to keep abreast of any changes.

COOPERATOR:

A Cooperator is a State or Federal agency or private organization having a mutual interest in agricultural research that has entered into a valid and legal Memorandum of Understanding, Cooperative Agreement, long-term lease, or similar document demonstrating that a proposed cooperative effort is of benefit to people of the United States. A Cooperator is not always involved in all major construction projects.

ARCHITECT ENGINEER (A-E):

The A-E is a private contractor who provides professional services of an architectural engineering nature with primary emphasis on the design of research facilities, laboratory support facilities, and administrative facilities. The design is performed under the supervision of a registered or licensed professional architect or engineer as required in the State where the project is located. The A-E also provides investigative studies, assists in quality assurance of the construction project, assists in project management, reviews submittals during construction, and provides consultative services as needed. The A-E will contact the EPM for day-to-day business, working within the terms of the contract. Adjustments to the contract will remain the authority of the CO.

During the planning phase, the A-E finalizes the POR, and prepares the Environmental Assessment and other investigative reports as may be required.

During the design phase, the A-E develops conceptual drawings and provides a preliminary cost estimate. After approval of the conceptual plans, the A-E is tasked with preparation of the final design and working drawings in a manner which incorporates the various adjustments approved through the design review process. Upon approval, various submittals of plans, specifications, and cost estimates are submitted for program, technical, and budget review through completion of final design. The A-E may formally conduct presentations at the various stages of design development and shall provide complete documentation of all such meetings. The A-E keeps the EPM and the CO advised of the status and progress of the project during design.

During the post-design and construction phase of the project, the A-E may be required to participate in the pre-bid, pre-construction, and other meetings. The A-E may be tasked to review and approve shop drawings, material submittals, review and comment on construction contract modifications, and other related activities as directed by the Government. The Government may confirm construction compliance with design intent through a separate inspection contract, or may contract for these services through the design A-E firm.

DESIGN REVIEWER (DR):

The DR is an independent contractor who provides professional services to review the design submittals prepared by the design A-E. The design reviewer is required to perform services under the supervision of a registered or licensed professional architect or engineer.

The DR is to provide assurance to the Government that the design A-E is proceeding in accordance with the project requirements. The DR will review the major design submittals including cost estimates, referencing project requirements cited in the design A-E contract, (i.e., final POR), geo-technical study, applicable Codes and Industry Standards, and good practices of design. The DR will use the ARS Design Review Check List as part of their review, but will be responsible to see that all project requirements are being satisfied.

The DR will be tasked to perform Value Engineering studies for major construction projects, when required. The DR may be tasked to perform the services of a CIC for major construction contracts.

CONSTRUCTION INSPECTION CONTRACTOR (CIC):

The CIC is an independent contractor, generally an A-E firm, whose primary role is to provide quality assurance that the construction project is being constructed as designed, and to provide oversight to the Quality Control Plan of the construction contractor. The CIC will consist of a CIC manager that has access to a technical staff that can report to the project site in a timely manner on an as-needed basis. For major construction projects, the CIC responsibility may be assigned as a task order to a construction management firm or an A-E firm separate from the design A-E.

The CIC will monitor the Quality Control Plan of the construction contractor and ensure that special test results, material certifications, etc., are obtained as required. In cases where test results or certifications, etc., are not satisfactory, the CIC will take immediate action to notify the construction contractor's Superintendent and the COR. Keeping the COR informed of these findings will enable corrective actions to be implemented by the CO, if necessary.

The CIC is to report to the COR all findings, observations, and communications with the construction contractor. A daily construction log will be maintained by the CIC, and daily Quality Assurance reports will be submitted concurrently to the CO and COR. If it is identified that the construction contractor has made deviations from the plans, the CIC will document these observations and bring them to the attention of the construction contractor's Superintendent, the CO, and the COR. Keeping the CO and COR informed of these findings will enable corrective actions to be implemented by the CO or other appropriate Project Team members.

The CIC will assist the CO and COR in analyzing and categorizing construction contract changes.

CONSTRUCTION CONTRACTOR: (CC)

The CC is an independent firm, hired under a Government contract, to provide those professional construction services defined by Federal Acquisition Regulations, Part 36. The specific work to be performed by the CC shall be set forth in writing in the specific contract document. The CC's team may consist of the Prime Contractor, who has direct contractual relationship with the Government, and various subcontractors and suppliers. No contract exists between the subcontractors, suppliers and the Government. The CC shall have full responsibility for the construction Project Team including coordination of work, performance, material delivery and storage, permits, licenses, protection of property and all other elements of construction. The CC shall maintain a competent Superintendent at the work site at all times during performance of the contract.

The Contractor shall contact the CO or the COR directly on all matters of the contract affecting changes to the contract provisions, contract scope performance time or cost. The CO is the legal Government representative authorized to enter, administer, and terminate contracts, and is the only member of the Project Team with the authority to obligate Government funds or change the contract. The COR is usually the primary point of contact for CC for day-to-day business, working within the terms of the contract.

In order to most effectively accomplish the construction contract, the Government may form a partnership with the CC. This partnership would strive to draw on strengths of all parties in an effort to achieve a quality project completed within budget, and on schedule. This partnership would be bilateral in make-up and participation is totally voluntary. The partnership is not a contractual agreement, nor does it create any legally enforceable rights or duties to either party.

The CC must prepare and maintain a suitable Quality Control Plan. The CC shall develop a progress schedule for approval by the CO and adhere to this schedule throughout the contract. In accordance with Occupational Safety and Health Administration (OSHA) regulations, the CC will assure that safety is maintained on the job site at all times. Proposed change orders must be coordinated with the CO, COR, and CIC. The CC is responsible for maintaining as built documents on the job site to show the construction of a particular structure or work as actually completed under contract. The CC shall submit shop drawings as required by the contract documents. The CC must attend all scheduled progress meetings and report the progress of the project as required. During the close out and warranty phase of the contract, the CC will in accordance with the contract, prepare operation and maintenance manuals, ensure systems are fully functioning, provide system demonstration to the RPR, COR, and other individuals designated by the CO. During the warranty phase, the CC is required to respond promptly to requests for warranty service, and shall be responsible to coordinate corrective actions as necessary to mediate Government concern.

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EXHIBIT 2New ARS Research Center
Anywhere, USAFACT SHEET1. FTE INFORMATION:

<u>Category</u>	<u>Current Facility</u>	<u>Planned Facility</u>
ARS Scientists	20	30
Visiting Scientists	6	5
Postdoctoral Fellows	5	10
Graduate Students	1	1
Admin. Personnel	10	20
Other	<u>50</u>	<u>54</u>
Total	92	120

2. APPROPRIATION ALLOCATION TO DATE:

Strict adherence to the project budget will be required. The estimated construction cost will be formulated in accordance with Agency guidelines and will be closely monitored through all phases of the project to prevent a cost overrun situation.

FY 1997 Planning and Design	\$ 1,400,000 (B&F)
FY 1998 Planning and Design	\$ 1,000,000 (B&F)
FY 1999 Construction (Proposed)	\$23,000,000 (B&F)

3. FACILITY SCOPE:

The new ARS Research Center is located in Anywhere, USA. The existing laboratory facilities require extensive modernization to bring them into compliance with current construction and safety and health codes and standards. There is no remaining space on the cramped 3.9-acre site for construction of needed additional laboratory and other special research facilities. A lease agreement has been executed with the University of Anywhere for a 200-acre site parcel to relocate the new ARS Research Center.

The project scope consists of the construction of a laboratory/office building and headhouse/greenhouse space at the laboratory complex site, and a farm center and research field plots at the farm site.

<u>Category</u>	<u>Gross Square Feet Current</u>	<u>Planned</u>
Office/Lab	35,945	53,740
Headhouse/ Greenhouse	46,812	58,860
TOTAL	82,757	112,600

4. LAND ACQUISITION COST: N/A
5. STAFF RELOCATION COST: N/A
6. PLANNING AND DESIGN BUDGET:

Predesign/Misc. (3%)	\$ 600,000
Design (6%)	1,200,000
Design Review/VE (3%)	<u>600,000</u>
TOTAL	\$2,400,000

7. CONSTRUCTION BUDGET:

<u>Type of Space</u>	<u>Sq. Ft.</u>	<u>Total Cost</u>
Office/Lab Building	53,740	\$ 13,000,000
Headhouse Complex	58,860	7,000,000
Telecommunications	LS	<u>200,000</u>
SUBTOTAL - Estimated Construction Cost (ECC)		\$ 20,200,000
Bid Phase (1% of ECC)		\$ 200,000
Inspection (3% of ECC)		600,000
Submittal Review (3% of ECC)		600,000
Construction Contingency (7% of ECC)		<u>1,400,000</u>
TOTAL BUDGET		\$ 23,000,000

8. SCHEDULE: (Construction schedule may be slightly revised when funds are appropriated.)

<u>Design</u>	<u>Construction (FY-99 Proposed)</u>
Start - 2nd Qtr., FY-98	3rd Qtr., FY-99
Complete - 2nd Qtr., FY-99	1st Qtr., FY-00

9. OPERATING COSTS:

FY-96 - Present Facility
82,757 SF \$ 643,000

FY-00 - New Facility
112,600 SF \$ 1,126,000

10. ECONOMIC ANALYSIS: N/A

EXHIBIT 3

FUNCTIONAL STATEMENT

1.0. INTRODUCTION:

The Conservation Production Systems and Remote Sensing Research Units (CPSRU and RSRU) are housed in the Fruit, Vegetable, Soil and Water Research Laboratory dedicated in 1958 to house Crops Research and Soil and Water Division programs that were greatly expanded at that time. Both units are being served by Group A facilities, presently including buildings 201, 202, 414, and three new greenhouses. Remote sensing techniques were used by Soil and Water Division personnel in the early and mid-sixties to document soil salinity and drainage conditions, and congressional funding that was received in 1967 permitted expansion of effort. It was not until a 1981 reorganization that the research was split into two groups.

The Soil and Water Conservation personnel have pioneered zero grade land leveling, manifold well drain systems, and ethylene glycol method of soil surface area determination; characterized and developed solutions for drainage and soil salinity problems; developed irrigation management practices for cotton, sorghum, citrus and sugarcane, and new lines of cotton; investigated new crops including quayule and kenaf. Because of requirements of the 1990 Farm Bill to control wind erosion and maintain adequate surface plant residue cover, research on the development of conservation tillage systems with crop rotations has greatly expanded. Additional benefits of this research are related to increased water use efficiency, reduced energy consumption, and increased profits. Research on an evaluation of weed and insect control interaction with conservation tillage systems is being conducted. personnel now in Remote Sensing determined the wavelengths for inclusion on satellites; pioneered modeling of light interactions with plant canopies, leaves, and leaf components, the development and application of spectral vegetation indices, and videography as a remote sensing tool. Remote Sensing personnel have also developed a geographic information system (GIS) for the Rio Grande valley. This technology is proving valuable for a wide range of applications.

Emphasis in soil chemistry and engineering has decreased and emphasis on plant science and biotechnology including weed science, pathology, and plant breeding has increased over the years. Periodic fund increases have made it possible to maintain a staff of about 12 professionals since about 1960.

1.1 Existing Programs:

1.1.1 Conservation Production System Research Unit (CPSRU)

The program of the existing Conservation and Production Systems Research Unit includes three primary CRIS projects, integrated production systems, sugarcane physiology, and kenaf breeding. Each of the projects is lead by a research scientist and is supported by 1 or 2 technicians. The unit is directed by a research leader, who administers, coordinates, and participates in the projects.

1.1.1 Integrated Production Systems

- 1.1.1.1.1 **Mission:** The objectives of the project are to develop improved cultural practices for row crops in South Texas to optimize production efficiency; develop conservation tillage and residue management systems for dryland and irrigated agriculture; and develop pest management strategies which are compatible with environmental quality and sustainable agricultural production.
- 1.1.1.1.2 **Research Programs:** Under dryland and irrigated conditions, tillage (conventional, reduced, and no-tillage on ridges) and cropping sequence (corn, cotton, and sorghum) are being evaluated in terms of productivity and profitability. Effectiveness of mechanical and chemical methods of controlling weeds are being assessed by visual evaluations and documentation of weed species and species shifts over time in the various cropping rotations. Plant growth and crop yield, water use efficiency, diseases, insects, and soil properties, as affected by tillage and crop rotation, are being determined.
- 1.1.1.1.3 **Staff:** This project involves four of the unit scientists, with each having primary responsibility in this area. These are a supervisory soil scientist, agronomist (weed scientist), agricultural engineer, and horticulturist. Six biological technicians provide support.

1.1.1.2 Sugarcane Physiology

- 1.1.1.2.1 **Mission:** This project determines physiological and biochemical mechanisms limiting sugar accumulation and juice purity in sugarcane, identifies genes that enhance early-season juice purity, and determines the effect of soil salinity on sugarcane during development.
- 1.1.1.2.2 **Research Programs:** DNA probes, monoclonal antibodies, and biochemical assays are used to determine the regulation of enzymes of sucrose metabolism, especially sucrose synthase and invertase, in sugarcane storage tissue during development and maturation of cultivars that vary in ripening. Sugarcane germplasm with variable sucrose accumulation patterns, including cultivars, breeding lines and wild relatives, are evaluated for biochemical pathways associated with high sucrose and early ripening. Biochemical assays and ion chromatography are used to evaluate sugar accumulation and metabolism in storage tissue of sugarcane from salt-affected fields.

- 1.1.1.2.3 **Staff:** This program is lead by a plant physiologist. Support is from two physical science technicians.

1.1.1.3 Improved Cultivars and Cultural Practices of Kenaf

- 1.1.1.3.1 **Mission:** The objectives of this program are to develop improved germplasm and cultivars of kenaf and crotalaria with increased yield, fiber and pulp characteristics needed by processors, improved seed quality, and resistance/tolerance to nematodes, pathogens,

insects, salinity, and lodging; and to develop optimal cultural practices for efficient kenaf and crotalaria production with required fiber quality traits.

1.1.1.3.2 **Research Program:** Kenaf and crotalaria germplasm will be evaluated for genetic variability in yield, fiber-pulp quality and resistance to pests, diseases, and lodging. Optimum cultural practices will be developed for efficient kenaf and crotalaria production through cooperative studies with Rio Farms, Inc. at Monte Alto, Texas. Cultural studies will include crop rotations, plant populations, date of planting, and pest management.

1.1.1.3.3 **Staff:** The project is lead by a plant geneticist and supported by two biological technicians.

1.1.2 **Remote Sensing Research Unit (RSRU)**

The RSRU program consists of two CRIS projects, a larger one that has continued over the years and a smaller one initiated in late 1993 to grow and spectrally characterize selected narcotic plant species.

1.1.2.1 **Remote sensing technology for resource assessment, monitoring, and management**

1.1.2.1.1 **Mission:** The unit develops, evaluates, and transfers remote sensing technology for natural resource management and investigates, characterizes, and models natural processes using remote sensing.

1.1.2.1.2 **Research Programs:** Research programs currently deal with (1) developing and testing state-of-the-art all digital videographic systems (2) development and use of geographic information systems (GIS) in conjunction with Bureau of Census Tiger Line Data, SGS topographic elevation and feature maps, and image analysis procedures to characterize and map natural vegetation, wildlife habitats including that of Africanized honey bees (AHB), range resources, weed distributors, soil salinity in cropland, etc. (3) Joint use of ground observations, spectral observations, and image analysis to determine yield and stress maps of cropped fields and areas... etc.

1.1.2.1.3 **Staff:** This project is staffed by two scientists (range scientist who is the research leader and ecologist) and part of the time of a scientist (soil scientist) from the other project; 2 category three scientists (remote sensing specialist and soil scientist); an electronic technician; a biological and an agricultural research technician; a computer specialist; and, a secretary. Cooperative work is done with a 1890 Land Grant University (Alabama A&M University) student, The University of Texas at Edinburgh, The Parks and Wildlife Service, Texas A&M University - Kingsville, University of Florida, Indiana State University, Sul Ross State University, and numerous ARS locations.

1.1.2.2 **Ecological, phenological, and spectral characteristics of plants**

1.1.2.2.1 **Mission:** Exploit the ecological, phenological, and spectral characteristics of plants to aid in their remote detection and identification in natural and cultural environments.

1.1.2.2.2 **Research Programs:** First emphasis has been on acquiring greenhouse, headhouse, and plot area for the work and securing them. Soil will be amended to vary the pH and root zone physical conditions. The effects on growth of weather stresses (high ambient temperatures, frosts, water management), daylength, ambient temperature, insects, herbicides, and diseases will be observed, recorded, and interpreted in terms of growth and production, and measurements will be taken for tuning a plant growth model.

1.1.2.2.3 A scientist and a technician man the local project. Collaboration is with several other laboratories on the same general project. Expertise of personnel of the other CRIS unit will be utilized to make and interpret spectral observations.

1.2 **Facility Requirements:**

The mission of the CPSRU is to develop new knowledge and technology through genetic, biological, physiological, and agronomic studies that will lead to more efficient use of soil, water, and energy resources in crop production systems. Much of the research is field-oriented and is conducted at Moore Field, near Mission, and at the North Farm, on Highway 88 north of Weslaco. There is a need, however, to provide laboratory support for the field programs related to sugarcane physiology, cotton and kenaf breeding, and conservation tillage. Of primary importance is expanded greenhouse space and laboratories to process soil and plant samples.

The mission of RSRU is to develop and transfer remote sensing technology for detecting, characterizing, and predicting agroecosystem behavior utilizing geographic information systems interlinked with global positioning systems, including descriptive mathematical equations.

1.2.1 **Scientist (Category I):** This facility serves two research units. Seven Category I scientists in the CPSRU and three Category I scientists in the RSRU are needed to adequately carry out the research mission. Condensed job descriptions for each position in each unit are as follows:

1.2.1.1 **Conservation and Production Systems Unit**

- (a) **Research Leader:** Supervisory Soil Scientist. Coordinates, assigns, evaluates, and administers research of the unit involving work on conservation tillage systems, sugarcane physiology, and kenaf and crotalaria.
- (b) **Research Plant Geneticist:** Has primary responsibility for developing improved germplasm and cultivars on kenaf, crotalaria, and cotton.

- (c) **Research Agronomist (Weed Science)**: Has primary responsibility for development of improved weed control methods, primarily for cotton, sorghum, and corn, in conservation tillage Systems.
- (d) **Research Horticulturist**: Has primary responsibilities for improving cultural practices for vegetable crops in South Texas.
- (e) **Research Plant Physiologist**: Proposed position having responsibilities for determining physiological and environmental barriers to cotton and corn yields in South Texas.
- (f) **Research Plant Physiologist**: Has primary responsibilities for determining biochemical limitations to sucrose accumulation in sugarcane.
- (g) **Agricultural Engineer**: Has responsibility for water use efficiency research for better irrigation water use.

1.2.1.2 Remote Sensing Research Unit

- (a) **Research Leader**: Supervisory Range Scientist. Coordinates, assigns, evaluates, and administers research of the unit involving the use of remote sensing techniques for the management of natural resources and the integration of remote sensing with geographic information system technology.
- (b) **Soil Scientist**: Has primary responsibility for application of remote sensing for management and yield assessment of crops.
- (c) **Ecologist**: Has primary responsibility for development of geographic information system technology for agricultural and natural resource assessment.

1.2.2 Support Staff:

1.2.2.1 CPSRU:

- (a) **Secretary**: Provides secretarial support to the Research Leader and scientists of the unit.
- (b) **Biological Technicians**: Because the primary mission of the unit is to conduct field research, each of the six scientists will be supported by one or two technicians.

1.2.2.2 RSRU:

- (a) Secretary: Provides secretarial support to the Research Leader and scientists of the unit.
- (b) Remote Sensing Specialist: Has primary responsibility to assist in development and assembly of imaging equipment and its application to natural resource management.
- (c) Soil Scientist (Category III): Provides expertise in developing a computer-based soil map for the Lower Rio Grande valley.
- (d) Electronics Technician: Has primary responsibility for providing expertise on electronics and assembly of imaging equipment.
- (e) Computer Specialist: Has primary responsibility for developing computer programs to assist in image analysis.
- (f) Biological/Agricultural Technicians: Each of the 3 category 1 scientists is supported by a full-time technician.
- (g) President's Stay in School, Teacher Research Fellow, or other part-time Program: One person assists the secretary.
- (h) Graduate Students: A Ph.D. candidate from an 1890 Land Grant college is doing his Ph.D. research at this facility.

2.0 SPACE REQUIREMENTS SUMMARY:

The Group A facilities occupied by CPSRU and RSRU can be divided into three categories: 1) space used by both groups in Building 201 (common area); 2) space used primarily by CPSRU in Building 201 and Buildings 208, 209, 210, and N03; and 3) space used primarily by RSRU in Building 201 and Building 202. The summary of space requirements for each building (Table 2-1) identifies all rooms and net square footage for the function areas of the proposed facility. Service areas such as utility rooms, corridors, and lobbies are not included in the net square footage. Space data sheets for each room follow these summaries.

SPACE REQUIREMENT SUMMARY

Building 201

No.	Office/Meeting Space	Sq. Ft.
1.	Common: Conference/Meeting Room	400
2.	RSRU: Research Leader's Office - Supervisory Range Scientist	190
3.	RSRU: Secretary's Office	200
4.	RSRU: Scientist's Office - Research Plant Scientist	135
5.	RSRU: Scientist's Office - Remote Sensing Specialist	135
6.	RSRU: Scientist's Office - Post Doc	135
7.	RSRU: Technician's Office (2 per office)	150
8.	RSRU: Technician's Office (2 per office)	150
9.	CPSRU: Research Leader's Office - Supervisory Soil Scientist	190
10.	CPSRU: Secretary's Office	150
11.	CPSRU: Scientist's Office - Research Agronomist	135
12.	CPSRU: Scientist's Office - Research Geneticist	135
13.	CPSRU: Scientist's Office - Research Plant Physiologist (Sugarcane)	135
14.	CPSRU: Scientist's Office - Research Agricultural Engineer	135
15.	CPSRU: Scientist's Office - Research Horticulturist	135
16.	CPSRU: Scientist's Office - Research Plant Physiologist (Cotton)	135
17.	CPSRU: Technician's Office (2 per office)	150
18.	CPSRU: Technician's Office (2)	150
19.	CPSRU: Technician's Office (2)	150
20.	CPSRU: Technician's Office (2)	150
21.	Common: Office Supply Storage	100
22.	Common: Copier/File/Mail Room	300
23.	Common: Bathroom/Shower/Locker Room - Women	220
24.	Common: Bathroom/Shower/Locker Room - Men	220
25.	Common: Small Meeting Room	300
26.	Common: Women's Toilet Room	100
27.	Common: Men's Toilet Room	<u>100</u>
	Total Office	4,585

Building 201

No.	Laboratories	Sq. Ft.
L1	RSRU: Laboratory - Plant & Soil Analysis	600
L2	RSRU: Laboratory - Plant Science	600
L3	RSRU: Laboratory - Electronics Lab	300
LA	CPSRU: Laboratory - Soil Physics	600
L5	CPSRU: Laboratory - Horticulture	800
L6	CPSRU: Laboratory - Kenaf/Cotton Breeding	400
L7	CPSRU: Laboratory - Weed Science	600
L8	CPSRU: Laboratory - Sugarcane Physiology	1,300
L9	CPSRU: Laboratory - Radioisotope	300
L10	CPSRU: Laboratory - Agricultural Engineering	600
L11	CPSRU: Laboratory - Cotton Physiologist	600
L12	CPSRU: Sample Storage	150
L13	CPSRU: Autoclave/Dishwasher Room	<u>120</u>
	Total Laboratories	6,970

Building 201

No.	Storage	Sq. Ft.
S1	CPSRU: Freezer/Refrigerator/Incubator Room	250
S2	CPSRU: Equipment Storage	240
S3	Common: Janitorial Storage	80
S4	Common: Audio-visual Storage	<u>80</u>
	Total Storage	650
	Total Building 201	12,205

Building 202 (RSRU)

No.	Office/Meeting Space	Sq. Ft.
1.	Scientist's Office - Ecologist	150
2.	Scientist's Office - Post Doc	150
3.	Scientist's Office - Remote	150
4.	Technician's Office (2 per office)	150
5.	Technician's Office (2 per office)	150
6.	Restroom - Women	35
7.	Restroom - Men	35
8.	Storage Room	150
9.	Storage Room	<u>140</u>
	Total Office	1,110

Building 202 (RSRU)

No.	Laboratories	
L1	Laboratory - Geographic Information System	300
L2	Laboratory - Electronics and Image Analysis	<u>300</u>
	Total Laboratories	600
	Total Building 202	1,710

**Building 414
FM1015 Site (CPSRU)**

No. Headhouse Space

1.	Data Processing Office	180
2.	Soil Storage	300
3.	Soil Preparation/Drying	360
4.	Plant Preparation/Drying	360
5.	Work/Shop Area	600
6.	Seed Storage	300
7.	Growth Chamber Room	300
8.	Chemical Storage	120
9.	Cotton Seed Acid Delinting	160
10.	Hydrology Laboratory	1,200
11.	Bathroom/Shower	<u>220</u>
	Total Building 414	4,100

No. Greenhouses (N03)

G1	Greenhouse/Sugarcane & Horticulture	1,600
G2	Greenhouse/Weeds	1,600
G3	Greenhouse/Kenaf & Cotton	<u>1,600</u>
	Total Greenhouses	4,800

Space Data Sheet

BUILDING 201 - COMMON AREA

SPACE DESIGNATION Conference Room

REQUIREMENTS

Number Required:	1
Number of Occupants:	up to 20
Net Area:	400 sq ft
Hours of Use:	varies
Access:	Visitors, General

CONSTRUCTION

Floor:	Carpet
Base:	Vinyl
Walls:	Dry Wall
Ceiling:	Acoustic
Special Features:	Noise reduction between offices

ACTIVITY FUNCTION

Unit meetings, small group discussions, presentations to visitors

RELATIONSHIPS

Centrally located, accessible to general public

SYSTEMS

HVAC:	Heating, cooling, and ventilation for personal comfort
Plumbing:	None
Electrical:	Fluorescent lighting, 120 v outlets; Provide several levels of room darkening; Clock outlet; electronic control of projection screen and projector;
Communications:	Telephone

EQUIPMENT

Fixed:	White board; Bulletin board; electrically operated projection screen; lockable storage cabinet for audiovisual equipment; conference modular tables and upholstered chairs; podium with audiovisual controls;
Movable:	Projection table; slide projector; tv/vcr; overhead projector