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

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NOTE: words or phrases in **BOLD** are defined in the Glossary.

1. PURPOSE

The purpose of this manual is to define major facilities construction, and outline the process for managing and executing major facilities construction projects. This manual also defines the responsibilities of key participants in the process.

2. BACKGROUND

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 Agricultural Research Service (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

Under direction from the Secretary of Agriculture, Senate Report 111-221, and House Report 112-101, ARS developed a Capital Investment Strategy (CIS), which is summarized in an April 2012 Final Report. This report presents a strategy for recapitalization of existing facilities and for new ARS research facilities based on a correlation of facility condition and research program priorities. The resulting prioritized facilities and associated research programs are listed in Table 5 of the CIS. The Table 5 projects consist of major capital projects in 9 Priority Groups with estimated total construction costs in excess of \$1 Billion to be implemented over a 10 to 15 year period depending on funding availability. Implementation of the CIS will require a united and integrated effort by the Eastern and Western Business Service Centers (BSCs) and Facilities Division (FD). In addition to the roles and responsibilities for the BSCs and FD outlined in this P&P, FD will initiate strategic planning sessions once funding is appropriated to discuss how ARS can best execute the capital projects. Several factors that must be considered during these sessions are listed below.

- Current engineering and contracting staffing at the Business Service Centers and FD
- Experience of the available engineers and contracting officers in managing major facilities construction
- Agency priority of specific projects
- Bio-containment level of specific projects
- Ability of ARS to contract with other federal agencies to manage the construction, both in terms of funding availability within the current project budget and expertise of the sister agency's staff (it may be better to keep certain bio-containment projects in house)

In general, the roles and responsibilities for the major project actions are listed below.

- FD prepares the Action Plan and Fact Sheet
- FD develops conceptual project information, which is provided to the BSCs
- FD is responsible for coordinating the development of the project's Functional Statement with review and guidance from the BSC.
- The BSC develops the POR with review and guidance from FD
- The BSC implements the design and construction of the project, with an FD representative as part of the project team.

3. POLICY

It is the Agency's policy that major facilities projects are managed in a structured and professional manner to provide facilities that meet the needs of the research program within the scope, schedule, and cost parameters established for each undertaking. The processes described in this manual govern the activities of diverse project teams representing research, management, stakeholder, and construction professionals to deliver projects in accordance with Agency priorities and meeting all applicable appropriation, environmental, building, and procurement laws, regulations, and policies.

4. ROLES AND RESPONSIBILITIES

There are three (3) distinct areas in the management of a major construction project: (1) Program Management is ensuring that all research 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 enforcing all contract terms and conditions; and (3) Engineering Project Management is ensuring all technical, operational, and program management issues are addressed and incorporated into the project. Project management is accomplished by the Project Team that is identified in the *Action Plan and Fact Sheet* (AP/FS) approved by the Agency Administrator for each major project.

The Project Team is a diverse group of ARS professionals contributing their skills, talents, and knowledge to plan, design, and construct a research facility in support of the Agency's research mission within a specified scope, budget, and schedule. The Project Team is generally established at the time the project requirements are determined. The primary goal 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.

This section provides a general discussion of the roles and responsibilities of each team member. Specific responsibilities of the Project Team members are discussed in more detail for the various phases of the project execution. Active participation of all members of the Project Team is 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 (AD). 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 AP/FS. Any deviations from the AP/FS 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 Functional Statement (sometimes called the Preliminary *Program of Requirements (POR)*) developed by the RPR and Engineering Project Manager (EPM), ensuring that it is consistent with the AP/FS approved by the Administrator. The RPM, together with the RPR, ensures 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.

Facilities Division (FD) will obtain approval of the RPM, RPR, and Office of National Programs Representative (ONPR) for the final POR and the final design ensuring that they are consistent with the approved AP/FS. The RPM is responsible for compliance with the National Environmental Policy Act (NEPA) as it relates to the project (Reference 7 CFR 520, Procedures for Implementing National Environmental Policy Act, and 40 CFR 1508, Protection of

Environment, Chapter V, Council on Environmental Quality). The RPM is the fund holder for the project and is responsible for requisition approval and issuance. The RPM may delegate authority to approve and issue *Procurement Requests*. The RPM should be directly involved in the *orientation session*, provide guidance during development of the POR, provide concept and final design reviews, as well as review 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 (LC), Research Leader (RL), or Laboratory Director (LD). The RPR prepares the Functional Statement for RPM approval, and coordinates the project's program requirements with the EPM to formulate a specific statement for the POR. The RPR serves as the primary source of program criteria information and any special Location criteria and works closely with FD and the Business Service Centers (BSCs) in preparation of the AP/FS. The RPR recommends POR approval to the RPM.

During the design phase, the RPR, or their designee, is invited to participate as a voting member on the Architect-Engineer (A-E) Evaluation Board that recommends the selection and contract award of the A-E firm who will design the project. The RPR coordinates the review of design submissions among the other researchers involved in the requirements to ensure the design meets the functional needs of the research program and provides consolidated review comments on the proposed design to the EPM. The RPR also coordinates the review with other Location and BSC entities involved in the long-term operation and maintenance of the facility considering such things as maintenance requirements, compatibility with existing systems (IT, fire, security, etc.) and facilities, local operational protocols, and staffing needs. 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/interests. The RPR will provide written concurrence with the final design documents. Implementation of research program needs is the major objective of the project. The RPR is responsible for obtaining all the necessary agent registrations or other programmatic inspections, certifications, registrations, permits, and approvals from the appropriate regulatory agencies (e.g., Centers for Disease Control and Prevention (CDC), United States Department of Agriculture (USDA)-Animal and Plant Health Inspection Service (APHIS), Food & Drug Administration (FDA), Nuclear Regulatory Agency (NRC), etc.) that may be required by the research program and will provide the necessary information and program requirements to the EPM and A-E. Together, 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 design contract.

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 other contractors must be coordinated with the EPM and CO. The RPR is expected to notify the EPM/Contracting Officer's Representative (COR) and 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 based on the contractor fulfilling their contractual obligations.

A smooth transition from the construction phase to the operational phase is critical. The RPR, with the BSC and/or Area Office (AO), will establish an effective Operation and Maintenance (O&M) program and arrange for personnel or maintenance contracts for facility systems and equipment and the establishment of contracts to install systems furniture, telephone systems, moveable equipment, etc. These types of activities are not funded with Building and Facilities (B&F) appropriations. The RPR will coordinate occupancy of the facility and, if applicable, any *ceremonial activities*. It is critical that the staff responsible for operation and maintenance of the new or modernized facility is available to actively participate in training on the facility systems and commissioning of the facility. During the warranty period following completion of the project, the Project Team members will provide the RPR with assistance in resolving any contractual or construction problems that may arise. It is imperative that the Location operate and maintain the facility in such a manner that warranties remain enforceable.

The RPR is responsible for keeping the Project Team members informed of all communications and actions concerning the project from the perspective of the program.

Office of National Programs Representative (ONPR)

The ONPR 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 ONPR, with the support of the RPR, is responsible for developing the Functional Statement and approving the final POR.

Engineering Project Manager (EPM)

The EPM is a BSC 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 on. The EPM role will continue throughout the planning, design, and construction phases of the project. The EPM serves as the lead point of contact (POC) for the project actions and will disseminate information to the appropriate Project Team members for their action or involvement. The EPM will keep Project Team members advised of project activities, required actions by team members, schedule, budget, and progress of the project. All Project Team members will keep the EPM

advised of their needs and concerns. The EPM, along with the CO, is the lead POC between the Project Team and contractors for day-to-day business, working within the terms and conditions of the contracts.

During the planning phase, the EPM will coordinate the development and review of the AP/FS 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 for the project. After consulting with other Project Team members, the EPM will prepare a ***Project Requirements Document (PRD)*** or ***Statement of Work (SOW)*** for professional services for the design of the various phases of the project and developing cost estimates for each phase.. The EPM will chair the A-E Evaluation Board to evaluate and recommend selection of the A-E for a particular project.

During the planning and design phases, the EPM will normally be designated as the COR and will act as the principal liaison with the A-E firm. The EPM/COR 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/COR will ensure that the project complies with the approved AP/FS. Should the POR change during the course of design, the EPM/COR will ensure, after consultation with the Project Team, that the AP/FS is revised and resubmitted for approval by the Administrator. The EPM/COR 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, Agency design standards, energy and sustainability policies, safety standards, etc.

During the construction phase, the EPM usually serves as the COR. In rare occurrences, the CO may designate the Facility Engineer to serve as COR, if beneficial to the Agency in execution of the project. 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.

During the construction phase, the EPM/COR is responsible for monitoring and classifying all changes to the construction contract. Each change order will be classified by purpose, such as: "A-E Error/Omission," "Customer Requested," "Differing Site Condition," or "Other." The EPM/COR shall maintain a spreadsheet listing each change order, its classification, and the cost for each. The EPM will coordinate budget and schedule issues with the RPR on a continual basis.

The EPM/COR provides interim (if applicable) and final evaluations of all contractors' performance (A-E, DR, and Construction Contractor (CC) at the end of each phase of the project design, design review, and construction) in accordance with Agency procedures.

Contracting Officer (CO)

The CO is an ARS Contract Specialist with the BSC 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 any of the specifications, drawings, terms, and conditions of the contract. The CO may delegate certain responsibilities not affecting the contract scope, performance time, or cost, to the EPM, COR, and/or Location Monitor (LM).

The CO is assigned to the project early in its development and will continue with this role through planning, design, construction, and closeout 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, policies, 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 fund holder for obligation.

The CO assists/participates with the Project Team in developing the AP/FS. The CO officially designates the A-E Evaluation Board members 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 for ensuring adequate contract performance and contract management. The CO is also responsible for monitoring contract performance and budgetary events, conducting and participating in *Pre-Bid/Pre-Proposal, Pre-Construction Conferences*, project meetings, conducting negotiations, and taking 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, 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 keeping Project Team members informed of all communications and actions concerning contracting issues and decisions for the project.

Contracting Officer's Representative (COR)

The COR is usually part of the BSC and is the EPM. The assignment as COR is made at the time of the contract award by an official appointment letter from the CO that outlines the responsibilities, authorities, and limitations of the COR function. A copy of this appointment letter is provided to the contractors and Project Team members.

The COR is responsible for interpreting technical data in the A-E, construction, and construction CIC contracts. The COR is responsible for reviewing progress payment 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 shall be documented and communicated to the Project Team as well as the contractors involved.

The COR will provide the CO with 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 POC between the Project Team and A-E, construction, and CIC contractors for day-to-day business, working within the terms of their delegation.

If the CO appoints someone other than the EPM as COR, the EPM is still the lead POC for the Project Team and the COR will work closely with the EPM to assure that appropriate information is provided to support the roles of the other Team Members.

BSC Safety, Health, and Environmental Management (SHEM) Personnel

The SHEM representative 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 BSC SHEM representative shall be consulted to provide interpretation and guidance on safety, health, NEPA, and other environmental matters related to the project. The SHEM representative will be asked to coordinate waivers for any proposed deviation from Agency policy for approval by the FD/Safety, Health, and Environmental Branch (SHEMB). The SHEM representative shall also be consulted during construction to address safety, health, and environmental matters. The SHEM representative will participate, as required, in project meetings and serve as the primary Subject Matter Expert (SME) concerning waiver requests. The EPM will inform SHEM of any project issues which fall under their area of oversight.

The Business Service Center, Safety and Health Manager (BSC SHEM) serves as the SHEM advisor and a resource to the Project Team during the planning, design, and construction phases on projects within their Area and shall be consulted on such issues. During the planning phase, the BSC SHEM may be consulted to provide input on developing the POR and the PRD for design. The BSC SHEM will assist in the preparation of the variances on safety, health, and environmental issues during the planning and site investigation phases. Also, the BSC SHEM shall assist in prioritizing the safety, health, and environmental items to be incorporated in the PRD for design. The BSC SHEM will advise the project team of any unique safety, health, and environmental issues related to the specific research programs to be housed in the facilities.

During the design phase, the BSC SHEM shall, review the design submittal and incorporate the

safety, health, and environmental requirements into the contract documents.

During the construction phase, the BSC SHEM may be requested to assist with ensuring that all appropriate safety, health, and environmental management related regulations are in place. The ASHM may participate in final inspection and acceptance of the project.

BSC Realty Specialist (RS) /Real Property Leasing Officer (RPLO)

The BSC RS/RPLO is responsible for ensuring that all realty interests are obtained for the planned project sufficient to cover the Federal Government's investment in the construction of facilities. The RS/RPLO is responsible for ensuring that easements, rights-of-way, or leases for the project, including roads and utilities are prepared, negotiated, and executed. The RS/RPLO will review each project to assure compliance with approved Master Plans, the National Historic Preservation Act, and the Threatened and Endangered Species Act. The RS is responsible for making a determination regarding capitalization and initiating the preparation of a *Unique Asset Identifier Request Form* and creation of a shell record within the Corporate Property Automated Information System (CPAIS). These actions will require coordination with the EPM and CO, as well as the Real Property Management Branch (RPMB). Upon receipt of either a *Certificate of Completion* or *Notice of Beneficial Occupancy* from the EPM or CO, the RS/RPLO will coordinate with the EPM and CO to update the facility information in CPAIS and obtain all Final Records of Payment from the CO to place the asset(s) in service for depreciation through RPMB. RPMB reviews the documentation submitted and forwards to the Financial Management Division (FMD) who closes the corresponding Work In Progress and places the facility in service for depreciation. The BSC RS/RPLO will coordinate with the FD/Real Property Management Branch (RPMB) for realty interests exceeding delegated-authority expressed within his/her Certificate of Appointment.

Location Monitor (LM)

The LM is an ARS representative at the construction site (or nearby location), and is formally appointed by the CO, and serves as a point of contact for either the A-E, CIC, or the CC to provide information regarding location rules, procedures, and regulations. The LM designation is normally made to the Location Facilities Manager/Maintenance or Facilities Engineer, Location Administrative Officer (LAO), or LC. 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 and 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; (4) coordinating authorization for contractor to work beyond normal work hours; (5) coordinating access to facilities and security protocols related to the site; and (6) designating material staging areas and contractor trailer location(s), etc. The LM should be an active participant in the design and construction process to provide input on Location operation and maintenance procedures and to gain familiarity with the facility in preparation for transitioning into the O&M mode. During construction, the LM should actively participate in all facility

turnovers, commissioning, and training activities, and have a thorough understanding of the O&M manuals and warranty information provided by the CC.

Cooperator

A Cooperator is a State or Federal Agency, college or university, or private organization having a mutual interest in agricultural research that has entered into a valid and legal long-term lease or revocable permit. 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/COR for day-to-day business, working within the terms of the contract. Adjustments to the contract always remain under the authority of the CO.

During the planning phase, the A-E finalizes the POR, prepares the NEPA documentation, 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 may be tasked with preparation of the final design and working drawings (if construction funding is available). At various stages of design, submittals of plans, specifications, and cost estimates are made to the Government for program, technical, and budget review. The Government will submit written comments to the A-E at each design submission and the A-E will respond to all comments in writing. Those comments will be incorporated into the next design submission. The A-E may be required to make formal presentations at the various stages of design development. 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-Proposal, Pre-Construction Conferences, and other meetings, as well as prepare solicitation amendment documents that result from contractor or Government questions on technical issues or program changes. The A-E may be tasked to review and approve shop drawings, material submittals, review and comment on construction contract modifications, progress payments, and other related activities as directed by the terms and conditions of their contract. 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 A-E who provides professional services to review the design submittals prepared by the design A-E. The DR 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, (e.g., 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 also be tasked to perform Value Engineering (VE) studies for major construction projects, when required. The DR may also 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 (QA) that the construction project is being constructed as designed and to provide oversight on the Quality Control (QC) plan of the CC. The CIC will utilize the services 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 through a task order under an existing Indefinite Delivery/Indefinite Quantity (IDIQ) contract with an A-E firm separate from the design A-E.

The CIC will monitor the QC plan of the CC 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 CC's Superintendent and the EPM/COR. Keeping the EPM/COR informed of these findings will enable corrective actions to be implemented by the CO if necessary.

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

Construction Contractor (CC)

The CC is an independent firm hired under Government contract to provide those professional construction services defined by Federal Acquisition Regulation (FAR), Part 36. The specific work to be performed by the CC shall be set forth in writing in the specific contract document which includes the construction drawings and specifications. The CC's team may consist of the

prime contractor, who has a direct contractual relationship with the Government and various subcontractors and suppliers. No legal contract exists between the Government and the subcontractors and suppliers. In other words, the Government has no privity of contract with anyone other than the prime CC. The CC has 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 CC shall contact the CO and the EPM/COR directly on all matters of the contract affecting changes to the contract provisions, contract scope, performance, time, or cost. The CO is the only 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 make changes to the contract. The EPM/COR is usually the primary POC for the CC for day-to-day business, working within the terms of the contract.

The CC must prepare and maintain a suitable QC 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, EPM/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 to the CIC or designated A-E firm, 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 closeout and warranty phase of the contract, the CC will, in accordance with the contract, commission the facility, prepare O&M manuals, ensure systems are fully functioning, provide system training and demonstration to Location personnel, EPM/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 mitigate or resolve Government concern(s).

Largely dependent on the funding availability for a project, the Government may consider alternate project delivery methods, such as Design-Build (D-B) or Construction Manager (CM) at Risk to expedite the project schedule. These concepts will be explained to the project team in detail if they are selected. Generally, the D-B process provides a conceptual design to a contractor who is responsible for both completion of the design documents and construction of the project. The D-B allows for award of a construction contract before completion of the full set of construction documents. This allows start of construction on elements, such as site work, foundations, etc., concurrent with the completion of the design.

5. AUTHORITIES

- 7 USC 2250

- Public Law 99-198, Food Security Act of 1983
- Public Law 92-582, The Brooks Act

6. PHASES AND STEPS

Generally, there are four (4) distinct phases to a major facilities construction project and numerous steps within each of those phases. These Phases are: Program Development; Project Planning; Project Design; and Construction.

PHASE I – PROGRAM DEVELOPMENT

Program Development includes project conception, scope and cost formulation, and budget request. **(Typically 180 to 360 days in duration.)**

A new project (either new construction or modernization) is typically generated by the AD to meet a research program need or is in response to a specific request from Congress (usually through language in an appropriations bill) to provide a feasibility study for a research facility that they determine is needed. The individuals primarily involved in this phase include the AD, a designated RPR, Office of National Programs (ONP), BSC, and FD. The Area will develop a Functional Statement that outlines the research needs of the facility and the staffing required to conduct the research program. The BSC and FD will assist the Area team in determining the type of space and the size of space necessary for the research and site considerations for a new facility. At this early stage of development, the space requirements are based on general industry standards when specific research needs cannot be fully defined. Once the space requirements are identified, a project cost estimate will be developed based on historical cost information of similar facilities. The BSC and FD will also develop an estimate of annual O&M costs for the proposed facility.

The ONP will obtain the Administrator's approval of the proposed project based on the information presented in the final Functional Statement. If the project was requested by Congress, FD will prepare a brief communication outlining the scope, cost and anticipated schedule for the project, forward it to the Budget and Program Management Staff (BPMS) who will forward it to Congress. The Area will work with the BSC to include the approved facility on the annual update of their Capital Project Repair Plan (CPRP).

An AP/FS places limitations on the scope and cost of the proposed facility and is prepared by FD in coordination with BSC for the Administrator's approval. The Fact Sheet is based on the Functional Statement previously approved by ONP and the Administrator. FD will coordinate with the BSC, Area, and ONP to identify individuals to be named for the project team in the Action Plan. The roles and responsibilities for each individual are delineated below for each step of this phase.

Phase 1 is comprised of three (3) steps:

1. Project Conception and Scope Formulation
2. Appropriation Request and Allocation of Funds
3. Project Initiation and Action Plan Development

Step 1 – Project Conception and Scope Formulation

The roles of the individual project team members during this step are as follows:

AD Identifies need for project through Annual Resource Management Plan (ARMP), Capital Investment Strategy, or CPRP process or directly with ONP.

ONP Recommends approval of project and obtains Administrator approval. Initiates appropriate Congressional contacts.

ADMINISTRATOR Approves project.

AD Provides the leadership in development of facility and program needs. (Functional Statement)

- 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 Area Office Engineer (AOE) may participate.

Consults ONP and FD for recommendations.

BSC, FD Assists AD in the development of preliminary project data, design alternatives, site selection, budget estimate, schedule, realty, environmental, safety and health, and other project development issues. FD develops estimate for total *project budget cost* (planning, design, and construction). BSC will coordinate reviews for studies (e.g., site selection, environmental, estimating).

ONP Reviews and approves preliminary program and project data, site selection, and budget estimate outlined in the Functional Statement.

Step 2 – Appropriation Request and Allocation of Funds

The roles of the individual project team members during this step are as follows:

FD Develops and submits *Justification Statement* to ONP.

ONP	Initiates <i>appropriation</i> request through BPMS.
BPMS	Submits the project and Justification Statement to Office of Budget and Program Analysis (OBPA). Incorporates the project in the ARS budget request and serves as the liaison for OBPA and Congress.
OBPA	Approves project and Justification Statement and determines if the project should be incorporated as a line item in the USDA budget request to the Office of Management and Budget (OMB).
OMB	Approves/incorporates USDA budget request in Federal budget request.
Congress	Appropriates partial or full funding of the project.
OMB	Provides <i>apportionment</i> of the funds through OBPA.
BPMS	Provides written notification of Congressional appropriations and provides <i>allocation</i> of funds to AD.
BSC	Establishes accounting codes/provides account maintenance services for fund holders.

Step 3 – Project Initiation and Action Plan Development

The roles of the individual project team members during this step are as follow:

FD	Consults with ONP and AD to establish project team.
RPM	RPM is usually the AD and selects RPR.
FD	Prepares a written AP/FS identifying project team members and defining responsibilities (see EXHIBITS 1 and 2 at the end of this document). FD shall obtain the Administrator’s approval of AP/FS. FD, with assistance from BSC, begins planning by preparing tentative schedule and preliminary budget for design and construction. Coordinates with the RPR and advises ONP and RPM of any schedule or budget concerns.
ONPR	Concurs with AP/FS.
RPM	Recommends Administrator’s approval of AP/FS.
ADMINISTRATOR	Approves AP/FS.
RPM ONPR	Develops project Functional Statement and preliminary POR. (See EXHIBIT 2)

- RPR Consults with the Office of the Chief Information Officer (OCIO) for telecommunications advice.
- FD Reviews and refines preliminary POR to insure consistency between project scope, budget and schedule before finalizing the preliminary POR.
- ONPR/RPM Approves final preliminary POR.

PHASES II AND III – PROJECT PLANNING AND DESIGN

Starting at Phase II, FD turns over management of the project and all prior project documentation to the BSC. FD will continue to provide guidance on the project to the BSC. The discussion of these two (2) phases is combined in this section as many of their processes are very similar. These phases are performed using a private A-E firm. The A-E firm documents detailed planning information for the project into a POR document. This POR becomes the Basis of Design for the facility. Generally the same A-E that developed the POR will be tasked with performing the design services when sufficient funding is available to do so. **(Phase II Typically 6 to 9 months in duration; Phase III typically 12 to 18 months in duration.)**

There are three (3) steps in this Phase II and III:

1. A-E Selection and Contract Award
2. Detailed Project Planning
3. Project Design Development

Step 1 - A-E Selection and Contract Award Process

A-E TECHNICAL SELECTION:

The selection of an A-E firm to provide programming, design, and CIC services is done in accordance with standard contracting policies. The A-E may be selected from one of several already under a nationwide or Area IDIQ contract or one could be solicited through a project-specific request for proposal when unique technical, geographic, or other considerations warrant. Depending on the method used, the process to select and enter into a contract with an A-E generally takes from 4 to 12 months.

Public Law 92-582, the Brooks Act, is the Federal statute that contains the basic Government policy for procuring architectural and engineering services. FAR Part 36.6 provides guidance to the Government for evaluating the qualifications and performance of A-E firms and conducting discussions to select the firm deemed to be most highly qualified based on technical merits only. There is no evaluation of cost. 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 FAR.

The roles of the individual project team members during this step are as follows:

- Project Team Participates in project *Orientation Session*.
- RPM Submits approved preliminary POR to FD.
Submits a funded Procurement Request for *A-E services* to CO.
- CO Prepares *Procurement Plan*.
Appoints A-E Evaluation Board.
- EPM Prepares and submits PRD/SOW for A-E services, project *Estimated Construction Cost (ECC)*, and A-E evaluation criteria to CO.

FOR A PROJECT-SPECIFIC AWARD:

- EPM Prepares and submits PRD, Government estimate of A-E fees, ECC, and A-E reevaluation criteria to the CO.
- CO Reviews the PRD, ECC, and evaluation criteria.
Publicizes the project and the evaluation criteria.
Advises A-E Evaluation Board of guidelines for integrity, evaluation, fairness, and contents of evaluation report.
Receives A-E Qualifications Statements from interested A-E firms.
Provides direction to the A-E Evaluation Board during the evaluation process.
- Board, EPM, RPR, BSC Engineers Evaluates A-E Qualifications Statements 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 and submits final report with order of preference to CO.
- CO Prepares/submits final selection report.
Selects A-E for negotiations; this selection is based solely on the A-E firms' technical qualifications in accordance with the Brooks Act. Pricing is not a factor at this time.

FOR SELECTION OF AN A-E USING TASK ORDER UNDER IDIQ CONTRACT:

- CO Reviews the PRD and ECC.

- RPM, RPR May request a presentation from contractors under existing IDIQ contracts.
- RPM, RPR, EPM Develop the topical areas to be addressed by A-E's.
- CO, EPM Coordinate and document decision to use an IDIQ.
- CO Invites A-Es to conduct presentation based on topics from RPM/RPR. Presentations are not mandatory. Selection of A-E from pool of IDIQ firms may be based on the A-E firm's past performance, experience, unique qualifications.
- Board Evaluates presentations and provides a recommendation to the CO for selection of the A-E to perform the design of the facility. Recommendation is submitted in writing and signed by the Board members.

A-E CONTRACT AWARD:

Once the A-E has been selected on technical merit, a cost proposal is requested from the A-E and the fee is negotiated. Depending on the funds appropriated for the project and how well defined project scope is, the CO may solicit a proposal for developing the POR, Conceptual Design, and Final Design. The CO then makes an initial award for the initial phases only, with the remaining design actions to be awarded at a later date under a separate Task Order.

The roles of the individual project team members during this step are as follows:

- CO Prepares the Request for Proposals (RFP) for A-E *Pre-design* and design services. Obtains required advice and reviews (e.g., Contract Review Board (CRB)), legal review by the Offices of General Counsel (OGC), pertinent State Historic Preservation Organization, etc...).
- EPM Updates PRD/SOW for A-E services, if necessary. Prepares and submits revised Government estimate of A-E services fees to the CO, if necessary.
- RPMB Finalizes the realty acquisition prior to design award. Pre-design award may occur prior to finalizing realty acquisition.
- RPR Assists in updating PRD, if necessary.
- CO Issues RFP for A-E services and receives A-E proposal. Obtains an evaluation of the proposal from the COR/EPM. Evaluates proposal and coordinates a Pre-Negotiation Plan with the COR/EPM.
- EPM Provides and coordinates assistance in cost evaluation of A-E proposal with the RPM, RPR, the BSC Engineer and if necessary an auditor.

- RPR May provide information on scientific program during cost evaluation.
- CO Conducts negotiations with A-E firm. If the CO and selected A-E firm cannot reach agreement on contract terms, the CO issues an RFP to the A-E ranked second highest by the Evaluation Board and enters into negotiations with this firm.
- EPM Provides and coordinates technical assistance and price support to CO during the negotiations.
- RPR May provide information on scientific program during negotiations with A-E.
- RPM Resolves program discrepancies, if necessary.
- CO Notifies the Legislative Staff (LS), FD, and others, as required, prior to award.
Notifies and debriefs unsuccessful firms.
Awards the Design Contract or Task Order.

DESIGN REVIEW (DR) A-E CONTRACT AWARD:

The selection of an A-E firm to provide design review services is done in accordance with BSC standard policies. The DR A-E is usually selected from one of several already under a nationwide or Area IDIQ contract. The negotiation of the DR fee often occurs shortly after award of the design contract. The DR firm provides an independent review of the Design A-E's work and is focused on technical adequacy, compliance with ARS and industry codes and standards, review of cost estimates, and specifications and drawings coordination and ambiguities. Negotiation of the DR A-E fee typically takes from 2 to 3 months.

The roles of the individual project team members during this step are as follows:

- EPM Prepares and submits PRD/SOW for DR VE with the Government Estimate to CO.
- CO Prepares and issues an RFP for DR and VE services to an A-E firm under an existing IDIQ contract.
Receives and evaluates DR/VE Proposal.
Obtains technical advice from the EPM, RPM, RPR, AOE, and if necessary an auditor.
- EPM Provides and coordinates assistance in technical and cost evaluation of DR and VE proposal.
- RPR Provides program guidance if necessary.
- CO Conducts negotiations with A-E firm.

EPM	Provides and coordinates technical assistance and price support to CO during negotiations.
RPR	Provides program guidance if necessary.
CO	Awards DR/VE contract.

STEP 2 – Detailed Project Planning

The Pre-Design and Design phases entail multiple submissions of documents by the A-E.

For the POR development (Pre-Design), the A-E initiates the process based on the functional statements and preliminary POR prepared by the RPR. Through a series of interviews and on-site meetings, the A-E prepares an initial draft of the POR and submits it for Government review. All members of the Project Team review the initial submission and submit written comments for consideration by the A-E. The A-E submits written responses to the Government and a meeting is held to reconcile all comments and hold discussions. The comments from the initial submission are incorporated into the final POR. This review process typically takes 30 days to complete.

The A-E then submits the final draft of the POR which contains more detail and addresses the reviewers' previous comments. Another review process similar to the one described above occurs. The A-E incorporates the comments into the Final POR which is delivered to the Government. The Final POR is approved by the RPM and ONP and becomes the basis of design for the facility.

A typical POR includes the following major features:

1. An Executive Summary
2. A refined and detailed description of the functional and technical requirements of the proposed project.
3. A description of the research program, Location staffing, and existing research equipment.
4. Draft and final data sheets completed by the A-E detailing the spatial, casework, equipment, and utility requirements of the functional areas.
5. A tabular summary of the spatial, equipment and utility requirements of the functional spaces. Discuss functional relationships, space tabulations, the net-to-gross analysis, bio-safety containment levels, the areas included in net space areas, and compliance with the ARS administrative space requirements.
6. A Design Intent document that describes the basis of design for all buildings and major systems.

7. The identification and documentation of the utility services that must be brought or extended to the site.
8. If the project involves bio-containment facilities, the POR will include flow diagrams for people, supplies, equipment, animals, and waste through the bio-barriers.
9. Brief discussions of the project's planned energy and water conservation measures, sustainable features, and use of bio-base and bio-preferred products and materials.
10. A code analysis identifying and documenting the governing codes and their application, and documentation for the consultation with local code officials to identify all permits and reviews required by the project.
11. A discussion of the physical security requirements and systems.
12. A discussion of the telecommunications and data system requirements.
13. An opinion of probable cost based on a square foot cost estimate, itemized by major project system.
14. Pending decisions that need to be considered in the design phase.
15. An estimate of the annual facility operation costs for utilities and maintenance.

The roles of the individual project team members during this step are as follow:

CO	<p>Appoints COR (usually EPM). Gives notice to proceed to each A-E firm. Monitors compliance with contract provisions and schedules.</p>
A-E	<p>Begins Pre-Design process. Finalizes the POR. Completes <i>environmental documentation</i> and other Pre-Design deliverables.</p>
EPM/COR	<p>Manages planning effort and A-E contract. Coordinates the Project Team's and DR A-E's (if necessary) review of Pre-Design submissions.</p> <p>Approves Pre-Design 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. Monitors compliance with the schedule.</p>

Provides the recommendations on contractor payment requests.
Provides the recommendation to proceed to next phase.

RPM Makes final decision on environmental documentation.
 Approves final POR and final Pre-Design submissions.
 Resolves and approves program deviations.

RPR Assures final POR complies with Research Program.
 Reviews and comments on Pre-Design submissions.
 Recommends approval of final POR to RPM.

CO Evaluates and authorizes contract changes, considering technical and program
 advice.
 Monitors compliance with contract provisions and schedules.
 Approves contractor payment requests.
 Gives Notice to Proceed (NTP) to next phase.

FD Obtains POR approval from ONP.
 Updates project Briefing Papers, communicates status/issues to BPMS and
 Administrator.

Step 3 – Project Design Development

Once the POR is approved, the A-E is given the NTP, (subject to funding availability and obtaining realty interest) for the design development. There are multiple submissions of the design documents to allow for Government review at interim stages of development. These submissions typically occur at a 15%, 35%, 50%, 95%, and 100% completion stage. Review submissions may be added or deleted depending on the complexity of the project. Documents include *drawings/plans, specifications*, engineering calculations, cost estimates, etc. The A-E initiates the design based on the information contained in the approved POR. Similar to the POR process, all members of the Project Team, including the DR, review the various submissions and provide written comments for consideration by the A-E. The A-E submits written responses to the Government and a meeting is held to reconcile all comments and hold discussions. The comments from the initial submission are incorporated into the next design submittal. This review process typically takes 30 days to complete at each stage of development.

Depending on the amount of funding appropriated for a project, the BSC may decide to take the project to a Conceptual (35% design) stage and stop there. Often there is a prolonged period from the time the Agency receives initial project funding for design and when sufficient funding has been appropriated to begin construction. During this prolonged period, building codes and standards change, research program needs change, and often the facility size/plan is reduced or scaled back because of budget considerations. The Conceptual design process minimizes wasted design effort should any of these events occur, but places the project in a position that alternative project delivery methods can be used to quickly restart the process once construction funding is

available.

DELIVERY THROUGH DESIGN-BUILD (D-B) PROCESS:

Whenever possible, it is ARS' preference to utilize the D-B method of project delivery. Use of this tool requires that all required funding for a project has been appropriated and that the requirements for the project can be adequately expressed at an early stage of development.

Under this process, ARS will contract with a design A-E and design review A-E as described above. The normal process will be followed until the 35 percent design submission stage. At that time, the A-E will be tasked with developing bridging documents.

Bridging documents are used to supplement the typical 35 percent submission consisting of the final floor plan, design analysis, etc. The bridging documents use outline specifications and other narratives to establish the minimum requirements of the project.

The bridging documents are used to solicit a D-B contract. Under this process, a CC and design firm team together. That team is responsible for completing the rest of the design effort and constructing the facility within the parameters authorized in the bridging document.

The D-B method allows for construction to start concurrent with design completion. A thorough assessment of contract risks for each project needs to be performed before deciding on this method.

The roles of the individual project team members during this step are as follows:

A-E	Begins Design. Produces various stages of submissions, including cost estimates (15%, 35% (conceptual design), 50%, 95%, 100%).
DR	Performs DR for each submission from the A-E. Conducts VE Workshop at the 35 percent design stage.
EPM/COR	Manages design effort and A-E contract. Coordinates Project Team's and DR A-E's review of design submissions and insures reviewer comments are reconciled. Approves A-E design and cost estimate submissions and performance. Approves DR's submissions and performance. Participates in VE Workshop. Coordinates and provides recommendations for incorporation of VE proposals. Reviews and provides recommendations on proposed changes from a technical and cost standpoint. Coordinates program review of proposed changes. With the CO, prepares FD internal 50 percent Design Review Board (DRB) briefing.

Provides recommendations to CO on A-E and DR A-E payment requests.

- RPR 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.
Approves final design.
- RPM Reviews and comments on design submissions.
May participate in VE Workshop.
Provides input on VE recommendations from program perspective.
Resolves and approves program deviations.
Approves final design.
- BSC SHEM May review and comment on design submissions.
May participate in VE Workshop.
- CO Participates in design review and VE Workshop.
With EPM, prepares BSC internal 50% DRB activities.
Evaluates and authorizes contract changes with technical and program advice.
Approves contractor payment requests.
- EPM Coordinates sign-off and acceptance of final design documents.
- FD Considers/approves waivers from ARS design standards.
Provides advice/interpretation of policies.
Updates project briefing papers.
Communicates status/issues to BPMS and Administrator.

PHASE IV– CONSTRUCTION

Once the bridging document or design process is completed and funding is available for construction, BSC will initiate the process by advising the AD. Then the CO will initiate the acquisition process for a construction contract. The design A-E firm assists the Government in issuing the solicitation and evaluating CC proposals or bids. One of the first steps is to award a contract or task order to the bridging document or design A-E for at least bid phase services and, possibly, to award the construction phase/inspection services at the same time to either the design A-E or another A-E.

The CO will conduct market research to determine the most appropriate method of acquisition (e.g., sealed bidding procedures, Invitation for Bids (IFB) or competitive negotiations RFP; sole source or competition within certain socio-economic groups, depending on the dollar value/ECC of the project; or unrestricted competition).. After that, if the project is to be competed, the CO will post a pre-solicitation notice on the Federal Business Opportunities (FedBizOps) Web site

that contains sufficient information about the project for potential offerors to determine whether or not they are interested in looking at the solicitation once it is released. The pre-solicitation notice is usually posted a minimum of 15 days prior to posting the solicitation which remains open for at least 30 days. If it is not competed, the CO will initiate actions to negotiate on a sole source basis with a firm within one of the permissible socio-economic groups (8(a), service-disabled veteran-owned small business (SDVOSB), HUBZone, or women-owned small business (WOSB)).

For larger facility projects, ARS prefers to use the negotiation process or RFP utilizing the Best Value method of evaluation. It is a process that evaluates not only cost, but also contractors' qualifications, proposed technical approach, and past performance. This process takes longer than sealed bidding procedures or IFB but typically, results in award to a more qualified contractor and fewer problems during construction.

Please see discussion of D-B delivery under Step 3.

There are six (6) steps in this Phase:

1. Bid Phase & Construction Phase Services Contract Award
2. Construction Contract Solicitation and Award
3. Construction Contract Award Administration
4. Final Inspections
5. Acceptance, Occupancy, and Facility Turnover
6. Warranty and Contract Closeout

The roles of the individual project team members are discussed for each of these steps.

Step 1 – Bid Phase and Construction Phase Services Contract Awards

ARS uses the design A-E and/or DR A-E to provide services during the solicitation of the construction contract and to assist with the administration and inspection of the construction effort. **(Typically 30 to 60 days to complete.)**

Bid Phase services include attendance at the *Pre-Bid/Pre-Proposal* & Site Visit Conferences, providing documents for any amendments to the specifications and/or drawings, assistance in evaluating the bids/proposals, etc. Construction Phase Services include the management, monitoring, and *inspection* of the construction as it progresses, including reviewing and commenting on the CC schedule, reviewing/approving shop drawings and submittals, conducting & documenting the monthly (or periodic) progress meetings, conducting labor interviews of the CC's employees (including subcontractor employees), reviewing and providing recommendations on *change order requests*, reviewing and providing recommendations on the CC's invoices, reviewing and commenting on the CC's (and subcontractors') payroll records, and participating in the commissioning activities, etc.

The roles of the individual project team members during this step are as follows:

EPM/COR	Prepares and submits PRD/SOW and Government Estimate for A-E CM services and/or CIC services to CO.
CO	Prepares and issues RFP for A-E CM services and/or CIC services. Receives and evaluates A-E CM/CIC proposal. Obtains technical advice from EPM, RPM, RPR, and AOE, (and audit advice, if necessary).
EPM/COR	Provides and coordinates assistance in technical and cost evaluation of the A-E's 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 2 – Construction Contract Solicitation and Award
(Typically 120 to 180 days to complete.)**

This step entails coordination with all members of the Project Team and the Design A-E. Market research enables the CO to make a determination as to the type of solicitation to be used, as well as whether to set aside the project for a particular socio-economic group or utilize unrestricted competition. The results of this research play an important part in the success of the project.

Coordination with the Design A-E is important to ensure that the solicitation “boiler plate” is in sync with the verbiage in the specifications and drawings, particularly the Schedule of Items in the solicitation and Division 1, General Requirements, in the specifications. Conflicts in either of these documents can cause delays as a result of ambiguities, protests, or the requirement for additional design work. Additional coordination is required for scheduling and conducting the Pre-Bid/Pre-Proposal Conference and Site Visit which is held to provide contractors an opportunity to familiarize themselves with the site and other logistics where the facility is to be built. Any changes to the specifications and drawings or administrative issues that arise from the Conference are addressed by the Design A-E and CO and issued in a solicitation amendment posted for the benefit of all offerors.

If the Best Value negotiated RFP process is used, rather than a sealed bid-lowest offer IFB, the timeframe for award will take a bit longer because an Evaluation Board must be established to

review and evaluate proposals and document the results, followed by negotiations as necessary. However, FD has preferred the use of the RFP process for larger, complex projects because of its flexibility. It has, for the most part, resulted in award to a more responsive contractor and a high quality facility and generally, was less problematic than an IFB.

The roles of the individual project team members during this step are as follows:

- RPM/RPR Submits funded Procurement Request for construction services to CO and begins coordination of *Ceremonial Activities*.

- A-E Provides specifications and drawings in hard copy and electronic format to EPM/COR.

- EPM Forwards complete solicitation package, including approved specifications, drawings, cost estimate, etc., to CO in hard copy and electronic forms.

- CO Reviews funding document, specifications, drawings, and cost estimate.
 Prepares Procurement Plan.
 Conducts Market Research to determine the most appropriate method (e.g., RFP or IFB; set-aside or unrestricted competition).
 Publicizes project in FedBizOpps (if competitive solicitation) and performs other pre-solicitation activities.
 Develops solicitation document and coordinates issuance of solicitation for construction bids or proposals.
 Acquires necessary approvals and reviews (e.g., OGC review, CRB, etc.).
 Issues the RFP or IFB by posting solicitation with the specifications and drawings on FedBizOpps.

- CO Conducts *Pre-Bid or Pre-Proposal Conference* and site visit.
 EPM/COR (BSC SHEM and other Area and Location staff may participate/attend.
 RPR A-E)

- A-E Prepares technical documents for solicitation amendment(s).
 Provides the CO with written responses to bidders' questions.
 Corrects specifications and drawings as necessary and transmits them to the CO for inclusion in solicitation amendment(s).

- EPM Coordinates and approves technical aspects of solicitation amendment(s).

- RPR Coordinates and approves program aspects of solicitation amendment(s).

- CO Coordinates issuance of solicitation amendment(s) with A-E and EPM/COR.
 Receives and evaluates bids.

- EPM/COR Assists in technical aspects of bid evaluations.

- RPR Assists in program aspects of bid evaluations.
- CO Conducts pre-award efforts (reference checks, reviews Excluded Party List System, VETS-100 certification, etc.).
Prepares construction contract award documentation.
Notifies unsuccessful offerors and provides pre-award notifications to LS and others, as required.
Awards Construction Contract.

FOR NEGOTIATED PROPOSALS:

After the solicitation (RFP) is issued:

- CO Appoints a Technical Evaluation Board (TEB) (usually 3-5 members) comprised of EPM/COR, AOE, and Location or other Area Personnel).
Receives proposals and convenes the TEB meeting.
Advises members of guidelines for integrity, evaluation, fairness, and contents of evaluation report.
- A-E Assists in technical aspects of proposal evaluations.
- RPR Assists in program aspects of proposal evaluations.
- TEB Evaluates proposals and documents results.
- EPM/COR Submits Evaluation Report with rankings and recommendation for competitive range and negotiation (if necessary) and award (if negotiations are not necessary)
- CO Reviews Evaluation Report.
Coordinates with EPM/COR in preparation for negotiations.
- CO Prepares for and conducts negotiations.
EPM/COR
- CO Conducts pre-award efforts (reference checks, reviews Excluded Party List System, VETS-100 certification, etc.).
Prepares construction contract award documentation.
Notifies unsuccessful offerors and provides pre-award notifications to LS and others, as required.
Debriefs unsuccessful offerors with assistance from EPM/COR.
Awards Construction Contract.

Step 3 – Construction Contract Administration
(Typical construction duration is 18 to 30 months, depending on size and complexity of

project.)

The construction effort tends to fall into three (3) overlapping periods of activity. In the initial period the Project Team conducts a **Pre-Construction Conference** during which the roles and responsibilities of all parties are discussed, as well as the various contractual, technical, and administrative activities and duties. The CC begins to provide submittals on materials to be used during construction, prepares a baseline construction schedule, as well as QC, Safety, and Environmental Protection plans, and submits the Schedule of Values, etc. These documents need to be approved by the Government before the CC starts work. The CC also begins to mobilize operations where he brings office facilities on site, arranges for temporary utilities, and establishes staging and employee parking areas. The second period is where the CC is in full production mode and actual construction activities take place. The third period is the closeout period where the CC wraps up construction and addresses punch list items, finalizes O&M manuals and provides training to Government staff. The CC also performs **commissioning** and other testing activities, establishes warranty procedures, and other activities in preparation for turning the facility over to the Government for occupancy.

The roles of the individual project team members during this step are as follows:

INITIAL PERIOD:

- | | |
|----------|---|
| CO | Appoints COR (usually EPM) and LM.
Receives Performance and Payment Bonds and Insurance Certification from contractor.
Gives the NTP.
Participates in Quality Coordination Meeting.
Conducts Preconstruction Conference.
Approves Construction Schedule of Values and baseline construction schedule based on input from EPM/COR, LM, and CM A-E. |
| EPM/COR | Participates in Quality Coordination Meeting.
Provides technical information at Pre-Construction Conference.
Coordinates A-E review and recommends approval to CO of Schedule of Values and baseline construction schedule.
Reviews and provides recommendations on proposed changes and costs.
Provides recommendations on contractor payment requests. |
| RPR | Participates in Preconstruction Conference providing information on research program, and Location access and operational procedures. |
| BSC SHEM | May participate in Preconstruction Conference. |
| A-E/CIC | Provides recommendations on Schedule of Values, baseline construction schedule, Safety and QC plans, etc.
Participates in Preconstruction Conference, and Quality Coordination Meeting. |

Acts as QA agents for Government and monitors CC's QC 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.

PRODUCTION PERIOD:

- CC Responsible for the means and methods to execute work required by the contract to the specified quality within the cost and schedule established by the contract.
- EPM/COR Monitors construction progress, CC's QC, A-E QA, and prepares reports of significant deviations from contract requirements.
Coordinates review of proposed changes from a technical and cost standpoint and provides recommendations.
Coordinates program review of proposed changes.
Provides recommendations on contractors' (CC and A-E) payment requests.
Monitors contractor performance against schedule.
Works with A-E to resolve technical issues.
Monitors RFIs, changes bulletin, and submittal processes for effectiveness.
Monitors *contingency fund* usage.
- 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 Administrator approval if necessary.
- CO Monitors compliance with contract provisions and schedules.
Evaluates and authorizes changes based on technical and program advice.
Negotiates and executes contract modifications to incorporate *change orders*.
Approves and processes contractors' (CC and A-E) payments.
Monitors contingency fund usage.
Resolves contract disputes and issues CO Final Decision(s) based on input from contractor, A-E, and EPM/COR.

CLOSEOUT PERIOD:

- CC Responsible for the means and methods to execute work required by the contract to the specified quality within the cost and schedule established by the contract.
Performs commissioning and testing activities, training of Government personnel in O&M of facility, turnover O&M manuals, establish warranty procedures.

- EPM/COR Monitors the CC's closeout progress, A-E QA efforts, and the Locations participation in turnover process.
- RPR Ensures participation of Location support staff in training and commissioning activities.
Signs for receipt of O&M manuals, warranty information, commissioning reports, spare materials, as-built drawings etc...
Obtains all the necessary agent registrations or other registrations, permits and approvals from the appropriate regulatory agencies (e.g., CDC, USDA-APHIS, FDA, NRC, etc.) that may be required to program operations.
Identifies to Location/AOE any required service and support contracts needed for operation of the facility.
Identifies operating budget needs.
Coordinates move activities.
Arranges for purchase of office furniture and furnishings, telephone handsets, fire extinguishers, etc.
- RPM Resolves and approves program deviations if necessary.
Obtains Administrator approval if necessary.
- CO Monitors compliance with contract provisions and schedules.
Evaluates and authorizes changes with technical and program advice.
Negotiates and executes contract modifications to incorporate needed *change orders*.
Approves and processes contractors' payments.
Resolves contract disputes and issues CO Final Decision(s) based on input from contractor, A-E, and COR.
- AO AO furnishes technical and contracting support to provide equipment and operational services not funded through B&F program and/or not included in the contract but are necessary for operation of the facility.

Step 4 - Final Inspections

The roles of the individual project team members during this step are as follows:

- RPR/RPM Begins planning and coordination of Ceremonial Activities.
- CC Submits request for Final Inspection to CO.
- EPM/COR Coordinates the conduct of inspections (e.g., punch-out inspection, Pre-Final Inspection, Final Inspection, etc.). AOE and LM may participate.
- A-E/CIC Participates in all inspections. Reviews and approves contractor's Test and Balance

(TAB) reports, O&M manuals and training, *warranty* documentation, and *as-built drawings*.

- CO Receives written certification from the CC that project is complete and ready for Final Inspection.
- EPM/COR Confirms that project is ready for Final Inspection and coordinates the Final
A-E/CIC Inspection with the Location staff and contractors.
- CO/EPM/COR Conducts Final Inspection.
A-E/CIC
- RPR, LM Participates in Final Inspection. AOE, and BSC SHEM 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 and specifies date for completion of Punchlist, if different than contract completion date.
- CO/EPM/COR Monitors Punchlist completion.
A-E/CIC

Step 5 – Acceptance, Occupancy, and Facility Turnover

The roles of the individual project team members during this step are as follows:

- 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 and coordinates occupancy of the facility.
AOE, and BSC SHEM may assist.
Arranges for the establishment of maintenance contracts for facility systems and equipment.
- 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 and provides instruction on warranty issues to RPR.
- EPM/COR Participates in Post-Acceptance Conference, if held.
RPR, A-E/CIC

RPM/RPR Conducts Ceremonial Activities. Occupy facility.

Step 6 – Warranty and Contract Closeout

The roles of the individual project team members during this step are as follows:

- CO Finalizes outstanding contract change orders, payments, and claims.
Monitors warranty performance.
Coordinates contract closeout activities in accordance with established procedures.
Works with FD and Area Real Property staff to place facility into service.
Initiates Contractor Performance Evaluation.
- EPM/COR Provides technical recommendations on final change orders, payments and claims.
Coordinates and provides technical advice on warranty issues.
Participates in closeout activities.
Completes Contractor Performance Evaluation Report(s) on contractor (s) (CC and A-Es)
- RPR Provides program recommendations on final change orders, payments and claims.
Notifies EPM/COR of any technical problems.
Requests warranty service directly with subcontractors/suppliers in accordance with instructions in Turnover package.
Notifies CO and EPM/COR of any warranty performance problems.
- A-E/CIC Provides recommendations on final change orders, payments, and claims.
Processes record drawings from contractor’s as-builts and submits *record drawings* to the Government.
- BSC Accepts record drawings.
- AO, RPO Participates in facilities capitalization in real property records.
- BSC Participates in reconciliation of financial issues.
FMD
- CO Reconciles all contractual and financial issues.
Makes final payment.

7. GLOSSARY (ABBREVIATIONS) AND DEFINITIONS

Project Team Titles:

A-E Architect-Engineer

AOE	Area Office Engineer
BSC SHEM	Business Service Center, Safety and Health Manager
CIC	Construction Inspection Contractor
CC	Construction Contractor
CO	Contracting Officer
COR	Contracting Officer's Representative
DR	Design Reviewer
EPM	Engineering Project Manager
LM	Location Monitor
ONPR	Office of National Program Representative
RPM	Research Program Manager
RPMB	Real Property Management Branch
RPR	Research Program Representative
SHEMB	Safety, Health and Environmental Management Branch

Other Titles:

ADMINISTRATOR	Administrator
ABFO	Area Budget and Fiscal Officer
AD	Area Director
CD	Center Director
LAO	Location Administrative Officer
LC	Location Coordinator
LD	Laboratory Director

ONPR Office of National Program Representative

RL Research Leader

RPO Real Property Officer

Organizational Titles:

AO	Area Office
OCIO	Office of the Chief Information Officer
BPMS	Budget and Program Management Staff, ARS
BSC	Business Service Centers
FD	Facilities Division, AFM
FMD	Financial Management Division, AFM
LS	Legislative Staff, ARS
OBPA	Office of Budget and Program Analysis, USDA
OMB	Office of Management and Budget
ONP	Office of National Programs, ARS

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

Architect-Engineer Services (A-E): 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 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 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 CC to indicate actual changes, deviation, and additions to the original construction contract documents.

As-built Drawings are used to prepare Record Drawings.

Ceremonial Activities: Activities that publicize the mission of the research Location and the circumstances for the gathering. These activities are normally open to the general public and include ground-breaking ceremonies just prior to the start of construction and dedication of the new facility at the conclusion of construction, etc.

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

Construction: The 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 contract 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 percent**. See Article on Project Budget Elements in Section 8.

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

Design: That phase of facility development activity which transforms the POR into architectural and engineering concepts resulting in a set of construction contract plans/drawings and specifications. These documents will permit construction bids or proposals 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 NEPA. REE Manual 160.0 includes a detailed

discussion of this subject. The AD is responsible for making and documenting NEPA decisions. The following are the possible reviews/documents:

- **Categorical Exclusion (CATEX):** A finding that a proposed action meets one of the Departmental or Agency categories for exclusion in 7 CFR Part 1b and/or 7 CFR Part 520, respectively, and has no potential to significantly affect the environment or be controversial. An Environmental Assessment (EA) or Environmental Impact Statement (EIS) would not be required. Modernization projects involving one-for-one replacement and no new programming may be categorized under this exclusion. New facilities cannot be categorized under this exclusion. New facilities must have an EA or EIS.
- **EA:** A public document that facilitates considerations of environmental factors and potentially incorporating 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 EIS. .
- **EIS:** A public document that 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.
- **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.
- **Record of Decision (ROD):** **A public document 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 that the project may proceed regardless of environmental considerations. This document will also contain monitoring and enforcement programs for any mitigation measures to be implemented.**

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. (However, it 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. It also includes 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 A-E firm, CIC, and/or others inspect work of the CC(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, GSF requirements, and the nature, condition, and layout 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 VE 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 Session: 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 to inform the RPR and Location staff about the ARS design and construction contracting process. See Article on Project Team Orientation in Section 8.

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

Pre-Bid/Pre-Proposal Conference: A forum held prior to receipt of bids or proposals in which the CO and other interested Agency personnel explain to potential offerors the nature of the work and known special conditions. The Design A-E assists in interpreting the plans and specifications.

Pre-Construction Conference: A forum after contract award, in which the CO, other Project Team members, and the CC meet to discuss mobilization, construction scheduling, authorities of Government personnel, progress reports, QA and inspection procedures, payroll submissions,

payment procedures, Equal Employment Opportunity responsibilities, change order procedures, and etc.

Pre-Design: 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 document that identifies the major milestones of the acquisition process and projected dates.

Procurement Request: Required for requesting the acquisition of pre-design, design, construction, and related services. Request includes the description of work or SOW, amount of funds committed, accounting/appropriation information, suggested source of supply, and signature (electronic) of fund holder, and Government estimate with breakdown of cost elements.

Project Requirements Document (PRD): 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 cost and technical proposal for their services. Design criteria may also be referred to as the SOW.

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, and construction management. These costs also include environmental/archeological impact costs, site acquisition and clearance costs, costs for utility and other agreements, other technical services, contingency fund reserved for unforeseen conditions, and the estimated cost of construction. All costs are 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 CC.

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

Quality Control (QC): Contractor QC 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 CC's "marked-up" (as-built) drawings that are submitted to the A-E

after final inspection for verification. The A-E transcribes all changes onto reproducible materials and/or electronic format and submits the documents on compact disc 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 PRD.

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 percent 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 one (1) year. Specialty items may have a longer warranty period (e.g., roofs, HVAC components, etc.). See Article on Facility Turnover in Section 8.

8. OTHER REFERENCES

P&P 134.2 Energy, Water, and Sustainability Policy

REE Manual 160.0 Safety, Health, and Environmental Management Program
(includes environmental documentation)

P&P 242.1 ARS Facilities Design Standards

P&P 158.0 Economic Analysis and Decision for ARS Facility Modernization

36 CFR 1191 Minimum Guidelines and Requirements for Accessible Design;
Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings
and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

9. SUPPLEMENTAL INFORMATION

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

- A. Project Budget Elements
- B. Communication of Major Project Budget Estimates
- C. Appropriate Use of Buildings and Facilities Funds
- D. Usable Facility
- E. Realty Interest
- F. Selection of RPR
- G. Developing the Project Scope
- H. Cooperator/Lessor Participation
- I. Ceremonial Activities and Informing Congress
- J. Project Team Orientation
- K. Telecommunications
- L. Review of A-E Design Submittals
- M. 15% Design Submission (Conceptual Presentation)
- N. Value Engineering
- O. Quality Control
- P. Quality Assurance
- Q. Commissioning
- R. Use of Facility Prior to Completion
- S. Facility Turnover
- T. Contract Closeout
- U. Placing a Facility in Service

A. 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 (e.g. changes due to unplanned or unforeseen issues or conditions). The examples below depict typical project budget elements, percentages, and estimated costs for a new construction project using Design-Bid-Build or Design-Build process. 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 which is reduced accordingly. Estimated costs will vary from project to project.

\$10,000,000 Appropriation for Planning/Design-Bid-Build

Planning & Design Costs

A-E Services:	% of ECC	Amount (+/-10%)
POR Finalization	2	\$160,000
Conceptual Design	3	\$240,000
Design Completion	3	\$240,000
Design Review	2	\$160,000
Design Contingency	1	\$80,000
Miscellaneous (VE, EA, Renderings, etc.)	1	\$80,000

Construction Design Fee	3.5	\$288,000
Construction Admin Fee	3.5	\$288,000
Construction Contingency	5	\$412,000
Subtotal Other Construction Costs	12.0	\$988,000
TOTAL Construction Costs		\$9,218,000
TOTAL BUDGET (Appropriation)		\$10,000,000

***May include an allowance for procurement preference when project size is appropriate for Small Disadvantaged Business programs.**

The Design-Bid-Build and the Design-Build methods both carry design and CA fees; however Design-Build is usually less costly because efficiencies are realized through reduced project duration, and managed risk due to single point responsibility.

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) a “top down” estimate, such as the previous example (a “top down” estimate may be constrained by a Congressional or Agency cost 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 percentages shown in the previous example are typical for a given project range and vary depending on overall project scope, cost, and technical complexity. The optimum method of developing a Project Budget Estimate is by conducting a detailed A-E study addressing programmatic, infrastructure, and environmental needs. Whether or not a project is constructed entirely at one time or in phases impacts the estimate. Project Budget Estimates, no matter what the source, generally require annual updates to reflect inflation and other industry and economic conditions. Project Budget Estimates are good for one year and are based on a specific anticipated construction timeframe. The estimates are revised on an annual basis when the Briefing Papers are updated for the Administrator.

B. COMMUNICATION OF MAJOR PROJECT BUDGET ESTIMATES

There is often a great deal of confusion generated during the discussion of project budget needs. While well-intentioned individuals can inadvertently communicate only the construction cost, omitting additional factors that make up the assumptions used in developing the entire estimate (e.g. A-E design costs, costs for CM services, socio-economic factors, etc.); they may also neglect to consider the timeframes associated with the estimate factors. These mistakes result in a number being communicated that is often far less than the total required by the project and can lock the Agency into a funding target that is not sufficient for the identified scope.

The following are the key players in the communication of the Project Budget process:

Administrator
Office of National Programs
Location research personnel
Facilities Division
Business Service Centers

Associate Administrator
Budget Program Management staff
Area Directors
Location Administrative Officers

The following is the process for communication of Project Budget Estimates:

<u>Activity</u>	<u>Responsibility</u>
• Conception of Estimate	ONP, AD, LAO, FD
• Finalization/Verification of Estimate	FD
• Approval of Estimate	Administrator
• 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 with BSC Input

C. APPROPRIATE USE OF B&F FUNDS

B&F 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.

B&F funds cannot be used to fund moveable, portable, or items not permanently affixed to the building and 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 B&F account:

IT (Information Technology) equipment (computers, servers, etc.)	
Systems furniture	
Filing cabinets and portable safes	Furnishings, including rugs and drapes
Food service equipment (portable)	Furniture (chairs, tables, desks, partitions, clocks)
Laboratory equipment (portable)	Photographic equipment (portable)
Safety equipment (portable)	Training equipment (portable)
Shop equipment (portable)	Office machines (calculators, copiers, etc.)
Scientific equipment (portable)	Telephone hand sets
Portable fire extinguishers	

D. USABLE FACILITY

A new or renovated facility must be a standalone 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. HVAC, 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 headhouses/greenhouses (HH/GH), repair shops, animal facilities, and storage facilities must be completed to the extent that requirements are known during the planning stages (including HVAC, safety considerations, provision for appropriate water, gas, and other utility hookups).

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

E. 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. However, programming activities are allowed to begin. 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 authority to execute the agreements to acquire realty interests. FD/RPMB is responsible for determining the type of real 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

F. 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 RL, LD, or 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.

G. DEVELOPING THE INITIAL PROJECT SCOPE

Past experiences in administering major facility construction programs reveal a general trend in the relationship between authorized Scientist Year (SY) count and the GSF of floor space in an ARS research facility. Based on this information, the Administrator 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 AP/FS.

General Formula for Developing the Project Scope:

$$\text{Number of SY} \times 3,000 \text{ GSF} = \text{Size of Facility}$$

Exemptions: Research Facilities with particularly unique characteristics may be exempt from this formula. HH/GH spaces are exempt from this formula.

Historically, the general square footage per SY ranges from 2,500 GSF per SY to 3,500 GSF per SY (excluding HH/GH space). Variables such as project locality, availability of utilities, containment level, other unique aspects of research functions, circulation and support space may significantly impact this GSF 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.

H. 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 FAR 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 utilities from the Cooperator/Lessor versus accessing them directly from a public utility company.
- DR: The Cooperator/Lessor may be afforded 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 or responsible for project inspection or acceptance.

I. 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, BSC, RPM, RPR, and/or Location Leader are responsible for coordinating these activities with the Administrator and Under Secretary, Research, Education and Economics (REE) and the 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.

The use of B&F funding to support ceremonial activities is limited to expenses necessarily incidental to the ceremony, such as light refreshments (e.g. coffee, tea, milk, juice, soft drinks, bagels, donuts, pretzels, chips, cookies, muffins), purchase and /or engraving or chrome-plating of ceremonial shovel(s) for groundbreaking ceremonies; and rental of tent(s), tables, chairs, sound/public address system, stage, and podiums. Meals, including luncheons, buffets, dinners, or other comparably catered events, as well as mementos and tokens of remembrance, are NOT authorized. Payment for any of the above is subject to the availability of B&F funds. Note: It is acceptable to encourage and/or share traditional ceremonial activity costs with interested cooperators, trade associations, or other non-Federal entities that have a mutual interest in the

Agency's ceremony.

J. PROJECT TEAM ORIENTATION SESSION

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 understanding and to share knowledge and concerns about the research program, the Federal acquisition process, the design and construction industry, and to establish mutual and common project goals.

K. TELECOMMUNICATIONS

Identifying the Facility's telecommunication requirements begins early in the planning phase. Coordination among the RPR, AO, and OCIO will ensure that telecommunication needs are identified for inclusion in the design contract. Telecommunication costs are part of the project Budget. There are two basic options:

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

Option 2: The Design A-E can design the distribution system allowing for a variety of telecommunication systems installations. The CC will install the distribution system to the extent designed. The Location or AO will purchase and install the telecommunication systems and equipment. This can normally be obtained from the General Services Administration schedule. Coordination with the CC will be needed to accommodate the installation of telecommunication equipment by others and tie-in to the CC-installed distribution system. This option may insure that installed equipment is state of the art since there can be a significant time lapse between completion of design documents and completion of construction.

L. REVIEW OF A-E DESIGN SUBMITTALS

It is critical for the Government to assure that completed A-E designs are "constructible," designed within the project budget, meet all applicable codes and standards (e.g. life safety codes, OSHA), result in a "usable facility," and contain minimal design deficiencies. These items are reviewed by the DR A-E. In addition, the BSC conducts a 50 percent DRB, during which the Project Team briefs management to confirm that the Design A-E's construction cost estimate at the 50 percent design submission conforms to the specified construction budget and scope. The ARS program and Area personnel review the design submittals to insure research program needs are met and to identify potential facility O&M concerns.

M. 15 PERCENT DESIGN SUBMITTAL (CONCEPTUAL PRESENTATION)

During this important and interesting step, the Design A-E makes formal presentations of at least three (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 constraints in a functional, aesthetic, and cost effective manner.

N. VALUE ENGINEERING (VE)

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 should not be confused with a cost cutting exercise. The VE process reviews alternative technical solutions and addresses not only initial construction costs, but also long term O&M costs of a facility. VE recommendations may result in an increase in construction costs, but show significant savings over the operational life of the facility.

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 DR A-E. The VE Workshop occurs at the 35 percent 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 lifecycle 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.

O. QUALITY CONTROL (QC)

QC is the CC's system for managing, controlling, and documenting activities to produce construction that complies with the contract documents.

The QC 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 three (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.

QC versus Inspection: The CC is responsible for controlling the quality and inspecting the work. QC 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 QC is "preventive."

P. QA

Government QA is the Government's system for protecting its interests during the construction of the project. Through reviews, inspections, and tests, the Government assures that the contractor's QC 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 QC system, performing specified tests and inspections, and reporting deficiencies, determining reported deficiencies have been corrected, and assuring timely completion. QA during the construction phase is usually performed by the CIC or Design A-E.

Q. 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 O&M 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 CC 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.

The commissioning process is a unique opportunity for the Location staff to gain a detailed understanding of the facility's systems, operational setpoints, and troubleshooting techniques.

R. 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 CO and Director of FD 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 (fume hoods, 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.).

S. FACILITY TURNOVER

Near the completion of construction, the Project Team enters into discussions with the CC to achieve a smooth turnover of the facility from the contractor to the ARS Location. These discussions include the following topics:

- Location approach to O&M activities
- Training of Location personnel in facility operation
- Demonstration of equipment and system operation to the ARS maintenance staff
- Participation of maintenance staff in commissioning activities
- Date certain for ARS assuming responsibilities of facility operation, maintenance, and security
- Procedures for dealing with facility malfunction (part of commissioning)

- Warranty periods for major building components

Establishing the process for facility occupants to report problems to a Location POC and how that individual will obtain warranty service from the CC.

Turnover of facility documents to include:

- O&M manuals
- Commissioning and TAB reports
- Warranty information and documentation
- POC for warranty calls
- Approved shop drawings, record drawings, and specifications
- Spare parts and other building materials

T. CONTRACT CLOSEOUT

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

- Verification that all contract requirements have been met; all documentation has been received; record drawings and documents, O&M manuals, and warranty documents have been delivered to the appropriate recipient.
- Completion of Performance Evaluation Reports by EPM/COR.
- Notification to facility of identification of warranty items and expiration dates.
- Notification to CC 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 the Location prior to warranty expiration dates.

U. PLACING FACILITY IN SERVICE

10. EXHIBITS

EXHIBIT 1 - Action Plan (with Cover Sheet) 11 Pages

EXHIBIT 2 - Fact Sheet 2 Pages

EXHIBIT 3 - Functional Statement 11 Pages

Should you have any questions, please contact the AFM FD on 301-504-1151.

Nino L. Fleri /s/
Director
Facilities Division
Agricultural Research Service

Date: May 31st 2013

Exhibits

EXHIBIT 1

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

TO: Area Director, Appropriate Area
Research Program Manager

FROM: Administrator

In accordance with Directives 157.0m and 242.5, the Facilities Division (FD) has developed, and I have approved, the enclosed Action Plan and associated Fact Sheet (AP/FS).

The primary members of the project team are:

Research Program Manager (RPM):
Research Program Representative (RPR):
Office of National Program Staff Representative (ONPSR):
Facilities Division Representative (FDR)
Engineering Project Manager (EPM):
Contracting Officer (CO):
Contracting Officer Representative (COR):
Business Service Center Safety and Health Manager (BSC SHEM):
Architect-Engineer (A-E):
Design Reviewer (DR): To Be Determined (TBD)
Construction Inspection Contractor (CIC): TBD
Construction Contractor (CC): TBD

FD is responsible for coordinating this effort through a team approach by interacting with the Office of National Programs (ONP), the RPM, the RPR, the Business Service Centers (BSC), the A-E, and the Contractors.

Should you require additional information concerning the AP/FS, please contact Director, FD.

2 Enclosures
Action Plan
Fact Sheet

ACTION PLAN

(New Agricultural Research Service (ARS) Center, Anywhere, USA)

There are three (3) distinct areas of Project Management: (1) Program Management is to ensure all program requirements are articulated and included in the project; (2) Contract Management is responsible for enforcing terms and conditions of the contract; and (3) Engineering Project Management is to ensure 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, talents, 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 member are:

Research Program Manager (RPM):

The RPM is usually the Area Director (AD). 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 AP/FS. Any deviations from the AP/FS 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 Functional Statement (sometimes called the preliminary Program of Requirements (POR)) developed by the RPR and EPM, ensuring that it is consistent with the AP/FS approved by the Administrator. The RPM, together with the RPR, ensures that the proposed and constructed facility satisfies program criteria for a complete and usable facility to support research and satisfy special requirements of any Cooperator.

The BSC will obtain approval of the RPM, RPR for the final POR and the final design, ensuring

that they are consistent with the approved AP/FS. FD will obtain approval of these documents by ONP. The RPM is responsible for compliance with the National Environmental Policy Act (NEPA) as it relates to the project (Reference 7 CFR 520, Procedures for Implementing National Environmental Policy Act, and 40 CFR 1508, Protection of Environment, Chapter V, Council on Environmental Quality). The RPM is the fundholder for the project and is responsible for requisition, approval, and issuance. The RPM may delegate authority to approve and issue Procurement Requests. The RPM should be directly involved in the orientation session, 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 (LC), Research Leader (RL), or Laboratory Director (LD). 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. The RPR serves as the primary source of program criteria information and any special Location criteria, and works closely with FD in their preparation of the AP/FS. The RPR recommends POR approval to the RPM.

During the design phase, the RPR, or their designee, is invited to participate as a voting member of the A-E Evaluation Board that recommends the selection and contract award of the A-E firm who will design the project. The RPR coordinates the review of design submissions among the other researchers and any Cooperators involved in the requirements to ensure the design meets the functional needs of the research program and provides consolidated review comments on the proposed design to the EPM. The RPR also coordinates the review with other Location and Area entities involved in the long-term operation and management (O&M) of the facility, considering such things as maintenance requirements, compatibility with existing systems (IT, fire, security, etc.) and facilities, local operational protocols and staffing needs. 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/interests. The RPR will provide written concurrence with the final design documents. Implementation of research program needs is the major objective of the project. The RPR is responsible for obtaining all the necessary agent registrations or other registrations, permits, and approvals from the appropriate regulatory agencies (e.g. Centers for Disease Control and Prevention (CDC), United States Department of Agriculture (USDA)-Animal and Plant Health Inspection Service (APHIS), Food & Drug Administration (FDA), Nuclear Regulatory Agency (NRC), etc.) that may be required by the research program and will provide the necessary information and program requirements to the EPM and A-E. Together, 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.

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 other contractors must be coordinated with the EPM and CO. The RPR is expected to notify the EPM/Contracting Officer's Representative (COR) and 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.

A smooth transition from the construction phase to the operational phase is critical. The RPR, with the Area Office, will arrange for personnel or maintenance contracts for facility systems and equipment and the establishment of contracts to install systems furniture, telephone systems, moveable equipment, etc. These types of activities are not funded with Building and Facilities (B&F) appropriations. The RPR will coordinate occupancy of the facility and, if applicable, any ceremonial activities. It is critical that the staff responsible for O&M of the new or modernized facility is available to actively participate in training on the facility systems and commissioning of the facility. During the warranty period following completion of the project, the Project Team members will provide the RPR with assistance in resolving any contractual or construction problems that may arise. It is imperative that the Location operate and maintain the facility in such a manner that warranties remain enforceable.

The RPR is responsible for keeping the Project Team members informed of all communications and actions concerning the project.

Office of National Programs Representative (ONPR):

The ONPR 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 ONPR, with the RPR, is responsible for developing the Functional Statement and approving the final 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 on. The EPM role will continue throughout the planning, design, and construction phases of the project. The EPM serves as the lead point of contact (POC) for the project actions and will disseminate

information to the appropriate Project Team members for their action or involvement. The EPM will keep Project Team members advised of project activities, required actions by team members, schedule, budget, and progress of the project. All Project Team members will keep the EPM advised of their needs and concerns. The EPM, along with the CO, is the lead POC between the Project Team and contractors for day-to-day business, working within the terms and conditions of the contracts

During the planning phase, the EPM will coordinate the development and review of the AP/FS 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 for the project. After consulting with other Project Team members, the EPM will prepare a design Project Requirements Document (PRD) or Statement of Work (SOW) for the various phases of the project and cost estimates for all professional services. The EPM will chair the A-E Evaluation Board to evaluate and recommend selection of the A-E for a particular project.

During the pre-design and design phases, the EPM will normally be designated as the COR and will act as the principal liaison with the A-E firm. The EPM/COR 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/COR will ensure that the project complies with the approved AP/FS. Should POR requirements change during the course of design, the EPM/COR will ensure, after consultation with the Project Team, that the AP/FS is revised and resubmitted for approval by the Administrator. The EPM/COR 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, Agency design standards, energy and sustainability policies, and safety standards, etc.

During the construction phase, the EPM usually serves as the COR. In rare occurrences, the CO may designate the Area Office Engineer (AOE) or Facility Engineer to serve as COR, if beneficial to the Agency in execution of the project. 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.

During the construction phase, the EPM/COR is responsible for monitoring and classifying all changes to the construction contract. Each change order will be classified by purpose, such as: "A-E Error/Omission," "Customer Requested," "Differing Site Condition," or "Other." The EPM/COR shall maintain a spreadsheet listing each change order, its classification, and the cost for each.

The EPM/COR provides interim (if applicable) and final evaluations of all contractors' performance (A-E, DR, and Construction Contractor (CC)) at the end of each phase of the project (design, design review, and construction) in accordance with Agency procedures.

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 any of the specifications, drawings, terms, and conditions of the contract. The CO may delegate certain responsibilities not affecting the contract scope, performance time, or cost, to the EPM, COR, and/or Location Monitor (LM).

The CO is assigned to the project early in its development and will continue with this role through planning, design, construction, and closeout 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, policies, 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 AP/FS. The CO officially designates the A-E Evaluation Board members 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 for ensuring adequate contract performance and contract management. The CO is also responsible for: monitoring contract performance and budgetary events, conducting and participating in Pre-Bid/Pre-Proposal, and Pre-Construction Conferences, project meetings, conducting negotiations, and taking 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, 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 keeping Project Team members informed of all communications and actions concerning the project.

Contracting Officer's Representative (COR):

The COR is usually the EPM. The assignment as COR is made at the time of the contract award by an official appointment letter from the CO that outlines the responsibilities, authorities, and limitations of the COR function. A copy of this appointment letter is provided to the contractors and Project Team members.

The COR is responsible for interpreting technical data in the A-E, construction, and CIC contracts. The COR is responsible for reviewing progress payment 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 shall be documented and communicated to the Project Team as well as the contractors involved.

The COR will provide the CO with 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 POC between the Project Team and A-E, construction, and CIC contractors for day-to-day business, working within the terms of their delegation.

If the CO appoints someone other than the EPM as COR, the EPM is still the lead POC for the Project Team and the COR will work closely with the EPM to assure that appropriate information is provided to support the roles of the other Team Members.

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

The SHEMB representative is a FD 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 shall be consulted to provide interpretation and guidance on safety, health, NEPA, and other environmental matters related to the project. The SHEMB representative will be asked to consider waivers for any proposed deviation from Agency policy. 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. The EPM will inform SHEMB of any project issues which fall under their area of oversight.

Real Property Management Branch (RPMB):

The representative of RPMB is a FD staff member responsible for ensuring that all realty interest activities 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, rights-of-way, 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. As the

facility is accepted, RPMB places the facility in service and enters financial and facility information into the Corporate Property Automated Information System (CPAIS). The EPM and CO provide required information to RPMB.

Business Service Center (BSC) Safety and Health Manager (SHM):

The BSC/SHM serves as the safety, health, and environmental advisor and a resource to the Project Team during the planning, design, and construction phases on projects within their Area and shall be consulted on such issues. During the planning phase, the SHM may be consulted to provide input on developing the POR and the PRD for design. The SHM will assist in the preparation of the variances on safety, health, and environmental issues during the planning and site investigation phases. Also, the SHM may assist in prioritizing the safety, health, and environmental items to be incorporated in the PRD for design. The SHM will advise the project team of any unique safety, health, and environmental issues related to the specific research programs to be housed in the facilities.

During the design phase, the SHM 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 SHM may be requested to assist with ensuring that all appropriate safety, health, and environmental management related regulations are in place. The SHM 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), and is formally appointed by the CO, and serves as a POC for either the A-E, CIC, or the CC to provide information regarding Location rules, procedures, and regulations. The LM designation is normally made to the Location Facilities Manager/Maintenance or Facilities Engineer, Location Administrative Officer (LAO), or Location Coordinator (LC). 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 and 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; (4) coordinating authorization for contractor to work beyond normal work hours; (5) coordinating access to facilities and security protocols related to the site; (6) designating material staging areas and contractor trailer location(s), etc. The LM should be an active participant in the design and construction process to provide input on Location O&M and maintenance procedures and to gain familiarity with the facility in preparation for transitioning into the O&M mode. During construction, the LM should actively participate in all facility turnover, commissioning and training activities, and have a thorough understanding of the O&M manuals and warranty information provided by the CC.

Cooperator:

A Cooperator is a State or Federal agency, college or university, 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/COR for day-to-day business, working within the terms of the contract. Adjustments to the contract always 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 may be tasked with preparation of the final design and working drawings (if construction funding is available). At various stages of design, submittals of plans, specifications, and cost estimates are made to the Government for program, technical, and budget review. The Government will submit written comments to the A-E at each design submission and the A-E will respond to all comments in writing. Those comments will be incorporated into the next design submission. The A-E may be required to make formal presentations at the various stages of design development. 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-Proposal, Pre-Construction Conferences, and other meetings, as well as prepare solicitation amendment documents that result from contractor or Government questions on technical issues or program changes. The A-E may be tasked to review and approve shop drawings, material submittals, review and comment on construction contract modifications, progress payments, and other related activities as directed by the terms and conditions of their contract. 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 A-E who provides professional services to review the design submittals prepared by the design A-E. The DR 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, (e.g. 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 also be tasked to perform Value Engineering (VE) studies for major construction projects when required. The DR may also 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 QA that the construction project is being constructed as designed and to provide oversight on the QC plan of the CC. The CIC will utilize the services 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 through a task order under an existing Indefinite Delivery/Indefinite Quantity (IDIQ) contract with an A-E firm separate from the design A-E.

The CIC will monitor the QC plan of the CC 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 CC's Superintendent and the EPM/COR. Keeping the EPM/COR informed of these findings will enable corrective actions to be implemented by the CO if necessary.

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

Construction Contractor (CC):

The CC is an independent firm, hired under Government contract to provide those professional construction services defined by Federal Acquisition Regulation (FAR), Part 36. The specific work to be performed by the CC shall be set forth in writing in the specific contract document

which includes the construction drawings and specifications. The CC's team may consist of the prime contractor who has a direct contractual relationship with the Government and various subcontractors and suppliers. No legal contract exists between the Government and the subcontractors and suppliers. In other words, the Government has no privity of contract with anyone other than the prime CC. The CC has 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 CC shall contact the CO and the EPM/COR directly on all matters of the contract affecting changes to the contract provisions, contract scope, performance, time, or cost. The CO is the only 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 make changes to the contract. The EPM/COR is usually the primary POC for the CC for day-to-day business, working within the terms of the contract.

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 the 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, EPM/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 to the CIC or designated A-E firm, 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 closeout and warranty phase of the contract, the CC will, in accordance with the contract, prepare O&M manuals, ensure systems are fully functioning, provide system demonstrations to the RPR, EPM/COR, and other individuals designated by the CO. During the warranty phase, the CC Construction Contractor is required to respond promptly to requests for warranty service and shall be responsible to coordinate corrective actions as necessary to mitigate or resolve Government concern(s).

Largely dependent on the funding availability for a project, the Government may consider alternate project delivery methods, such as Design-Build (D-B) or Construction Manager (CM) at Risk to expedite the project schedule. These concepts will be explained to the project team in detail if they are selected. Generally, the D-B process provides a conceptual design to a contractor who is responsible for both completion of the design documents and construction of the project. The CM at Risk allows for award of a construction contract before completion of the full set of construction documents. This allows start of construction on elements such as site work, foundations, etc., concurrent with the completion of the design. Under the CM delivery method the Government holds separate contracts with the designer of record and with the CM at Risk firm.

New ARS Research Center
Anywhere, USA

FACT SHEET

1. 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 2011 Planning and Design	\$ 1,400,000 (B&F)
FY 2012 Planning and Design	\$ 1,000,000 (B&F)
FY 2013 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, 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>Current</u>	<u>Gross Square Feet</u>	<u>Planned</u>
Office/Lab	35,945		53,740
Headhouse/Greenhouse	<u>46,812</u>		<u>58,860</u>
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	
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</u> (FY-99 Proposed)
Start - 2nd Qtr., FY-98	3rd Qtr., FY-99
Complete - 2nd Qtr., FY-99	1st Qtr., FY-00

9. OPERATING COSTS:

<u>FY-96 - Present Facility</u> 82,757 SF	\$643,000
<u>FY-00 - New Facility</u> 112,600 SF	\$1,126,000

10. ECONOMIC ANALYSIS: N/A

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 the Crops Research, 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 the Soil and Water Division personnel in the early and mid-sixties to document soil salinity and drainage conditions. Congressional funding 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; and 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 wave lengths for inclusion on satellites. They also 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 approximately 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 led by a research scientist and is supported by one or two technicians. The Unit is directed by a research leader, who administers, coordinates, and participates in the projects.

1.1.1 Integrated Projection 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 dry land 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 dry land 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's 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 led by a plant physiologist. Support is from two physical science technicians.

1.1.1.3.1 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-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, disease, 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 led 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 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, and 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, a soil scientist from the other project; two Category III 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 headhouse, greenhouse, 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) day length, 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 subject. 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 1): This facility serves two research units. Seven Category 1 scientists in the CPSRU and three Category 1 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 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 per office)	150
19	CPSRU: Technician's Office (2 per office)	150
20	CPSRU: Technician's Office (2 per office)	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
L4	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 Sensing Specialist	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	140
	Total Office	1,110

Building 202 (RSRU)

No.	Laboratories	SQ FT
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	SQ FT
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	1,600
	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, ventilation, and cooling for personal comfort

Plumbing: None

Electrical: Fluorescent lighting, 120v 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