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**CLINCH RIVER  
BREEDER REACTOR PROJECT**

**PRELIMINARY  
SAFETY ANALYSIS  
REPORT**

**VOLUME 12**

**PROJECT MANAGEMENT CORPORATION**

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THE CLINCH RIVER BREEDER REACTOR PLANT  
PRELIMINARY SAFETY ANALYSIS REPORT

CHAPTER 17.0 - QUALITY ASSURANCE

APPENDIX E

A DESCRIPTION OF THE ARCHITECT-ENGINEER  
QUALITY ASSURANCE PROGRAM

BURNS AND ROE INC.  
BREEDER REACTOR DIVISION

CLINCH RIVER BREEDER REACTOR PLANT  
A DESCRIPTION OF THE ARCHITECT-ENGINEER  
QUALITY ASSURANCE PROGRAM

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CLINCH RIVER BREEDER REACTOR PLANT  
A DESCRIPTION OF THE ARCHITECT-ENGINEER  
QUALITY ASSURANCE PROGRAM

0. INTRODUCTION

0.1 SCOPE

This document provides a description of the Quality Assurance Program to be conducted for the Clinch River Breeder Reactor Plant by the Breeder Reactor Division (BRD) of Burns and Roe, Inc., referred to hereinafter as the Architect-Engineer (AE). The practices described are those plans and actions on the part of the AE to assure the quality of safety-related structures, systems and components of the plant within its contractually defined scope of work.

0.2 BASIS

The program planned, structured and defined herein assumes that the AE is assigned execution responsibility for the Quality Assurance Program for the detailed design of the Balance of Plant, the overall integration of the Nuclear Steam Supply System (NSSS) with the Balance of Plant, the detailed design of that part of the NSSS for which the AE is responsible and for procurement of items for which the AE has procurement responsibility.

0.3 APPLICATION

The AE Quality Assurance Program described herein will be applied to the extent described below to the planning and design of all parts of the plant for which the AE is responsible, and procurement of all parts of the plant for which the AE has procurement responsibility. It includes application to all structures, systems and components that are required to perform satisfactorily for the plant to operate safely.

The AE Quality Assurance Program applies to 1) all safety-related plant structures, systems/subsystems thereof and components listed in Sections 3.2 and 7.1 and 2) the Non-Sodium Fire Protection System and components described in Section 9.13-7 and 9.13-8 that are assigned to the AE scope of work. As the designs of structures, systems and components become fixed, the selection of each safety component will be identified and will be added to (or removed from) the referenced list as appropriate. In addition, any required special equipment, environmental conditions, skills or processes will be provided.

1. ORGANIZATION

1.1 FUNCTION

The quality assurance functions of the AE are executed by the AE's project staff. These functions and designated responsibilities are as follows:

1. The development of an overall plan for conduct of the AE Quality Assurance Program is the responsibility of the Quality Assurance Manager.
2. The development of working plans and procedures to conduct the AE program activities is the responsibility of the Project Operations Manager and the Quality Assurance Manager.
3. Organizing and staffing appropriately to implement the AE program activities is the responsibility of the Project Manager for all of the project except for the Quality Assurance Section. Organizing and staffing for the Quality Assurance Section is the responsibility of the Quality Assurance Manager.
4. The implementation of procurement activities related to structures, systems and components is the responsibility of the Project Procurement Manager. The Assistant Project Manager, Licensing and Procurement Services, provides technical guidance and support to the Procurement Manager, conducts selected procurement activities, and reviews and approves all important actions.
5. The surveillance over and coordination of supplier quality programs is the responsibility of the Quality Assurance Manager.
6. Evaluation of the degree of compliance to the AE Quality Assurance Program requirements and the effectiveness of the program is the responsibility of the Quality Assurance Manager.

## 1.2 QUALITY ASSURANCE ORGANIZATIONAL ARRANGEMENT

To perform the quality assurance functions, the Quality Assurance Section is organized as shown in Figure 17E-1. These groups are organized to assure that individuals who verify conformance to QA requirements do not have direct responsibility for performing the work being verified.

Internal Audit and Surveillance - This group performs periodic internal audits and surveillances according to the plans and schedules and special audits when directed by the Quality Assurance Manager, Project Manager, Vice President-BRD or the Client.

Quality Assurance Engineering - This group reviews all applicable documents and provides quality assurance input for system design descriptions, technical documents, procurement documents, change requests, etc. to assure proper incorporation of Quality Assurance requirements.

Vendor Audit and Surveillance Group - This group performs periodic external audits, surveys and surveillances of supplier activities. The services of qualified AE engineers are utilized whenever the scheduled audit or survey requires such capability. By virtue of the charter of the Quality Assurance Manager, the group has authority to issue an order through contractual channels to stop unsatisfactory or unapproved practices for so long as such stoppage may be necessary to assure compliance with specification requirements.

### 1.3 RESPONSIBILITY AND AUTHORITY

The responsibility for execution of the AE Quality Assurance Program has been assigned to the Architect-Engineer by Contract. The Vice-President, Breeder Reactor Division, has been assigned responsibility for the AE Quality Assurance Program within the Architect-Engineer Organization.

The Quality Assurance Manager reports directly to the Vice-President, Breeder Reactor Division, for overall quality assurance matters and administrative control and interfaces with the Project Manager for integration of quality program requirements and coordination of quality assurance activities with overall project efforts. The Quality Assurance Manager is responsible for assuring that the Quality Assurance Program is established and implemented. He is responsible for the review and concurrence or approval of engineering and procurement documents to assure that quality requirements are properly applied. The Quality Assurance Manager has organizational freedom and authority to evaluate quality problems and initiate or recommend and verify implementation of solutions. Through him, this authority is extended to individuals under his supervision that perform quality assurance functions. He has the responsibility of reporting to the Vice-President, Breeder Reactor Division, on the adequacy and effectiveness of implementation of the AE Quality Assurance Program. He has the responsibility for planning, definition and coordination of Quality Assurance Program activity, and by surveillance, audit and review, for assuring that adequate procedures to control quality related work are developed and implemented. He has the authority to require the Project Manager to stop work in any area of the project when he detects nonconforming conditions which jeopardize quality objectives. He communicates directly with the Client's Quality Assurance Manager for the interchange of project quality assurance criteria and information.

The Quality Assurance Manager is responsible for verifying, by yearly evaluation, the quality achievement of suppliers and subcontractors in their work performance. The AE retains responsibility for assuring that the program execution delegated to suppliers and subcontractors is adequate to support project quality objectives. The AE has established procedures for implementing the plans and actions described herein to assure that the technical design bases, codes, standards, regulations and documentation requirements are appropriately invoked for each procurement action. The Quality Assurance Manager is responsible for assuring that suppliers are performing work in accordance with approved supplier quality assurance programs during component design, procurement and manufacture. Verification is performed through surveillance and audits of supplier operations which relate to design, procurement, fabrication, testing and shipping. The

activities also include assuring that corrective actions, when necessary, have been effectively implemented. He is also authorized to direct the Procurement Manager to stop unsatisfactory work by subcontractors and suppliers and to control further processing, delivery or installation of deviating material.

He also has the responsibility to assure that an adequate indoctrination and training program for AE personnel performing activities affecting quality is provided. The indoctrination and training program will assure that:

1. Personnel performing activities affecting quality are appropriately trained in the principles and techniques of the activity being performed;
2. Personnel performing activities affecting quality are instructed as to purpose, scope and implementation of governing manuals, policies and procedures;
3. Appropriate training procedures are established.

The Quality Assurance Manager has complete administrative and technical control of personnel in the QA Section in order to assure sufficient independence and freedom in the performance of quality verification activities. His "hire/fire/promote" actions are reviewed and approved by the Vice President, Breeder Reactor Division. Manpower schedules and budgets, with Project limitations, are prepared by the QA Manager, then reviewed and approved by the Vice President, Breeder Reactor Division.

#### 1.4 QUALIFICATION REQUIREMENTS FOR QUALITY ASSURANCE MANAGEMENT POSITIONS

##### 1.4.1 QUALITY ASSURANCE MANAGER

The individual responsible for management of the quality assurance program will have the following qualifications:

Education - A BS degree in engineering/science or an equivalent combination of education and experience is required.

General - He shall have a minimum of 10 years experience, at least 4 years of which is in quality assurance and the balance in quality control/assurance engineering associated with design, construction, or operation of a nuclear reactor plant facility, power generating station or heavy industry.

Specialty - He shall possess a broad knowledge and understanding of industry and government codes, standards and regulations which define quality assurance program requirements and practices. He shall have a broad knowledge and understanding of quality assurance methods and their application. He shall have experience in planning, defining and implementing quality assurance practices and the application of procedures.

Managerial - He shall have a minimum of 8 years experience in the supervision of personnel and the planning and management of other resources needed to develop and operationally maintain a comprehensive quality assurance program to satisfy contractually invoked requirements.

#### 1.4.2 QUALITY ASSURANCE ENGINEERING GROUP - SUPERVISOR

The individual responsible for supervising the quality assurance engineering function will have the following qualifications:

Education - He shall be a graduate of a four year accredited engineering college or university.

General - He shall have a minimum of 7 years experience, at least 4 years of which is in quality assurance and the balance in quality control/assurance, engineering associated with design, construction, or operation of a nuclear reactor plant facility, power generating station or heavy industry.

Specialty - He shall possess knowledge and understanding of industry and government codes, standards and regulations which define quality assurance requirements and practices. He shall be familiar with methods of application of programmatic and special quality assurance requirements in design and procurement documents. He shall be experienced in evaluating program plans, procedures and practices, and subsequently verifying conformance.

Supervisory - He shall be experienced in the supervision of technical and administrative personnel engaged in quality assurance or engineering activities.

#### 1.4.3 INTERNAL AUDIT AND SURVEILLANCE GROUP SUPERVISOR

The individual responsible for supervising the quality assurance internal auditing and surveillance function will have the following qualifications:

Education - He shall be a graduate of a four year accredited college or university, or be a high school graduate and have 10 years experience in quality assurance/control in lieu of a degree.

General - He shall have a minimum of 7 years experience, at least 4 years of which is in quality assurance and the balance in quality control/assurance, engineering associated with design, construction, or operation of a nuclear reactor plant facility, power generating station or heavy industry.

Specialty - He shall possess knowledge and understanding of industry and government codes, standards and regulations which define quality assurance requirements and practices. He shall be experienced commensurate with the scope, complexity or special nature of the activities to be audited. He shall possess good communicative skills.

Supervisory - He shall be experienced in the supervision of technical and administrative personnel engaged in quality assurance auditing activities.

#### 1.4.4 VENDOR AUDIT AND SURVEILLANCE GROUP - SUPERVISOR

The individual responsible for supervising the vendor audit and surveillance function will have the following qualifications:

Education - He shall be a graduate of a four year accredited college or university, or be a high school graduate and have 10 years experience in quality assurance/control in lieu of a degree.

General - He shall have a minimum of 7 years experience, at least 4 years of which is in quality assurance and the balance in quality control/assurance, engineering associated with design, construction, or operation of a nuclear reactor plant facility, power generating station or heavy industry.

Specialty - He shall possess knowledge and understanding of industry and government codes, standards and regulations which define quality assurance requirements. He shall be experienced in establishing and implementing programs, plans and practices for product inspection, process surveillance, and auditing of vendor QA Programs. He shall have a broad knowledge and understanding of NDE, special processes and equipment test methods, including evaluation of vendor qualifications and capabilities.

Supervisory - He shall be experienced in the supervision of technical personnel engaged in inspection and test verification, vendor surveillance or auditing activities.

## 2. QUALITY ASSURANCE PROGRAM

### 2.1 POLICY

Burns and Roe is committed to achieving standards of quality in all its services to clients which will assure public safety and optimize plant reliability consistent with costs and schedules. The company will take appropriate measures to perform its designated work in accordance with all applicable codes, standards and regulations concurrent with its corporate wide commitment to excellence in engineering. The AE QA program is consistent with these corporate QA policies, goals and objectives.

### 2.2 PROGRAM REQUIREMENTS

The AE has established and implemented a quality assurance program in accordance with contractual requirements. The contract also provides that appropriate nationally recognized codes and standards such as those published by ASME, ANS, ASTM, IEEE, ANSI, etc. will be applied and followed.

The AE QA program complies with the NRC-Licensing requirements contained in Title 10, Code of Federal Regulations, Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants (10CFR50, Appendix B)." This program description demonstrates the AE's methods of

complying with each of the applicable criteria in 10CFR50, Appendix B. Codes, standards and other contractual documents used in the AE's QA Program Description were based on the April 11, 1975 docket date of the CRBRP PSAR. Regulatory guides and other requirements addressed prior to that date are as follows:

- a. Regulatory Guides in Subsection V, as described in PSAR Sections 1.1, 17.0 and 17.1.2.1 and the answers to questions 411.1 and 411.2.
- b. 10 CFR Part 50, 50.55a, as described in PSAR Sections 17.1.2.1, 3.1, 3.2 and 7.1.
- c. 10 CFR Part 50, 50.55(e) in accordance with the quality assurance program, as described in PSAR Section 17A.15.1.
- d. 10 CFR Part 50, Appendix A, General Design Criteria 1, as described in PSAR Sections 17.0.5, 17.1.2.6 and 3.1.1.
- e. ASME B&PV Code Section III, as described in PSAR Sections 17.1.2.6 and 3.2.2.

### 2.3 PROGRAM ELEMENTS

To fulfill the requirements for quality assurance on the planning and design of the Balance of Plant, assigned portion of the NSSS, the integration of the NSSS with the Balance of Plant and the procurement of items for which the AE has procurement responsibility, the AE Quality Assurance Program has been established. The program described herein was initiated in the Fall of 1973 and applied to all work performed since then. The program, changes thereto and the BRDQA Procedures Manual are prepared and/or approved by the Quality Assurance Manager, concurred in by the Project Manager, and approved for release and implementation by the Vice President, Breeder Reactor Division. This program has been structured and defined in accordance with contractually established requirements, with major program elements as illustrated in Figure 17E-2. This figure shows that the program is made up of a program management practice complemented by those programmatic practices unique to the design, procurement and manufacturing phases or activities of the project.

In other sections of this description, the methods and techniques that will be implemented to conduct program practices are described and include those requirements that are imposed on suppliers/subcontractors to assure that individuals or groups within their organizations who are performing quality assurance functions have sufficient authority and organizational freedom to effectively implement their respective programs; and that quality related activities are performed with appropriate equipment and under suitable environmental conditions. For ease of NRC-Licensing review, these practices have been aligned to correspond with the appropriate criteria of 10CFR50, Appendix B.

Figure 17E-3 of this description is a matrix cross-referencing 10CFR50, Appendix B, the contractually established QA program requirements and the BRD documents or procedures that implement each criterion and requirement. Attachment 1 is a brief summary of each procedure.

## 2.4 PROGRAM IMPLEMENTATION

The Architect-Engineer functional organization of QA Program responsibility is shown in Figure 17.1-4. The Owner will be notified within 30 days after announcement of change. The second level includes management type functions while the first level is primarily work practice-oriented programs concerned with direct control and verification through inspection, examination and testing.

### 2.4.1 PROGRAM PLANNING

The AE QA program applies to planning and engineering and procurement administration irrespective of whether it is safety related. The program is implemented through a series of procedures which prescribe the methods of accomplishing activities affecting quality. The preparation, release and control of project procedures is described in Subsections 5 and 6.

### 2.4.2 TRAINING, INDOCTRINATION, QUALIFICATION AND CERTIFICATION

The AE determines the initial capabilities of employees by verifying the professional (both educational and employment) qualifications of all new hires in accordance with standard employment practices. Records of these verifications are maintained in the employee's personnel folder. The employees continued proficiency and understanding of job requirements are monitored on an on-going basis and documented annually on a performance evaluation report. The AE has a training and indoctrination program under the control of its Project Operations Section. Indoctrination and training sessions are conducted for all new project members. This training is accomplished in group sessions and individual discussions covering the purpose, scope, and implementation of quality related manuals, procedures and instructions. Individual procedures are addressed in training sessions involving personnel responsible for performing activities affecting quality. These sessions emphasize and reiterate that the QA Program Plan, procedures and instructions are mandatory requirements which are enforced through the authority of the Vice President, Breeder Reactor Division. Work assignments, principles and techniques involved, and responsibilities are addressed in individual sessions with the Group Supervisors. Further training is given by attendance at courses given in house or at recognized learning institutions. Training records are kept for each session and individual. The record includes the topic or subject of the training, attendees and date of training. The training and indoctrination program encompasses quality assurance engineers who verify that functions delegated to suppliers and subcontractors are properly accomplished. A list is maintained, by job type, of personnel authorized to accept materials, products, processes or systems by required inspections and tests. Personnel in these job categories are qualified to and certified as meeting specific qualification requirements or industry codes and standards which identify qualification requirements.

### 2.4.3 RESOLUTION OF QUALITY ASSURANCE REQUIREMENTS

The provisions for application of "Quality Assurance Holds" to documents when there are disagreements regarding QA requirements are covered in Subsection 3

of this program description. The resolution of other horizontal disputes arising from differences of opinion between quality assurance and other sections which cannot be resolved at the intra-project managerial level is accomplished by decision of the Vice President, Breeder Reactor Division.

#### 2.4.4 MANAGEMENT REVIEW

A management review to assess the scope, implementation, effectiveness and currentness of the QA Program is scheduled to be performed at four month intervals by a Management Review Committee comprised of the Vice President, Breeder Reactor Division, QA Manager, Project Manager, and the two Assistant Project Managers. Minutes of the meeting including any resulting corrective action, the status of which is reported on in subsequent meetings, are published and kept for the record. In addition, the QA Manager must prepare a monthly memorandum type report for the Vice President, Breeder Reactor Division and the Client detailing the current status of the QA Program.

#### 2.4.5 ANNUAL ASSESSMENT

An assessment of the scope, implementation and effectiveness of the AE CRBRP QA Program is performed annually. The assessment is conducted by designated corporate personnel or consultants from outside the Breeder Reactor Division to assure that the program is meaningful and effectively complies with the criteria of 10CFR50, Appendix B. The results of the assessment will be documented in a report to the Vice President, Breeder Reactor Division and the status of corrective action reported to him in a monthly report.

#### 2.4.6 QUALITY ASSURANCE PROGRAM REVIEW

The results of management reviews, annual assessments, external audits including Authorized Inspection Agency Audits, and internal audits, contract scope changes, project interface and infrastructure changes as well as other input are considered in maintaining the QA Program current. This QA Program description is reviewed at least annually and shall be modified as necessary to keep it current and up-to-date.

### 3. DESIGN CONTROL

#### 3.1 DESIGN CONTROL PLANNING AND ASSIGNMENT

The AE executes his design activities through a Cognizant Engineer system. The plant is broken down into manageable unit systems, each of which is assigned to a Cognizant Engineer who is responsible for all design activity for his system. He is supported by all the engineering disciplines and specialties required to execute the design of his systems. He is the focal point for the receipt and the release of information concerning his system. The Cognizant Engineer reports to a Group Supervisor who in turn reports to a Discipline Section Manager. The AE Project Organization is shown in Figure 1.4-7.

### 3.2 FUNCTION RESPONSIBILITY

Engineering is performed by four engineering discipline sections; Mechanical/Nuclear, Auxiliary Systems, Electrical/Instrumentation, and Civil/Structural, each under a Section Manager. In addition stress analysis is performed under a Stress Analysis Engineering Manager. An engineering discipline section is comprised of a series of groups, each of which is headed by a Group Supervisor responsible to his Section Manager. Work is performed within an individual engineering group, and checked by another engineer of the same discipline before it is presented to the Group Supervisor for review. If the work in question is a calculation, it is approved by the Group Supervisor. If the work is a procurement specification, it is reviewed and concurred with by all affected Section Managers, the Quality Assurance Manager and the Engineering and Construction Services Section Manager. After resolution of all comments, concurrence is obtained from the Procurement Manager on procurement specifications where Burns and Roe has complete procurement responsibility. Final approval of procurement specifications is given by the Cognizant Section Manager and the Assistant Project Manager, Engineering and Design Services. Procedures are established to assure that all engineering activities affecting design are carried out in a planned, controlled and orderly manner. Included, as applicable, are such activities as field design engineering; physics, seismic, stress, thermal, hydraulic, radiation, and the SAR accident analyses; associated computer programs; compatibility of materials; accessibility for in-service inspection, maintenance, and repair; and quality standards.

#### 3.2.1 ENGINEERING AND CONSTRUCTION SERVICES

The Engineering and Construction Services provides expertise in the areas of materials, special processes, codes and standards, constructibility, maintainability, operability, reliability, availability and accessibility for in-service inspection. The design engineering groups accurately translate the applicable regulatory requirements and design bases for safety-related structures, systems and components into specifications, drawings, procedures and instructions.

#### 3.2.2 LICENSING AND ENVIRONMENTAL SECTION

The Licensing and Environmental Section determines federal, state, and local legal requirements and assures that the requirements of these regulatory bodies are included in the design and construction specifications.

#### 3.2.3 PROCUREMENT SECTION

The Procurement Section determines the overall adequacy and suitability of the equipment and construction specifications to support the method of procurement.

#### 3.2.4 QUALITY ASSURANCE SECTION

The Quality Assurance Section provides engineering support by determining the quality assurance requirements applicable to each system, assuring that appropriate quality standards are specified, assuring that deviations and

changes from such standards are controlled, determining the quality assurance elements applicable to each procurement action, reviewing and approving quality assurance requirements and accompanying acceptance criteria in procurement, inspection, or test documents and assuring that all specialists, including those of the Engineering and Construction Services Section and Procurement Section, have reviewed and concurred with the technical documents as evidenced on the document review and concurrence form. This includes assurance that adequate review and selection for application suitability and the use of valid industry standards is conducted for materials, parts, equipment and processes that are essential to safety-related functions of the structures, systems and components.

### 3.3 DESIGN DATA CONTROL

Unbaselined system design information is controlled by the use of "Controlled Information Data Transmittals" (CINDT) up to the issue of a System Design Description (SDD) for project use. After that, each system is controlled by its SDD or other baselined Principal Design Documents (PDDs). CINDTs are used for transmittal of specific new design information among design organizations prior to such information being incorporated into a baselined document. Design information is transferred from engineer to engineer or from engineer to drafting room via a Controlled Information Data Transmittal form which is filed for the purposes of traceability. Approved PDDs are subjected to control measures which assure timely and positive processing in order to prevent inadvertent use of superseded design information. Document control measures are described in Subsection 6. Design engineering groups prepare their technical documents with the assistance of the Engineering and Construction Services Section, the Licensing Section, Procurement Section and the Quality Assurance Section.

### 3.4 DESIGN DOCUMENT CONTROL

Drawings, generated by the AE or received from other project participants, are collected and controlled by the filing section of the AE design and drafting group. All other design documents are collected and controlled by the Document Control Group of the Project Operations Section. Procedures are implemented for the review, approval, release, distribution, collection and storage of documents involving design interfaces and changes thereto. Whenever a standard "off-the-shelf" component is to be used, the responsible engineer defines a design and performance envelope for the component that is used as the basis of the procurement action after adequate application review and selection.

### 3.5 DESIGN REQUIREMENTS INDEX AND INTERFACE CONTROL

Each Cognizant Engineer maintains a system design notebook which contains a design requirements index. Major interface requirements imposed by other systems, which are derived from overall plant design criteria or from design configuration integration, are listed in the index. As each design requirement, including criteria and interface requirements, is identified, the cognizant engineer enters it into his design requirements index noting its origin and status. He also enters in his index the documents in which it is

used as a basis of design. Then, when later requirements arrive superseding prior information, he revises all information derived from it, using his notebook and associated indices as a record of where requirements are used as a basis of design. The Section Manager may direct termination of a design requirements index when the information is verified as having been incorporated into a baselined document and the maintenance of the index no longer serves a useful purpose.

Major interface requirements imposed on and by each system are listed in the SDD along with the baselined PDD controlling each interface. This may be an Interface Control Document (ICD). ICDs controlling RM interfaces are concurred in by the LRM prior to final approval and release. In checking his design requirements, he also assures that specifications for suitably controlled conditions are included which assure: (1) the use of appropriate equipment, (2) a suitable environment for accomplishing the activity, e.g., adequate cleanliness, and (3) compliance with necessary prerequisites for the given activity.

### 3.6 DESIGN VERIFICATION

All design documents generated by the AE are subjected to the regimen of checking, review and approval described in this Appendix. In addition, the AE has established a system for independent design review (IDR) performed by its Corporate Chief Engineers who have no CRBRP design or organizational reporting responsibilities, together with a representative from Quality Assurance and appropriate specialists from Licensing and Engineering and Construction Services when applicable. Each Cognizant Section Manager develops a list of items which shall require an IDR based on guidance provided in CRBRP procedures or determines when testing (type or qualification) or alternate calculations will be used as the method of design verification. When testing is the selected method it will be accomplished in accordance with Subsection 4.1 and/or 11.0. When an alternate calculation is the selected method it will be accomplished in accordance with Subsection 3.10. Typical items subjected to IDR are conceptual and preliminary major general arrangements, major process and instrumentation diagrams, major equipment specifications and other major system or design documents, such as seismic criteria documents and overall plant criteria. Project schedules identify the work areas subjected to these reviews, and the point in work development at which they take place. These reviews are established as hold points beyond which work cannot proceed until completion of the review. These design reviews are conducted after completion of all technical review and sign-offs of the concerned designs in accordance with documented procedures. All individuals responsible for design verification are other than the original designer and his immediate supervisor. Topics to be used as a basis for IDR are listed in CRBRP procedures and include review for delineation of acceptance criteria for inspections and tests. In all cases, the design verification will be completed prior to relying upon the component, system, or structure to perform its function.

### 3.7 DESIGN DOCUMENT REVIEW AND APPROVAL REQUIREMENTS

Upon completion, technical documents, other than calculations and drawings, are submitted to a regimen of review, comment, and correction by engineers

of all participating disciplines other than the persons who prepared the document. This includes assurance that design characteristics can be controlled, inspected, and tested. Calculations and drawings are checked and corrected upon their completion. After completion of the checking/correction cycle, technical documents, including drawings, are put through a review and approval regimen starting with the Group Supervisors and proceeding up through the Section Managers and the Assistant Project Manager, Engineering and Design Services. The Quality Assurance Manager is part of the review and approval process. He assures that the documents have been prepared, reviewed and approved in accordance with applicable procedures and that they contain necessary inspection and test criteria, acceptance requirements and the extent of documentation of their results. Sign-off sheets are generated and retained, testifying to the completion of the proper review and approval cycle for each type of document generated. Specifications for procurement of standard commercial items are subject to the established review and approval process for technical documents. Changes to baselined documents including field changes are authorized by approved Engineering Change Proposals (ECPs) that describe the changes to be made. The change is then processed through a system of internal review and approval, which subjects it to the same design controls that were applied to the original design.

### 3.8 DRAWING REVIEW

Drawings are checked using a multicolored system in which every item on the drawing has a line drawn through it indicating either acceptance or rejection. When an item is marked as incorrect, the desired correction is indicated. The correcting draftsman checks off each item on the check print as the correction is made. When the drawing has been corrected to the satisfaction of the checker, the check print is filed and retained in accordance with the records requirements.

### 3.9 DESIGN SCALE MODEL

Design activities such as the development of piping and ductwork, conduit, and cable tray arrangements are performed in conjunction with engineering design scale models of the Reactor Containment, Reactor Control Building, Reactor Service Building, Steam Generator Building, and Turbine Generator Building which are being constructed by the AE. The models will show all systems within each building necessary to insure an interference free design. The AE performs the modeling work regardless of which project participant is developing the design of the system. The flow of design information to the model shop is controlled by the use of CINDTs issued by the cognizant system engineer, the cognizant building engineer, and the drafting/design squad leader.

### 3.10 CALCULATION VERIFICATION

Hand calculations are checked by a second party with qualifications at least equal to those of the person who performed the calculation. The checking process produces a separate copy of the calculation being checked with comments for resolution. After resolution of all check comments, the checker signs and dates the original calculation cover sheet and initials each original calculation sheet. The checking copy is filed in the calculation notebook.

Computer calculations are performed using authorized computer programs. The Burns and Roe Computer Program Index (CPI) documents computer programs which have been certified or approved (authorized) for project use and stored in a secure location. Authorization is established for programs under development and for changes to existing programs by approval of the Cognizant Corporate Chief Engineer. The use of interim approved and unlisted programs may be authorized by the Section Manager after demonstrating validity by processing a program with known results. In checking a computer calculation, the checker verifies that an authorized program has been used and then proceeds to check each item of input data in a fashion similar to a hand calculation.

### 3.11 ERRORS, DEFICIENCIES AND NONCOMPLIANCE

An error or deficiency which could create a substantial safety hazard or adversely affect safety related structures, systems or components is evaluated by Engineering, Licensing, Project Management and Quality Assurance for consideration as a reportable defect or noncompliance under 10CFR Part 21 and as a reportable deficiency under Par. 50.55 (e) of 10CFR50. If it is concluded that the error or deficiency comes under this paragraph, the deficiency together with the proposed corrective action is reported to the Client and/or NRC. The deficiency, whether reportable or not, is further evaluated by the AE Quality Assurance and Project Management against the procedural requirements that should have prevented the occurrence. When the procedural system is deficient, Project Operations and the affected organization are required to take whatever steps are necessary to achieve appropriate corrective action to the system to preclude recurrence of the error or deficiency. The deficiency is reported within the project via a Corrective Action Request to be dispositioned as described in Section 16. Completion of corrective action is verified by Quality Assurance as prescribed for CAR responses. The file is not closed until corrective action is complete and the Client's disposition of the proposed deficiency report is known.

### 3.12 HOLD SYSTEM

The AE has instituted a "Hold" system which identifies a "stop work" area of design or fabrication or a design area in which work is proceeding but which requires that some portion of the design basis be verified in order to remove the hold. These "holds" are highlighted in a periodic hold report that describes the hold, the date of imposition, resolution action required and by whom, as well as the date by which the resolution is required. The "Hold" system includes provisions for application of "Quality Assurance Holds" when QA engineers do not agree that the QA requirements have been satisfied for any information or document.

#### 4.0 PROCUREMENT DOCUMENT CONTROL

##### 4.1 REQUIREMENTS

The AE prepares procurement documents for BOP or NSSS items for which it has procurement responsibility and for subcontracted engineering services within the AE scope of work. The procurement documents contain or reference the design basis technical requirements including regulatory requirements, scope of work, applicable codes and standards, physical identification, inspection and test requirements, special process instructions, and required drawings. They also include Quality Assurance Program requirements such as programmatic requirements, right of access, design verification, documentation control, deviation control, etc. which must be complied with and requirements for submittal of the supplier's/subcontractor's QA Program Documentation. The contractual requirements pertaining to each procurement action grants the Purchaser the right of access to vendor facilities and records for source inspection or audit and the requirement for supplier reporting and documented disposition of deviations. The right of access provision permits the Purchaser to perform verification and/or monitoring of items, documentation and activities to determine conformance with established requirements. An integral part of the audit and surveillance of suppliers/subcontractors is the review of their documented bases for certificates of compliance. Selected procurement documents specify hold points for inspections and tests, and include provisions for Purchaser overchecks to assure compliance with Specification requirements.

##### 4.2 REVIEW AND APPROVAL

A description of the method of preparation, review and approval of documents appears in Subsection 3. The Quality Assurance Manager has the responsibility to determine that quality control and quality assurance requirements are correctly stated, inspectable and controllable; adequate acceptance and rejection criteria are specified; and the procurement document has been prepared, reviewed, and approved in accordance with QA program requirements. As part of this review and approval cycle, a "sign-off" sheet verifying the actions of individuals involved in the review and approval process is generated and filed as part of the permanent record for the technical documents. The Procurement Manager is included in the review and approval cycle of each procurement document.

##### 4.3 SUPPLIER'S QUALITY ASSURANCE PROGRAM

These documents require suppliers/subcontractors to have and implement documented Quality Assurance Programs for purchased materials, equipment and services to an extent consistent with their importance to reliable and safe plant operation. They provide for an evaluation of the supplier/subcontractor before the award of the purchase order or contract to assure that it can meet the procurement requirements.

#### 4.4 QUALITY ASSURANCE RECORDS

An integral part of the document preparation process requires the originating engineer to prepare a list of documents required by the procurement action, the location in the technical specification requesting the document together with the approval requirements for the document. This information serves as the input to a vendor document control program maintained by the AE Computer Department. This computerized file maintains a continuous record of the status of all requested documentation. There are also provisions for required supplier/subcontractor documents such as instructions, procedures, drawings, specifications, inspection and test documents to be prepared, submitted, or made available for AE review or approval. Whenever there are no code requirements involved, the supplier is instructed as to the collection, retention and storage of vendor documents and is directed to provide copies of specific Quality Assurance documents to the AE for collection and eventual delivery to the Client. Whenever code or other requirements are involved, the supplier is directed to comply with the control and maintenance of documents required by code.

#### 4.5 CHANGE CONTROL

Procurement documents require that requests for changes from suppliers/subcontractors be formally submitted for review and approval in accordance with documented procedures. Such requests for changes are processed in accordance with governing engineering change procedures when indicated as necessary by the Nonconformance Review Board. Approval is granted to suppliers/subcontractors to implement the change by means of the dispositioned waiver request. Upon final approval, a waiver request becomes a contract document. The AE vendor surveillance function verifies that formal documented approval and when required, revised technical and contractual documents are available prior to implementation of the change. When they are applicable, changes or revisions to procurement documents are subject to the same review and approval requirements as the original documents.

#### 4.6 REPLACEMENT PARTS

When acquisition of spare or replacement parts is a separate procurement action from that involved in procurement of original equipment and the AE is involved in this action, the procurement action is subjected to the same system of internal technical and quality assurance review as the original component. All quality assurance and acceptance criteria are of the same level as the original procurement actions.

## 5. INSTRUCTIONS, PROCEDURES, AND DRAWINGS

The AE prepares his procedures and instructions in accordance with Breeder Reactor Division (BRD) standards that prescribe the format to be followed and the numbering system to be used. Procedures and instructions cover management activities, document review and control, engineering and design, inclusion of qualitative and quantitative acceptance criteria, procurement, surveillance and audit activities, record collection and storage, and review and approval requirements. These procedures prescribe methods for performing quality-related activities in conformance with the requirements of 10CFR50, Appendix B.

The AE procedures are the responsibility of the Project Operations Manager and are administrated by a Plans and Procedures Supervisor from within the project organization. The Procedures Supervisor is the prime control officer for all BRD CRBRP procedures and as such he:

1. Assures that style, format, and numbering sequence conform to the requirements of the BRD standards.
2. Oversees the printing and distribution of the final procedures after approval.
3. Maintains a current master file of all procedures that have been issued.
4. Maintains a list of the status of draft procedures.
5. Promptly distributes all revisions and changes to existing procedures, according to the distribution schedule.

Each procedure is subjected to a system of review and comment by the AE's Senior Managers and, after resolution of comments, procedures are approved and issued. All procedures are approved by the Vice President, Breeder Reactor Division and according to subject, are also approved by the Project Manager or the Project Quality Assurance Manager. The Quality Assurance Manager reviews all procedures and approves or concurs in all procedures prior to issue.

The responsibility for prescribing in instructions, procedures and drawings activities affecting quality relative to procured equipment will be delegated to suppliers by contract.

The AE Quality Assurance Section both participates in and monitors the execution of this practice. Periodically, the Quality Assurance Section audits or arranges for independent audit of this practice to assure implementation and adequacy.

## 6. DOCUMENT CONTROL

### 6.1 DOCUMENT CONTROL SYSTEM

The document control system controls documents such as system design descriptions, engineering reports, calculations, engineering studies, construction and installation drawings, procurement specifications, contract waiver requests, deviation reports, FDDRS, SAR/ER, Quality Assurance Program Plan and its attendant methodical procedures, test procedures, maintenance manuals and operating manuals. Each design document cover sheet includes the following information: document number, title, date, revision number, purpose of the release, and any use restrictions on the document. The system identifies the relative importance of the controlled document. The lowest level of control requires only that use and issue of the document be indicated. This level is used for such things as calculations, engineering reports and studies and drawings. There are three higher control levels, in each of which documents are numbered and issued to individuals. In ascending order, these levels require a) no acknowledgement of receipt, b) acknowledgement of receipt from all recipients external to the AE, and c) acknowledgement of receipt from all recipients. Documents such as SAR/ER and Project Plans such as the Quality Assurance Program Plan, and revisions thereof are subject to these higher levels of control.

Records of as-built procurement specification, installation and construction drawings are maintained. As-built procurement specification records are defined as the contract specification together with all contract waiver requests and deviation reports that were approved during the duration of the contract. The as-built procurement specification records will be collected within one binder and issued for distribution. As-built installation and construction drawings are maintained and changes authorized by approved field change notices, deviation reports or engineering change proposals.

The responsibility for execution of Document Control practices relative to the manufacturing of equipment is delegated to equipment suppliers by Contract.

The Quality Assurance Section both participates in and monitors the execution of the Document Control System. Periodically, the Quality Assurance Section audits or arranges for independent audit of the Document Control System to assure implementation and adequacy.

### 6.2 DOCUMENT REVIEW AND APPROVAL

Documents produced by the AE are reviewed technically by the Assistant Project Manager, Engineering and Design Services, the Cognizant Engineering Section Managers, the Engineering and Construction Services Manager when requested by the Cognizant Engineering Section Manager, and the Quality Assurance Manager prior to release. A single procedure identifies the required technical and quality assurance processing for each of the various types of documents produced by the AE. The same procedure requires that the revisions to documents are processed by the same internal review methods as was the original document. Release of AE documents is authorized by the Cognizant

Engineering Section Manager, and the Assistant Project Manager, Engineering and Design Services. For SDD revisions only, the Cognizant Engineering Section Manager determines when content is such that the Assistant Project Manager, Engineering and Design Services, is to sign the title page. After technical review, concurrence and approval is complete, the Quality Assurance Manager's signature is certification that all requirements of generation, review and approval, at whatever level is required, are complete and the document is ready for issue to the Project.

### 6.3 DOCUMENT CHANGE PROCEDURE

An integral part of the review and concurrence process provides for verification that proposed engineering changes have been approved at the highest level required by project procedures. After each Engineering Change Proposal (ECP) has been reviewed and approved, the information is entered into the computer data system to document the approved changes outstanding against each Principal Design Document. Periodically, each Principal Design Document is updated incorporating all outstanding approved ECPs and issued for project use. CRBRP project procedural changes may be requested by any affected AE organizational entity. The Project Operations Section, in collaboration with the requesting organizational entity, works out the details of the proposed procedural change; the change is then circulated for review and approval to the same senior management work group that reviewed the original procedure and any comments are resolved. The finalized revisions/amendments are then approved by the Vice President, Breeder Reactor Division as before and issued.

### 6.4 DOCUMENT DISTRIBUTION

The Project Administration Supervisor maintains a distribution schedule to assure that all documents are available at the locations where the activity will be performed. Work in any area of the project does not start until all the necessary technical information is available to permit the work to start and proceed at a reasonable pace. Computerized document status information is updated regularly as information is received. Updated Document Status Reports are distributed monthly in accordance with an approved distribution list.

### 6.5 OBSOLETE DOCUMENTS

Obsolete and superseded documents are replaced at all points of use by implementation of a controlled distribution system employing a unique copy number to assure proper control of key project documents. Obsolete documents are retained only in designated historical files. Cognizant Engineers for the various systems then enter the fact in their SDD notebook that an existing design document has been superseded and replaced by a new document.

### 6.6 PROCUREMENT DOCUMENTS

Control of procurement documents is described in Subsection 4 of this Appendix.

## 7. CONTROL OF PURCHASED MATERIAL, EQUIPMENT AND SERVICES

### 7.1 PROCUREMENT CONTROL

The AE has established measures to control the procurement process in which material, equipment and services are purchased. The established measures include provisions to control procurement document preparation, review and change control; selection of procurement sources; bid evaluation and award; evaluation of supplier's performance; acceptance of item or service; and corrective action with regard to the procurement process. Each of these elements is controlled by implementing procedures to assure conformance to quality requirements.

The responsibility for execution of practices for Control of Purchased Materials, Equipment and Services related to equipment manufacturing is delegated to equipment suppliers by Contract.

### 7.2 EVALUATION OF SUPPLIERS

The selection of procurement sources is based on evaluation by qualified Quality Assurance, Procurement and Engineering personnel of the supplier's capability to meet all requirements of the proposed procurement action. Evaluation of prospective suppliers is based on one or more of the following:

- a. The supplier's capability to comply with the elements of 10CFR50, Appendix B which are applicable to the type of material, equipment, or service being procured.
- b. A review of previous records and performance of suppliers who have provided similar articles of the type being procured.
- c. A survey of the supplier's facilities and quality assurance program practices to determine his capability to supply a product which meets the design, manufacturing, and quality assurance requirements. Results of these surveys are documented and filed by the AE.

### 7.3 SURVEILLANCE OF SUPPLIERS

Surveillance of suppliers during engineering, fabrication, inspection, testing and shipment of materials, equipment and components is performed in accordance with documented project procedures to assure conformance to contractual requirements. The frequency and scope of surveillance depends upon the complexity of the parts and components being manufactured, the manufacturing stage and the supplier performance. For commercial "off-the-shelf" items, where specific quality assurance controls appropriate for nuclear applications cannot be imposed on the supplier in a practicable manner, special quality verification requirements e.g. supplier surveillance, receipt inspection, etc. will be accomplished in accordance with project procedures. Governing procedures provide for:

- a. Instructions that specify the characteristics or processes to be witnessed, inspected or verified, and accepted; the method of surveillance and the extent of documentation required; and those responsible for implementing these instructions.
- b. Audits and surveillance which assure that the supplier complies with all quality and quality assurance requirements. Surveillance is performed on those items where verification of conformance to procurement requirements cannot be determined upon receipt.

The status of an item, component or service is documented on a QA Completion Record. Surveillance activities associated with supplier-furnished material, equipment and services are performed to assure that:

1. The material, component or equipment is properly identified and corresponds to the contractual documentation.
2. Inspection of material, component or equipment, and acceptance documents is performed and judged acceptable in accordance with predetermined inspection instructions.
3. Inspection documents or certificates of compliance attesting to the acceptance of material, components and equipment are available.

#### 7.4 SUPPLIER QUALITY ASSURANCE RECORDS

Procurement documents identify those documents which the supplier is required to submit for review and approval or for information. As a minimum, the supplier is required to furnish the following documents:

1. Certifications that specifically identify the purchased material or equipment and the specific procurement requirements (codes, standards, specifications, etc.) met by the items.
2. AE approved waiver requests and deviation reports that identify procurement requirements which have not been met are provided with the QA Completion Record delivered to the site as part of the Quality record file.

The review and approval of supplier furnished data by qualified personnel of the AE is performed in accordance with established procedures. The material and equipment are shipped to the site to the attention of the Constructor or its representative who performs the required receiving inspection in accordance with documented procedures to verify that the material, component or equipment is properly identified and corresponds with the receiving documentation.

8. IDENTIFICATION AND CONTROL OF MATERIALS, PARTS AND COMPONENTS

The responsibility for execution of identification and control of materials, parts and components, is delegated to equipment suppliers by contract.

55 | Each supplier, who has an assigned responsibility for materials, parts and components including partially fabricated subassemblies is required, by contract, to establish and implement identification and control practices. Each supplier's identification requirements are to be determined during the initial planning stages and his practice will assure that identification of the item is maintained, either on or attached to the item and on reports traceable to the item as required throughout fabrication, erection, installation, and use of the item; the item(s) can be traced to the appropriate documentation such as drawings, specifications, purchase orders, manufacturing and inspection documents, deviation reports, and physical and chemical mill test reports; that the method and location of identification does not affect the function or quality of the item being identified; and that the correct identification of items is accomplished and verified prior to the release for fabrication, assembly, shipping and installation. These practices preclude the use of incorrect or defective materials, parts and components.

40 | The AE monitors supplier identification and control of materials, parts and components practices and periodically audits the suppliers' practices to assure proper implementation and adequacy.

Amend. 55  
June 1980

9. CONTROL OF SPECIAL PROCESSES

The responsibility for execution of control of special processes during manufacture of equipment is delegated to equipment suppliers by contract.

Procurement documents contain requirements that a supplier have measures for control of special processes. Suppliers, who are assigned responsibility for activities where special processes are involved, are required to establish and implement practices to assure adequate performance and control of special processes such as welding, heat treating, nondestructive examination, and cleaning. These practices will include the following elements:

- a. Qualification of procedures, equipment, and personnel for performance of special processes in accordance with applicable codes, standards, specifications, or supplementary requirements.
- b. Special processes are performed by qualified personnel and accomplished with written process sheets, shop procedures, check lists, travelers, or equivalent.
- c. Qualification documents of procedures, equipment, and personnel associated with special processes as required by applicable standards are established, filed and kept current.

The AE monitors supplier special process control practices and periodically audits the suppliers' practices to assure proper implementation and adequacy.

## 10. INSPECTION

The responsibility for direct inspection of items and work practices related to equipment manufacturing is delegated to equipment suppliers by contract.

The AE Quality Assurance Vendor Audit and Surveillance Group will perform required audits, surveillance and will witness selected inspections to verify that suppliers are providing items that will meet specified requirements. Each supplier who is assigned responsibility for performing procurement or manufacturing activities that affect quality is required, by contract, to establish and implement inspection practices. These inspection practices will determine and verify conformance of items and services with the documented specifications, instructions, procedures and drawings for accomplishing the required activities. The practice will assure that:

1. Inspection personnel are independent from the individual or group performing the activity being inspected.
2. Inspection procedures, instructions, and check lists contain the following:
  - a. Identification of characteristics to be inspected.
  - b. Identification of the individuals or groups responsible for performing the inspection operations.
  - c. Acceptance and rejection criteria.
  - d. A description of the method of inspection.
  - e. Verification of completion and certification of inspection.
  - f. A record of the results of the inspection operation.
3. Inspection procedures or instructions are available for use prior to performing inspection operations.
4. Inspectors are qualified in accordance with appropriate codes, standards, and company training programs, and their qualifications and qualification records are kept current.
5. Modifications, repairs, and replacements are inspected in accordance with the original design and inspection requirements or approved alternatives.
6. Provisions are established that identify mandatory inspection hold points for witness by an authorized inspector.
7. Provisions are established for indirect control by monitoring processing methods, equipment, and personnel if direct inspection is not possible.

The AE monitors supplier inspection practices and periodically audits the suppliers practice to assure proper implementation and adequacy.

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## 11. TEST CONTROL

### 11.1 TEST PROGRAM REQUIREMENTS

The AE delegates execution responsibility for testing and test control practices to suppliers by contracts. The AE includes requirements for written test programs in his procurement and/or construction specifications. These requirements include the identification of all testing required to demonstrate that structures, systems and components will perform satisfactorily in service; the training and appropriate qualification of personnel conducting tests; written test procedures which incorporate or reference the requirements and acceptance limits. Test procedures generated during procurement of components are reviewed by the AE's engineering and quality assurance organization to assure that they comply with requirements of the particular procurement specifications. These test procedures are reviewed to assure that all prerequisites for the given test have been specified; that adequate test instrumentation and equipment are delineated; that each test is required to be performed under suitable environmental conditions with adequate test methods; and that test results are required to be documented and evaluated to assure that test requirements have been satisfied. Test items that are modified, repaired, or replaced are tested in accordance with the original test program requirements or alternate procedures which are reviewed in the same manner and to the same extent as required for the original.

### 11.2 SUPPLIER TEST PROGRAMS

Each supplier performing manufacturing activities is required by contract to establish a testing control practice for which testing is required. The test control practice will include the following elements:

1. Identification of required testing to demonstrate that the item will perform satisfactorily in service and that testing activities are identified, documented and accomplished in accordance with written controlled procedures.
2. Written test procedures that incorporate or reference the requirements and acceptance limits contained in applicable design and procurement documents.
3. Written test procedures that include:
  - a. Instructions for testing method and test equipment and instrumentation.
  - b. Provisions for the following as appropriate:
    - o Calibrated instrumentation
    - o Adequate and appropriate equipment
    - o Trained, qualified, and licensed or certified personnel
    - o Preparation, condition, and completeness of item to be tested
    - o Suitable and controlled environmental conditions

- . Mandatory inspection hold points for witness by purchaser, contractor, or authorized inspector
- . Provisions for data collection and storage
- . Acceptance and rejection criteria
- . Methods of documenting or recording test data and results.

4. Test results are documented, evaluated, and acceptance status identified by a qualified, responsible individual or group.

### 11.3 PREOPERATIONAL AND OPERATIONAL TESTING

40 The Engineering and Construction Services Section of the AE prepares preoperational and startup test specifications for those systems and components for which it has been assigned responsibility in its contract.

### 11.4 TEST RESULTS

40 When a specification contains performance test requirements, the appropriate engineering group in the AE organization reviews and dispositions the test results. Quality Assurance will verify that this is done. The AE periodically audits the suppliers' test control practice to assure implementation and adequacy.

12. CONTROL OF MEASURING AND TEST EQUIPMENT

17 The execution responsibilities for the control and calibration of measuring and test equipment in accordance with applicable codes and standards are delegated through procurement documents to suppliers/subcontractors. These documents require that records be maintained and equipment be suitably marked to indicate calibration status and next calibration due date. Each supplier/subcontractor, who is assigned responsibility for performing inspections, examinations, or tests, is required by contract to establish and implement a system for calibration and control of measuring and test equipment. This system will include the following elements:

- a. Procedures that describe the calibration technique and frequency; maintenance and control of all measuring and test instruments, tools, gages, fixtures, and nondestructive test equipment which are used in the measurement, inspection, and monitoring of safety-related components, systems, and structures.
- b. Measuring and test equipment identification and identification of calibration test data to the equipment to which it applies.
- c. Calibration of measuring and test instruments at specified intervals based on the required accuracy, purpose, degree of usage, stability characteristics, and other conditions affecting the measurement.
- d. An investigation to determine the validity of previous inspections when measuring and test equipment is found to be out of calibration.
- e. Calibrating standards have an uncertainty (error) requirement of one-fourth to one-tenth of the tolerance of the equipment being calibrated. A greater uncertainty may be acceptable when limited by the "state-of-the-art."
- f. The calibration status of all items used in satisfying the contract requirements is recorded and maintained.
- g. Reference and transfer standards are traceable to nationally recognized standards; or, where national standards do not exist, provisions are established to document the basis for calibration.

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40 Verification of supplier/subcontractor compliance with the requirements for control and calibration of measuring and test equipment is done through surveillance of activities during manufacture, inspection and testing of items and materials, and periodic audits of the suppliers/subcontractors practices to assure implementation and adequacy.

13. HANDLING, STORAGE AND SHIPPING

The AE delegates execution responsibility for handling, storage and shipping practices to the suppliers through contracts.

Each supplier, who is assigned responsibility for manufacturing, fabrication or assembly, is required by contract to establish and implement practices for handling, storage and shipping of items. These practices will include the following:

- a. Special handling, preservation, storage, cleaning, packaging, and shipping requirements are specified and accomplished by qualified individuals in accordance with predetermined work and inspection instructions.
- b. Procedures are prepared in accordance with design and specification requirements which control the cleaning, handling, storage, packaging, shipping, and preservation of materials, components, and systems to preclude damage, loss, or deterioration by environmental conditions such as temperature or humidity.

The AE monitors the suppliers' handling, storage and shipping practices and periodically audits suppliers' practices to assure implementation and adequacy.

14. INSPECTION, TEST AND OPERATING STATUS

The execution responsibilities for inspection, test and operating status measures are delegated to suppliers through contracts.

Suppliers, who are assigned responsibility for manufacturing, are required to establish and implement practices to indicate the status of inspections and tests performed upon individual items throughout fabrication, assembly and test by using such markings as stamps, tags, labels, routing cards or other suitable means. These practices will include provisions for:

- a. Inspection, test, and operating status of structures, systems and components being known throughout fabrication and assembly.
- b. Controlled application and removal of inspection and welding stamps and status indicators such as tags, markings, labels, and stamps.
- c. Controlled bypassing of required inspection, tests and other critical operations through documented measures under the cognizance of the QA organization.
- d. Identification of the status of deviating, inoperative, or malfunctioning structures, systems, or components to prevent inadvertent use.

The AE monitors the suppliers' practices for indicating inspection, test and operating status and periodically audits suppliers' practices to assure implementation and adequacy.

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## 15. DEVIATING MATERIALS, PARTS AND COMPONENTS

### 15.1 CONTROL OF DEVIATIONS

The execution responsibilities for the identification, documentation, notification, segregation, disposition and reinspection of deviating items or services are delegated to suppliers/subcontractors. These practices are designed to assure that measures are established to control materials, parts, or components which do not conform to requirements in order to prevent their inadvertent use of installation. The deviation control practice includes the following elements:

- a. Establishment of disposition responsibility
- b. Documentation and reporting
- c. Review, evaluation and disposition

The responsibility to control deviating materials, parts and components related to equipment manufacturing and resulting subcontracting, is delegated to equipment Suppliers by Contract.

### 15.2 REVIEW AND APPROVAL OF DEVIATION REPORTS

All reports of deviations that are proposed to be dispositioned "accept-as-is", "repair", or "as modified" are forwarded to the AE for approval, or to obtain the approval of the same organization that approved the requirements not met; dispositions pertaining to safety related items and those which might require major design changes as defined in Project procedure are forwarded to the owner for approval. Submitted deviation reports are reviewed in accordance with documented procedures which also provide for the review of deviations for consideration as reportable defects and noncompliance under 10 CFR Part 21 and as reportable deficiencies under Par. 50.55 (e) of 10 CFR 50. The AE has established a Nonconformance Review Board (NRB) whose members have final authority in establishing dispositions and approving dispositions for items and services reported on deviation forms. The membership of the NRB is the QA Manager and the appropriate engineering discipline Section Managers or their designated alternates. The NRB functions in accordance with documented procedures which also establish the requirements for record retention, filing, and subsequent forwarding to the owner. Records are retained and deviation reports are analyzed to assess the existence of any adverse quality trends. Adverse quality trends are reported to responsible organization management.

### 15.3 SUPPLIER DEVIATION CONTROL SYSTEM

Each supplier/contractor, who is assigned responsibility for manufacturing or construction of items by the AE, is required by contract to establish and implement a practice for the control of deviating materials parts or components. These deviation control practices will include the following elements:

- a. Identification, documentation, segregation, review, disposition, and notification to affected organizations of deviating materials, parts, components, or services (including computer programs).

- b. Documented identification of the deviating items; description of the deviation, disposition of the deviation, and inspection requirements; and signed approval of the disposition.
- c. Identification of those individuals or groups delegated the responsibility and authority to approve the dispositioning of deviating items.
- d. Segregation of deviating items from acceptable items and identification as discrepant until properly dispositioned.
- e. Verification of acceptability of rework or repair of materials, parts, components, systems, and structures by the original inspection methods or by a method which is at least equal to the original inspection method, and documentation of inspection, rework, and repair procedures.
- f. Incorporation of deviation reports dispositioned "use as is", "use as repaired", or "use as modified" into the inspection records.
- g. Periodic analysis of deviation reports to show quality trends and forwarding of the results to management.

These practices will assure that deviating items are reviewed and accepted, rejected, repaired or reworked in accordance with documented procedures. They will include measures which control further processing, delivery or installation pending proper disposition of the deficiency.

#### 15.4 REVIEW OF SUPPLIER DEVIATION CONTROL

The AE Vendor Audit and Surveillance Group performs periodic audits and surveillance to verify that supplier/subcontractor procedures concerning deviations are adequate and implemented.

## 16. CORRECTIVE ACTION

### 16.1 CORRECTIVE ACTION PROGRAM

Conditions adverse to quality such as failures, nonconformance, malfunctions, deficiencies, deviations and defective material and equipment that are required for reliable and safe operation of the plant are reported to the AE through deviation reporting procedures. Quality Assurance activities found deficient by reviews and audits of supplier's activities, are documented by the AE representative performing such reviews and audits. The system includes the following elements:

- a. Evaluation of deviations and determination of the need for corrective action in accordance with established procedures.
- b. Initiation of prompt corrective action following the determination of a deviation to preclude the recurrence of those adverse conditions significant to quality.
- c. Verification by review of proper implementation of corrective actions and close out of the corrective action documentation.
- d. Reporting to appropriate levels of management adverse conditions significant to quality, the cause of the conditions, and the corrective action taken.

### 16.2 ISSUANCE OF CORRECTIVE ACTION REQUESTS

A formal documented Corrective Action Request (CAR) is issued when any of the following conditions are encountered:

- a. Detection of a condition which can significantly degrade a product, quality or service.
- b. Procedural or documentation deviations that can adversely affect product quality or required quality records.
- c. Evidence that prior corrective actions or preventive actions committed to are ineffective or inadequately implemented.
- d. An unsatisfactory quality trend or repetitive or recurring deviation.
- e. Unreported deviations, failures, malfunctions or accident.
- f. Ineffective procedures or documentation that govern products or systems.

- g. When an audit response has not been received in the allotted time.
- h. When a specific corrective/preventative action results from Nonconformance Review Board actions.

The CAR identifies the condition encountered, and requests corrective action from the recipient of the request. The required CAR response contains the cause of the condition, the action taken to correct the condition, and the action taken to prevent recurrence, and the schedule by which the actions will be completed. This is reviewed for acceptability by the Quality Assurance Group Supervisor and approved by the Quality Assurance Manager. When a CAR is issued, the fact is recorded in a CAR Log. Follow-up is conducted by Quality Assurance to assure a timely reply, verify implementation of defined corrective/preventive action and close-out CARs. Status information of CARs is reported monthly by the Quality Assurance Manager.

### 16.3 DISTRIBUTION OF CORRECTIVE ACTION REQUESTS

Internal CARs are distributed to the responsible organization representative and any others as may be required by the individual corrective action being requested. CARs for suppliers or contractors are transmitted via a transmittal letter to the concerned contractor or supplier through contractual channels.

## 17. QUALITY ASSURANCE RECORDS

### 17.1 QUALITY ASSURANCE RECORDS SYSTEM

The AE has established a Quality Records Management Plan providing the general requirements for records identification and collection for transfer to the Owner. The Quality Records Center (QRC) processes those records resulting from activities that are necessary to define the overall program quality and provide objective evidence of quality achievement. The system includes provisions that ensure:

1. Records are processed to provide documentary evidence of the quality of items and activities affecting quality.
2. QA records include operating logs; results of reviews, inspections, tests, audits, and material analyses; monitoring of work performance; qualification of personnel, procedures, and equipment; and other documentation such as drawings, specifications, procurement documents, calibration procedures and reports, and deviations and corrective action reports.
3. Records are readily identifiable and retrievable.
4. Requirements and responsibilities for record transmittals, retention, and maintenance subsequent to completion of work are consistent with applicable codes, standards, and procurement documents.
5. Inspection and test records contain the following:
  - a. A description of the type of observation
  - b. Evidence of completing and verifying a manufacturing, inspection, or test operation
  - c. The date and results of the inspection or test
  - d. Information related to deviations
  - e. Inspector or data recorder identification
  - f. A statement as to the acceptability of the results
6. Storage of records meet the requirements of ANSI N.45.2.9 for dual facilities.

The Quality Records Management Plan is executed using approved procedures which address the following major elements:

- o Declaring
- o Filing
- o Storage
- o Retrieval

## 17.2 SUPPLIER QUALITY ASSURANCE RECORDS

The AE has delegated execution responsibility for other reports preparation and initial collection, storage and maintenance to suppliers/subcontractors by contract. This includes those official documents directly related to structures, systems and components of the plant that are prepared by and used in design, procurement, manufacturing, construction and operation. In progressive stages as required by code, standard, regulation and specification, these documents will be turned over to the Owner.

## 17.3 MAINTENANCE OF QUALITY ASSURANCE RECORDS

Official project records are maintained by the Document Control group of the AE Project Operations Section (or satellite groups designated by them). Project files are keyed to the same system and subsystem numbers in general use by all participants in the project and are documented in a project file guide to assure that records will be identifiable and retrievable. Engineering files are started upon the beginning of the project and continue throughout the life of the project. The AE prepares quality records for transfer to the Owner. When a procurement action contract is issued, quality record files accumulate the information generated during the execution of the contract and furnish evidence of activities affecting quality. The Quality Records Center transfers technical correspondence, contract changes, material and test reports, surveillance and audit reports, deviation reports, Nonconformance Review Board reports, corrective action requests, drawings, etc. All drawings and their revisions are transferred on aperture cards. The record retention, maintenance and subsequent transmittal to the owner are performed in accordance with written procedures and are in compliance with applicable requirements. Record transfers to the owner shall be pre-authorized in writing. The AE will request such authorization using the owner form.

## 17.4 VERIFICATION OF QUALITY ASSURANCE RECORDS SYSTEM

The AE Quality Assurance Section participates in and monitors the implementation of the Quality Records Management Plan. The Quality Assurance Section periodically audits or arranges for independent audit of the Records System to assure implementation and adequacy. They also periodically audit supplier's Quality Assurance document collection and storage system to assure implementation and adequacy.

## 18. AUDITS

### 18.1 AUDIT PROGRAM

The AE has established and implemented an audit practice for conducting comprehensive planned and periodic audits to verify compliance with all aspects of the Quality Assurance Program and to determine the effectiveness of the program. This practice is also designed to assure that procedures and activities are meaningful, adequate, and comply with the overall Project Quality Assurance Program requirements.

The quality assurance audit practice was established during the project planning and conceptual design stage with audits planned and scheduled based upon the importance of the activities being performed with regard to its effect upon the reliable and safe operation of the plant and was initiated early enough to assure effective quality assurance practices during design, procurement and manufacturing, inspection and test. Audits are planned in a general way on an annual basis with a more detailed plan and schedule prepared and issued on a quarterly basis. The features of this program include:

1. The planning and scheduling of audits to assure that they are regularly scheduled on the basis of the status and safety importance of the activities being performed, and that they are initiated early enough to assure effective Quality Assurance during design, procurement, manufacturing, construction and installation, inspection, and test.
2. Performance of special audits confined to specified areas and conducted at a time not in accordance with the established schedule.
3. Audits performed to evaluate preparation, review and approval of procedures, drawings and procurement documents.
4. Conduct of audits in accordance with written procedures or checklists by appropriately trained and qualified personnel not having direct responsibility in the area being audited, independent of the schedule pressures in the areas being audited.
5. Documentation of audit results with review by management responsible for the area audited and where indicated, follow-up action taken, including re-audit of deficient areas until corrections have been accomplished.

Each audit is conducted according to pre-established written procedures and checklists that include a detailed plan for the audit with a prepared checklist of items to be investigated; notification of or a meeting with responsible management personnel takes place before the audit to review scope, purpose, and schedule of the audit and at the conclusion, to review adverse audit findings with management having responsibility for correcting the finding. The need for corrective actions is established and the audit results are documented in a formal report. Each audit is conducted by trained

personnel that do not have direct responsibilities in the areas being audited.

This program is executed by the organization outlined in Figure 17E-1.

## 18.2 INTERNAL AUDITS

Internal audits, in addition to surveillances, are conducted by members of (or approved by) the Quality Assurance Section in accordance with written directives and written procedures. Upon conclusion of the audit evaluation, a rough report is prepared and a debriefing held with all of the affected parties. After the debriefing, the final audit report is issued to the organization manager/supervisor responsible for correcting adverse findings with copies sent to the Vice President, Breeder Reactor Division, Project Manager, Project Quality Assurance Manager, Cognizant Assistant Project Manager, the cognizant representative from the activity audited, his supervisor and the Quality Assurance Group Supervisor. The responsible organization manager/supervisors are required to respond to the audit report, in writing, within ten working days to the Quality Assurance Manager. The response will identify the actions necessary to correct the findings of deviations revealed by the audit, prevent their recurrence and schedule their completion. Verification of corrective action is promptly performed at the end of the scheduled implementation to assure corrections have been accomplished. Failure to obtain an approved extension of the reply due date or to respond to the audit report or to complete proper corrective action will cause the initiation of a corrective action request. The Quality Assurance Manager may grant one extension of the corrective action schedule, in writing, not to exceed 20 working days. Additional extensions, not to exceed 60 working days, are granted in writing by the Project Manager or Assistant Project Manager, with the concurrence of the Quality Assurance Manager. When extensions are not granted, a CAR will be issued. Audits evaluate both the degree of compliance with established procedural methods and the effectiveness of the methods for the purpose for which they are intended. Audits of each project area will be conducted at least once in each twelve month period. The indoctrination and training program are included as a regular part of the scheduled project auditing program.

## 18.3 EXTERNAL AUDITS

External audits, in addition to surveillances, are conducted on preselected procedural and work areas of suppliers and vendors QA programs. The audit of each supplier's program is designed to include an objective evaluation of quality-related practices, procedures and instructions; the effectiveness of implementation; and the conformance with policy directives. These audits include the evaluation of work areas, activities, processes and items, and the review of documents and reports. Scheduled audits are supplemented by unscheduled audits where the need becomes evident. Manufacturer-identified special processes would be typical work areas that would be subjected to audits in addition to the normal surveillance. The audits are conducted from checklists prepared for the audit in question. The audit team is comprised of Quality Assurance personnel supplemented by selected discipline engineers from the engineering groups. The results of the audits are documented in audit reports, audit report responses, and finding reports or corrective action requests as may be applicable.

#### 18.4 INTERFACE AUDITING

The Burns and Roe design control concept requires that an "SDD Notebook" be maintained for each system by its Cognizant Engineer. Three lists in this notebook which are part of the interface control practice are the Design Requirements Index, the Interfaces Imposed Index and the Parameter List. The status, traceability and currentness of these lists are part of each audit of system design control conducted on each system. They are therefore regularly audited as part of the scheduled audit program which covers all systems in the project. The Design Requirements are derived from controlled information received by the subject system from other systems (either from within Burns and Roe or from other project participants) which define conditions or parameters imposed on the subject system. In a similar manner, the subject system defines its requirements on other systems and lists them in its "Interfaces Imposed Index". In addition, when the situation warrants, a nonscheduled interface audit is conducted.

#### 18.5 AUDIT FINDINGS REVIEW

Summaries of audit findings and corrective actions are included in the monthly Quality Status Report. These reports are reviewed by the Management Review Committee to evaluate quality trends and effectiveness of the QA Program.

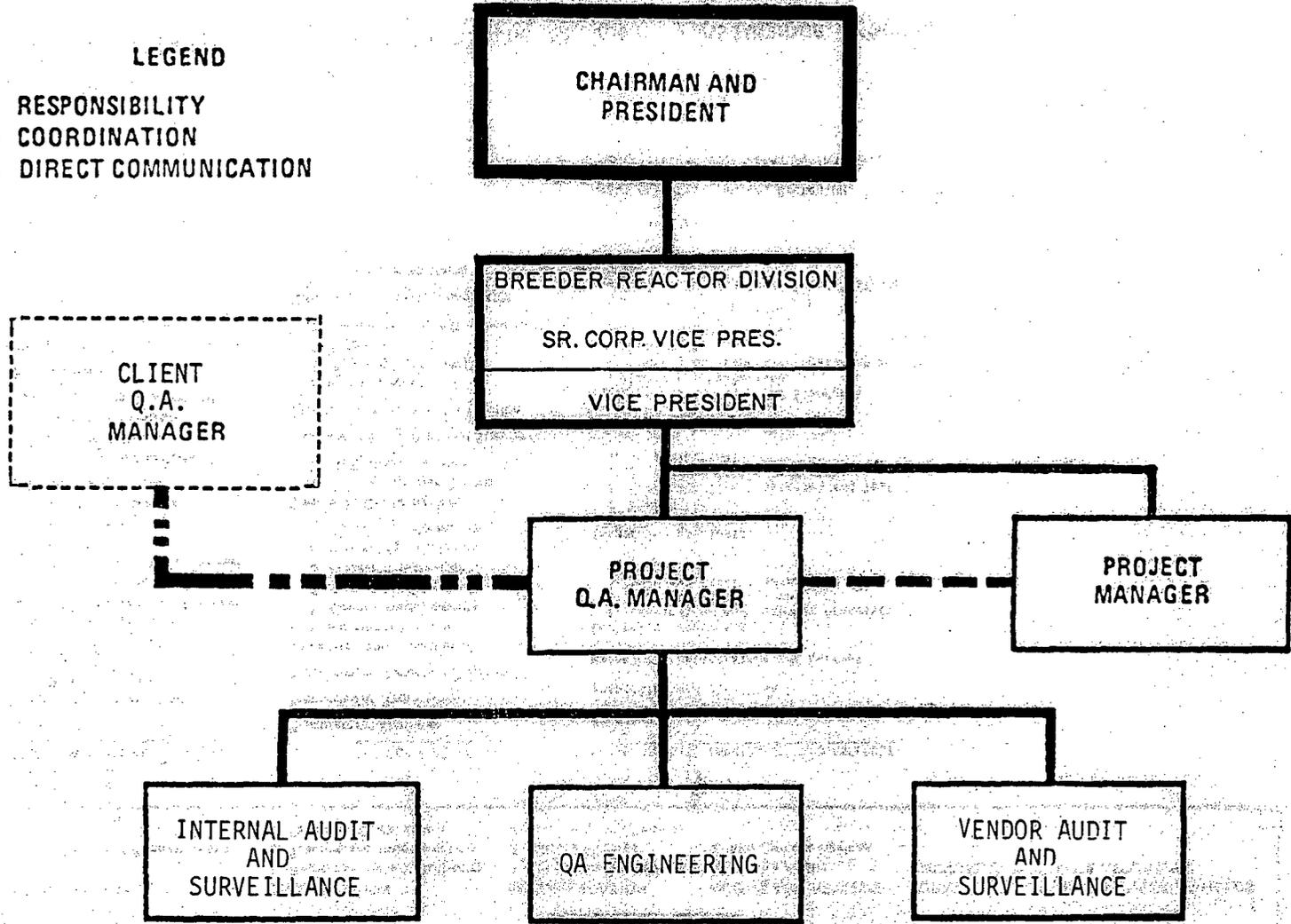
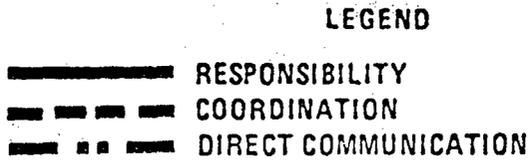


FIGURE 17E-1 A.E. QUALITY ASSURANCE ORGANIZATION CHART

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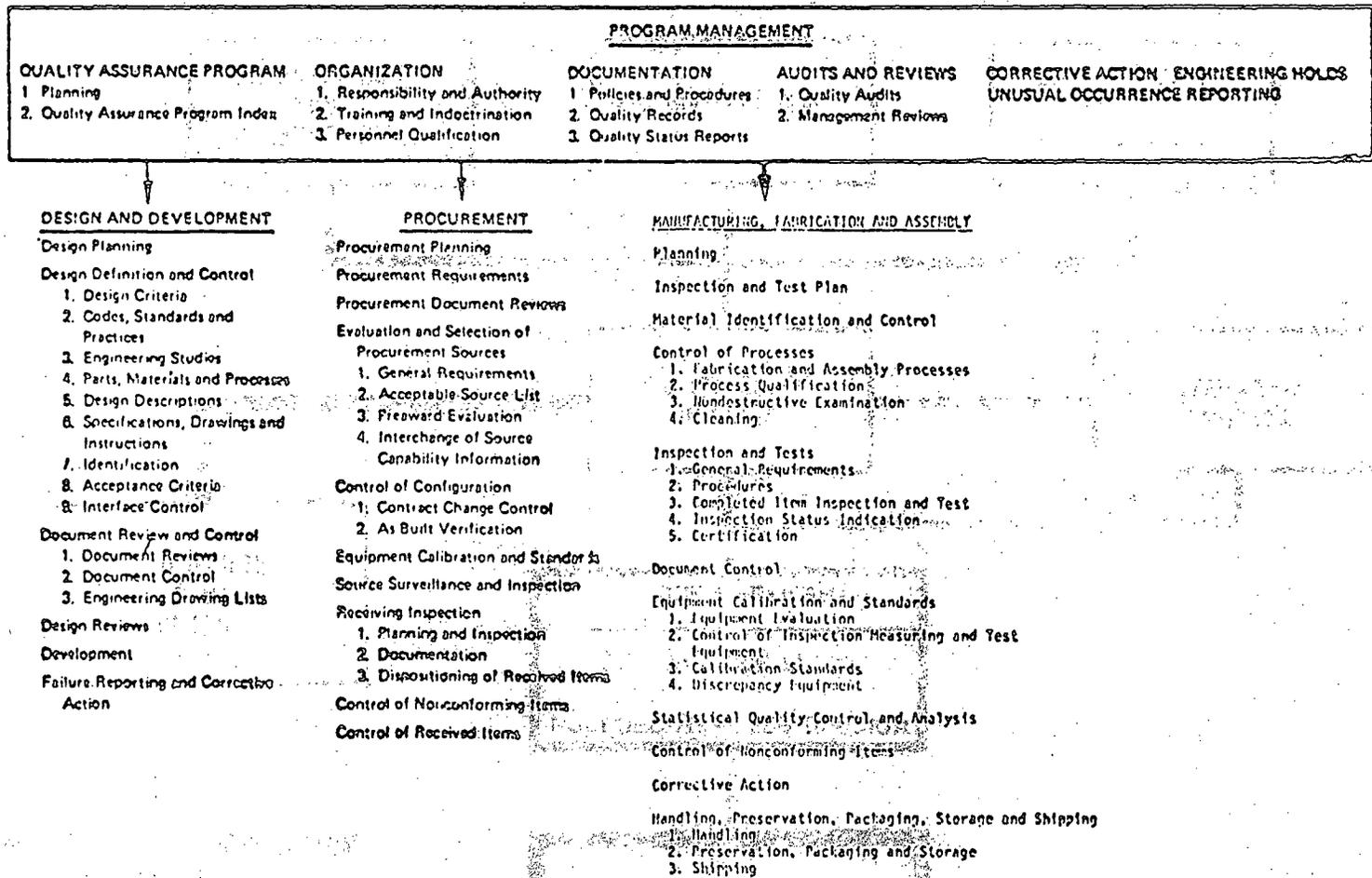


Figure 17E-2. Major Elements of the AE Quality Assurance Program

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APPENDIX B  
CRITERION

PROGRAM PLAN  
SUBSECTIONS

NO.

BRD IMPLEMENTING DOCUMENT OR PROCEDURE  
TITLE

I	Organization	Section 1; 2.3, Appendix V		
II	QA Program	Section 1; 2.2, 2.3.2, 2.3.3, 2.4.1, 2.4.3, 2.5.2	E-1.5 PC-7.1 QA-4.2 QA-3.1000	System and Equipment Classification Personnel Indoctrination, Training and Qualification Audits Project Surveillance
III	Design Control	2.7, Section 3, 4.6	D-1.4 D-3.3 E-1.1 E-1.1-1 E-1.2 E-1.2-1 E-1.3 E-1.24	Drawing Checking and Review Interface Control Documents System Design Description System/Subsystem Designations Calculations Auxiliary Steel Calculations Engineering Studies Using Fast Flux Test Facility (FFTF) Experience

FIGURE 17E-3. MATRIX OF 10CFR50 APPENDIX B AND THE QUALITY ASSURANCE PROGRAM PLAN.

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APPENDIX B CRITERION	PROGRAM PLAN SUBSECTIONS	NO.	BRD IMPLEMENTING DOCUMENT OR PROCEDURE TITLE
III Design Control (continued)		E-1.4	Basic Model and Engineering Design Model
		E-1.5	System and Equipment Classification
		E-1.6	Equipment Numbers and Nomenclature
		E-1.7	Drawing Control
		E-1.7-1	Classifying and Issuing Drawings
		E-1.7-2	Review of AE Construction Drawings & Specifications by Constructor
		E-1.7-3	Sequence of Operations
		E-1.12	Incorporation of Safety & Environmental Requirements In Design
		E-1.13	Incorporation of Specialty Requirements In Design
		E-1.13-1	Reliability Assurance Analysis
		E-1.13-2	Codes and Standards
		E-1.13-3	Materials, Welding and Nondestructive Examination
		E-1.13-4	Maintenance, In-service Inspection and Surveillance
		E-1.13-5	Constructibility
		E-1.13-7	Cleaning and Cleanliness
		E-1.13-8	Packaging, Shipping, Receiving, Storage and Handling
		E-1.13-9	Piping Stress Analysis
		E-1.13-13	Radiation Protection
		E-1.15	Engineering Changes
		E-1.16	Holds
		E-1.18	Technical Document Review and Release
		E-1.18-2	Baselining Design Information
		E-1.19	Interface Control
	E-1.19-1	Internal Interface Data Report	
	E-1.20	Independent Design Review	
	E-1.21	Overall Plant Design Description	
	E-2.1	Preparation of Specifications	
	E-2.1-1	Initiation and Close-out of Development Requirements Specifications	

FIGURE 17E-3 (CONT'D.) MATRIX OF 10CFR50 APPENDIX B AND THE QUALITY ASSURANCE PROGRAM PLAN.

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APPENDIX B  
CRITERION

PROGRAM PLAN  
SUBSECTIONS

NO.

BRD IMPLEMENTING DOCUMENT OR PROCEDURE  
TITLE

III

Design Control  
(Continued)

E-2.3	Technical Evaluation of Proposals
E-2.4	Vendor/Contractor Documents
E-2.5	Vendor/Contractor Waiver Requests
PC-3.2	Project Information Center
PC-3.3	Technical Information - Receipt and Control
PC-3.6	Distribution
QA-1.16	QA Review of Technical and Vendor Document Submittals
QA-1.16-1	QA Review of Technical and Vendor Document Submittals
QA-1.21	Bid Review for Quality Requirements

IV

Procurement Document Control 1, 4.3, 4.4, 4.6.1

E-1.1	System Design Description
E-1.1-1	System/Subsystem Designations
E-1.15	Engineering Changes
E-1.16	Holds
E-1.18	Technical Document Review and Release
E-2.4	Vendor/Contractor Documents
E-2.7	Preparation of Purchase Requisitions

FIGURE 17E-3. (CONT'D.) MATRIX OF 10CFR50 APPENDIX B AND THE QUALITY ASSURANCE PROGRAM PLAN.

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APPENDIX B  
CRITERION

PROGRAM PLAN  
SUBSECTIONS

NO.

BRD IMPLEMENTING DOCUMENT OR PROCEDURE  
TITLE

IV

Procurement Document  
Control (Continued)

PR-1.1  
PR-1.2  
PR-1.3  
PR-1.4  
PR-1.10  
PR-1.12

Request for Proposal  
Proposal Processing, Negotiation and Contract Award  
Purchase Approval Requests  
Purchase Contract Amendments  
Documenting Communications for Burns & Roe Designed Equipment  
Technical Audit of Contractor Proposals

V

Instructions, Pro- 2.4.1, 3.3.6,  
cedures and 3.3.9  
Drawings

E-1.7  
E-1.7-1  
E-1.7-2  
  
E-1.7-3  
E-1.12  
  
E-1.13  
E-1.13-1  
E-1.13-2  
E-1.13-3  
E-1.13-4  
E-1.13-5  
E-1.13-7  
E-1.13-8

Drawing Control  
Classifying and Issuing Drawings  
Review of AE Construction Drawings and Specifications  
by Constructor  
Sequence of Operations  
Incorporation of Safety & Environmental Requirements  
In Design  
Incorporation of Speciality Requirements In Design  
Reliability Assurance Analysis  
Codes and Standards  
Materials, Welding and Nondestructive Examination  
Maintenance and Inservice Inspection and Surveillance  
Constructibility  
Cleaning and Cleanliness  
Packaging, Shipping, Receiving, Storage and Handling

FIGURE 17E-3. (CONT'D.) MATRIX OF 10CFR50 APPENDIX B AND THE QUALITY  
ASSURANCE PROGRAM PLAN.

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APPENDIX B  
CRITERION

PROGRAM PLAN  
SUBSECTIONS

NO.

BRD IMPLEMENTING DOCUMENT OR PROCEDURE  
TITLE

V

Instructions, Procedures and Drawings  
(continued)

E-1.13-9	Piping Stress Analysis
E-1.13-13	Radiation Protection
E-1.16	Holds
E-2.1	Preparation of Specifications
E-2.1-1	Initiation and Close-out of Development Requirements Specification
E-2.4	Vendor/Contractor Documents
E-2.5	Vendor/Contractor Waiver Requests
E-4.1	Preoperational and Startup Test Specification
L-1.2	Preparation of Safety and Environmental Reports
L-1.3	Preparation of Responses to NRC Questions
L-2.3	Reporting of Defects and Noncompliances
QA-1.14	Unusual Occurrences
PC-1.5	Procedure Preparation
PC-1.5-1	Lists and Guides Manual
PC-3.2	Project Information Center
PC-3.3	Technical Information - Receipt and Control
PC-3.6	Distribution
QA-1.2	Preparation, Control and Distribution of QA Instructions
QA-1.3	Preparation of QA Procedures
QA-1.19	Procedure Writing Format
E-1.18-1	Assignment of Data Types
E-1.18-2	Baselining Design Information

FIGURE 17E-3. (CONT'D.) MATRIX OF 10CFR50 APPENDIX B AND THE QUALITY ASSURANCE PROGRAM PLAN.

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APPENDIX B  
CRITERION

PROGRAM PLAN  
SUBSECTIONS

NO.

BRD IMPLEMENTING DOCUMENT OR PROCEDURE  
TITLE

VI

Document Control

3.4, 4.9.2

E-1.1	System Design Description
E-1.1-1	System/Subsystem Designation
E-1.7	Drawing Control
E-1.7-1	Classifying and Issuing Drawings
E-1.7-2	Review of AE Construction Drawings and Specifications by Constructor
E-1.7-3	Sequence of Operations
E-1.15	Engineering Changes
E-1.18	Technical Document Review and Release
E-1.18-1	Assignment of Data Types
E-1.21	Overall Plant Design Description (OPDD-10)
E-2.1	Preparation of a Specification
E-2.1-1	Initiation and Close-out of Development Requirements Specifications
E-2.4	Vendor/Contractor Documents
L-1.2	Preparation of Safety and Environmental Reports
PC-1.5	Procedure Preparation
PC-1.5-1	Lists and Guides Manual
PC-3.2	Project Information Center
PC-3.3	Technical Information - Receipt and Control
PC-3.6	Distribution
E-1.23	Control of Safeguards Information
PR-1.10	Documenting Communications for Burns & Roe Designed Equipment

FIGURE 17E-3. (CONT'D.) MATRIX OF 10CFR50 APPENDIX B AND THE QUALITY ASSURANCE PROGRAM PLAN.

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APPENDIX B  
CRITERION

PROGRAM PLAN  
SUBSECTIONS

NO.

BRD IMPLEMENTING DOCUMENT OR PROCEDURE  
TITLE

VII

Control of Purchased Material, Equipment and Services

4.2, 4.3, 4.5,  
4.6.2, 4.8, 4.9.1  
4.9.2, 4.9.3, 4.10

E-2.2  
E-2.3  
E-2.4  
E-2.5  
E-2.4-2

Prequalification of Bidders  
Technical Evaluation of Proposals  
Vendor/Contractor Documents  
Vendor/Contractor Waiver Requests  
Site Equipment Preshipment Activities

QA-1.11  
QA-1.11-1  
QA-1.12  
QA-1.12-1

Vendor Quality Assurance Prequalification Program  
Evaluation of Prequalification Questionnaire  
Vendor QA Qualification Survey  
Performance, Evaluation and Reporting of Preaward Surveys

QA-1.16  
QA-1.16-1  
QA-1.21  
QA-1.25  
QA-3.101  
QA-3.101-1

QA Review of Technical and Vendor Document Submittals  
QA Review of Technical and Vendor Document Submittals  
Bid Review of Quality Requirements  
Nonconformance Review Board (NRB)  
Source Surveillance  
Preparation and Control of Source Verification Plans and Schedules

QA-3.101-2  
QA-3.101-3  
QA-3.101-4

Administration of the Source Surveillance Program  
Preparation for and Performance of Surveillance  
Preparation and Issuance of Source Surveillance Reports

PR-1.1  
PR-1.2  
PR-1.4

Request for Proposal  
Proposal Processing, Negotiation and Contract Award  
Purchase Contract Amendments

FIGURE 17E-3. (CONT'D.) MATRIX OF 10CFR50 APPENDIX B AND THE QUALITY ASSURANCE PROGRAM PLAN.

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APPENDIX B CRITERION	PROGRAM PLAN SUBSECTIONS	NO.	BRD IMPLEMENTING DOCUMENT OR PROCEDURE TITLE
VIII			
Identification & Control of Materials Parts and Components	3.3.7, 4.11	E-1.5 E-1.6 E-1.13-3 E-2.1	System and Equipment Classification Equipment Numbers and Nomenclature Materials, Welding and Nondestructive Examination Preparation of Specifications
IX			
Control of Special Processes	2.3.3, 3.3.4, 8.6	E-1.13 E-1.13-3 PC-7.1	Incorporation of Specialty Requirements In Design Materials, Welding and Nondestructive Examination Personnel Indoctrination, Training and Qualification

FIGURE 17E-3. (CONT'D.) MATRIX OF 10CFR50 APPENDIX B AND THE QUALITY ASSURANCE PROGRAM PLAN.

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APPENDIX B  
CRITERION

PROGRAM PLAN  
SUBSECTIONS

NO.

BRD IMPLEMENTING DOCUMENT OR PROCEDURE  
TITLE

X	Inspection	4.2, 4.3, 4.8, 4.9.1	E-1.13-3	Materials, Welding and Nondestructive Examination
			QA-3.101	Source Surveillance
			QA-3.101-1	Preparation and Control of Source Verification Plans and Schedules
			QA-3.101-2	Administration of the Source Surveillance Program
			QA-3.101-3 QA-3.101-4	Preparation for and Performance of Surveillance Preparation and Issuance of Source Surveillance Reports
XI	Test Control	3.6	E-2.4	Vendor/Contractor Documents
			QA-1.16	QA Review of Technical and Vendor Document Submittals
XII	Control of Measuring and Test Equipment	4.7		
XIII	Handling, Storage and Shipping	4.11		

FIGURE 17E-3. (CONT'D.) MATRIX OF 10CFR50 APPENDIX B AND THE QUALITY ASSURANCE PROGRAM PLAN.

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APPENDIX B CRITERION	PROGRAM PLAN SUBSECTIONS	NO.	BRD IMPLEMENTING DOCUMENT OR PROCEDURE TITLE
XIV Inspection, Test and Operation Status	4.9.2, 4.9.3, 4.11	QA-3.101-2	Administration of the Source Surveillance Program
XV Nonconforming Materials Parts or Components	2.6, 2.8, 2.9, 3.7, 4.10	E-2.5 QA-1.13 QA-1.25 QA-1.1000 E-2.8 L-2.3 QA-1.14	Vendor/Contractor Waiver Requests Corrective Action Requests (CAR) Nonconformance Review Board (NRB) Deviation Reporting and Control Field Deviation and Disposition Reports (FDDRs) Reporting of Defects and Noncompliances Unusual Occurrences
XVI Corrective Action	2.6, 3.7, 8.8	QA-1.13 QA-1.25 QA-1.1000  QA-1.14 L-2.3	Corrective Action Request (CAR) Nonconformance Review Board (NRB) Deviation Reporting and Control  Unusual Occurrences Reporting of Defects and Noncompliances

FIGURE 17E-3. (CONT'D.) MATRIX OF 10CFR50 APPENDIX B AND THE QUALITY ASSURANCE PROGRAM PLAN

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APPENDIX B CRITERION	PROGRAM PLAN SUBSECTIONS	NO.	BRD IMPLEMENTING DOCUMENT OR PROCEDURE TITLE
XVII Quality Assurance Records	2.4.2, 3.8, 4.6.2 4.9.2	E-2.4-1	Documentation Required by Constructor
		QA-3.101	Source Surveillance
		QA-3.101-1	Preparation and Control of Source Verification Plans and Schedules
		QA-3.101-2	Administration of Source Surveillance Program
		QA-3.101-3	Preparation for and Performance of Surveillance
		QA-3.101-4	Preparation and Issuance of Source Surveillance Reports
		PC-3.1	Filing
		PC-7.1	Personnel Indoctrination, Training and Qualification
		E-1.18	Technical Document Review and Release
		E-2.4	Vendor/Contractor Documents
PC-3.7	Declaring, Filing, and Retrieving Quality Records		
XVIII Audits	2.5, 3.9, 4.12, Section 8	QA-1.13	Corrective Action Request (CAR)
		QA-4.2	Audits

FIGURE 17E-3. (CONT'D.) MATRIX OF 10CFR50 APPENDIX B AND THE QUALITY ASSURANCE PROGRAM PLAN.

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Attachment 1

QUALITY ASSURANCE MANUAL  
PROCEDURE DESCRIPTIONS

PROJECT CONTROL

BRD-PC-1.5 Procedure Preparation

This procedure establishes the method for preparation, review, revision approval, and distribution of all BRD procedures and supplementary instructions except those numbered "BRD-QA-xx."

BRD-PC-3.1 Filing

This procedure establishes the methods for maintenance, coding, and filing of project documents and correspondence, including declared quality records in the Quality Records Center that will be transferred to the Owner.

BRD-PC-3.2 Project Information Center

This procedure establishes the Project Information Center as the repository for reference information required for use by Project Personnel.

BRD-PC-3.3 Technical Information - Receipt and Control

This procedure establishes the method for control and transmission of technical information for subsequent use in design documents including processing of Controlled Information Data Transmittal (CInDT) form.

BRD-PC-3.6 Distribution

This procedure establishes the method for maintaining distribution requirements of project documents.

BRD-PC-3.7 Declaring, Filing, and Retrieving Quality Records

This procedure establishes the method for declaration, filing, storage and retrieval of Quality Records in the Quality Records Center (QRC).

BRD-PC-7.1 Personnel Indoctrination, Training and Qualification

This procedure describes the methods used to indoctrinate, train and certify the qualifications of required CRBRP Project personnel.

QUALITY ASSURANCE MANUAL - PROCEDURE DESCRIPTIONS

PROJECT CONTROL INSTRUCTIONS

BRD-PC-1.5-1 Lists and Guides Manual

This instruction provides the method for authorizing, preparing, Issuing and revising the Burns and Roe List and Guides Manual.

## QUALITY ASSURANCE MANUAL - PROCEDURE DESCRIPTIONS

### ENGINEERING

#### BRD-E-1.1 System Design Descriptions

This procedure establishes the method for development and control of system design descriptions and assigns responsibility for a system design description to a Cognizant Engineer. It also provides for the traceability of the design requirements throughout the design process.

#### BRD-E-1.2 Calculations

This procedure provides the method for selection and authorization, and the requirements for preparing, checking, approving, superseding and voiding preliminary and final calculations.

#### BRD-E-1.3 Engineering Studies

This procedure defines the format and identification of engineering studies and establishes the requirements for review and approval of completed studies.

#### BRD-E-1.4 Basic Model and Engineering Design Model

This procedure establishes the responsibilities and control governing the flow of information to and from the model shop applicable to plant design.

#### BRD-E-1.5 System and Equipment Classification

This procedure provides direction for determining appropriate codes and standards and for assigning classifications or categories.

#### BRD-E-1.6 Equipment Numbers and Nomenclature

This procedure establishes a standard identification system for all plant components.

#### BRD-E-1.7 Drawing Control

This procedure defines the methods for controlling the development, initiation, processing, checking, reviewing, approving, release, reproduction, and distribution of drawings.

#### BRD-E-1.12 Incorporation of Safety and Environmental Requirements in Design

This procedure establishes the method and assigns the responsibility for monitoring all regulatory requirements, disseminating these requirements to implementing personnel and assuring that the design conforms to the regulatory requirements.

ENGINEERING (Continued)

BRD-E-1.13 Incorporation of Specialty Requirements in Design

This procedure establishes the methods by which design requirements concerning specialty subjects, such as materials, welding, NDE, cleaning, packaging, codes and standards, constructibility, reliability, availability and maintainability, are defined and incorporated in the design.

BRD-E-1.15 Engineering Changes

This procedure establishes the method to control the initiation, review, approval, and implementation of changes to baselined Principle Design Documents.

BRD-E-1.16 Holds

This procedure defines the method for initiating, reporting and assigning resolution responsibility for engineering holds and Quality Assurance Holds that are imposed to identify and limit design and fabrication activities.

BRD-E-1.18 Technical Document Review and Release

This procedure establishes the sequence and minimum requirements for review and approval of all technical documents except drawings before issue. It identifies required reviews and provides for the maintenance of the Document Status Report.

BRD-E-1.19 Interface Control

This procedure establishes the method for identifying, documenting, reporting, and controlling interface information.

BRD-E-1.20 Independent Design Review

This procedure defines the methods and responsibilities for planning, conducting, and documenting independent design reviews. This procedure encompasses only Internal Design Review.

ENGINEERING (Continued)

BRD-E-1.21 Overall Plant Design Description

This procedure establishes the methods for processing initial criteria subject input to Overall Plant Design Description (OPDD-10), prior to baseline and changes thereto after baselining.

BRD-E-1.23 Control of Safeguards Information

This procedure defines the methods for controlling and safeguarding Safeguards Information.

BRD-E-1.24 Using Fast Flux Test Facility (FFTF) Experience

This procedure defines the follow up system to assure that valuable and applicable experiences from FFTF are incorporated into the CRBRP design.

BRD-E-2.1 Preparation of Specifications

This procedure establishes the method for preparation and control of procurement and/or construction specifications utilizing a standardized format.

BRD-E-2.2 Prequalification of Bidders

This procedure establishes the method for selection and prequalification of prospective bidders.

BRD-E-2.3 Technical Evaluation of Proposals

This procedure defines the methods to be used for engineering review and evaluation of proposals.

BRD-E-2.4 Vendor/Contractor Documents

This procedure provides the methods for receipt, handling, routing, recording, reviewing, approving, distributing, and return of Vendor/Contractor (V/C) document submittals.

BRD-E-2.5 Vendor/Contractor Waiver Request (CWR)

This procedure provides the method for processing Contractor Waiver Requests (CWRs) from Contractors supplying/performing in accordance with B&R Specifications.

QUALITY ASSURANCE MANUAL - PROCEDURE DESCRIPTIONS

ENGINEERING (Continued)

BRD-E-2.7 Preparation of Purchase Requisitions

This procedure defines the requirements and methods for preparation of a purchase requisition to be submitted to the Purchasing Department.

BRD-E-2.8 Field Deviation and Disposition Reports (FDDRs)

This procedure establishes the methods for processing Field Deviation and Disposition Reports (FDDRs) received from the Constructor.

BRD-E-4.1 Preoperational and Startup Test Specifications

This procedure controls the preparation of all preoperational and start-up test specifications by B&R, and the review of externally-generated test specifications.

ENGINEERING INSTRUCTIONS

BRD-E-1.1-1 System/Subsystem Designations

This instruction defines the project breakdown into systems and subsystems with identifying names and numbers.

BRD-E-1.2-1 Auxilliary Steel Calculations

This instruction identifies the degree of effort by Structural Engineering for checking auxilliary steel calculations.

BRD-E-1.7-1 Classifying and Issuing Drawings

This instruction provides for preparing, classifying, issuing and revising drawings for information, project use, pre-construction use, and construction.

BRD-E-1.7-2 Review of AE Construction Drawings and Specifications  
By Constructor

This instruction provides the method for the selection and review of Burns and Roe Construction Drawings and Specification by the Constructor Resident Representative (CRR).

BRD-E-1.7-3 Sequence of Operation

This instruction defines the responsibilities of the contributors to the development and change cycle of Sequence of Operations.

BRD-E-1.13-1 Reliability Assurance Analysis

This instruction defines the methods to be utilized and tasks to be accomplished for the CRBRP Reliability Program.

BRD-E-1.13-2 Codes and Standards

This instruction provides the requirements for inclusion of codes and standards in project design documents.

BRD-E-1.13-3 Materials, Welding and Nondestructive Examination (NDE)

This instruction provides the requirements for inclusion of materials, welding and NDE in system design descriptions and procurement documents.

ENGINEERING INSTRUCTIONS (Continued)

BRD-E-1.13-4 Maintenance, Inservice Inspection and Surveillance

This instruction provides for the inclusion of maintenance, inservice inspection, and surveillance requirements in System Design Description.

BRD-E-1.13-5 Constructibility

This instruction provides for the incorporation of constructibility requirements in project design documents.

BRD-E-1.13-7 Cleaning and Cleanliness

This instruction provides for incorporation of cleaning and cleanliness requirements in project design documents.

BRD-E-1.13-8 Packaging, Shipping, Receiving, Handling and Storage

This instruction provides for the incorporation of packaging, shipping, receiving, storage and handling requirements in project design documents.

BRD-E-1.13-9 Piping Stress Analysis

This instruction applies to all piping stress analysis performed for ASME Section III, Class 1, 2 and 3 and ANSI B31.1 piping.

BRD-E-1.13-13 Radiation Protection

This instruction provides guidance for the analysis and incorporation of radiation protection requirements in project design documents.

BRD-E-1.18-1 Assignment of Data Types

This instruction provides guidance for determining the organizational approval level required for design documents.

BRD-E-1.18-2 Baseline Design Information

This instruction provides for baselining design information in Principal Design Documents (PDDs).

BRD-E-1.19-1 Internal Interface Data Report

This instruction provides the method of identifying internal interface data requirements and their scheduled transmittal dates.

ENGINEERING INSTRUCTIONS (Continued)

BRD-E-2.1-1 Initiation and Close-out of Development Requirements Specification

This instruction provides direction from initiation through close-out of development programs required to support the CRBRP Nuclear Island activities, using Development Requirements Specifications (DRS).

BRD-E-2.4-1 Documentation Required by Constructor

This instruction provides instructions for collecting, preparing, and transmitting documents required by the Constructor prior to, with, and after the shipment of a finished item.

BRD-E-2.4-2 Site Equipment Preshipment Activities

This instruction covers the activities to be completed before an equipment shipping release is authorized.

DESIGN AND DRAFTING

BRD-D-1.4 Drawing Checking and Review

This procedure establishes the minimum requirements for drawing checking and provides objective evidence of the checking activity.

BRD-D-3.3 Interface Control Documents

This procedure applies to all ICD's submitted by other project participants.

QUALITY ASSURANCE MANUAL - PROCEDURE DESCRIPTIONS

LICENSING

BRD-L-1.2 Preparation of Safety and Environmental Reports

This procedure establishes the methods for preparation, revision, review and approval of B&R input to the SAR and the ER. Revisions will be subjected to the same regimen of reviews and approvals as the original report.

BRD-L-1.3 Preparation of Responses to NRC Questions

This procedure establishes the methods used to prepare concise and timely responses to questions raised by the Nuclear Regulatory Commission (NRC) in conjunction with their review of the Safety Analysis and Environmental Reports.

BRD-L-2.3 Reporting of Defects and Non-Compliances

This procedure establishes the method for review and reporting of defects or non-compliances as defined by 10CFR21 and significant deficiencies as defined by Paragraph 50.55(e) of 10CFR50.

QUALITY ASSURANCE

BRD-QA-1.2 Preparation, Control and Distribution of Quality Assurance Instructions

This procedure establishes the guidelines for preparation, issue, control and use of quality assurance instructions by QA personnel.

BRD-QA-1.3 Preparation of QA Procedures

This procedure establishes the method for preparation and control of "QA" designated procedures.

BRD-QA-1.11 Vendor Quality Assurance Prequalification Program

This procedure establishes the method of prequalifying a prospective bidder's quality assurance program for a bidder's list.

BRD-QA-1.12 Vendor Quality Assurance Qualification Survey

This procedure establishes the method and criteria for conducting a preaward survey and evaluation of a prospective vendor's or subcontractor's quality assurance/quality control system.

BRD-QA-1.13 Corrective Action Request (CAR)

This procedure establishes the method for requesting and obtaining corrective/preventive action from the management of an organization responsible for repetitive quality assurance deficiencies or for significant problems that have resulted in or could result in adverse Project Quality Conditions.

BRD-QA-1.14 Unusual Occurrences

This procedure establishes the method for determining and reporting an unusual or unplanned event as required by RDT Standard F1-3T.

BRD-QA-1.16 QA Review of Technical and Vendor Document Submittals

This procedure provides methods and responsibilities guidelines for Quality Assurance review of submitted documents.

QUALITY ASSURANCE (Continued)

BRD-QA-1.19 Procedure Writing Format

This procedure provides a guide to the standardized format to be used in writing procedures for the BRD.

BRD-QA-1.21 Bid Review for Quality Requirements

This procedure provides guidelines for a standard approach for quality assurance review of bids.

BRD-QA-1.25 Nonconformance Review Board (NFB)

This procedure provides the structure and responsibility for a Nonconformance Review Board whose members have final authority within B&R in establishing dispositions.

BRD-QA-1.1000 Deviation Reporting and Control

This procedure establishes the methods and for identification, documentation, control and dispositioning of deviating items or services. Also includes determination of corrective action to prevent recurrence.

BRD-QA-3.101 Source Surveillance

This procedure describes the Source Surveillance Program which implements Source Surveillance and Inspection Requirements.

BRD-QA-3.1000 Project Surveillance

This procedure establishes the method of performing project surveillance.

BRD-QA-4.2 Audits

This procedure establishes the guidelines for auditing of the Quality Assurance Program.

QUALITY ASSURANCE MANUAL - PROCEDURE DESCRIPTIONS

QUALITY ASSURANCE INSTRUCTIONS

BRD-QA-1.11-1 Evaluation of Prequalification Questionnaire

This instruction provides direction for evaluating a QA Prequalification Questionnaire when considering the suitability of a vendor as an acceptable source.

BRD-QA-1.12-1 Performance, Evaluation and Reporting of Preaward Surveys

This instruction defines the actions required in planning, performing and reporting the results of a preaward survey.

BRD-QA-1.16-1 QA Review of Technical and Vendor Submittals

This instruction provides the checklist that defines the minimum QA review of technical and vendor document submittals.

BRD-QA-3.101-1 Preparation and Control of Source Verification Plans and Schedules

This instruction describes the considerations which must be addressed when preparing Source Verification Plans and Schedules or revisions thereto.

BRD-QA-3.101-2 Administration of Source Surveillance Program

This instruction describes methods to assure surveillance required by the Source Verification Plans are scheduled and performed.

BRD-QA-3.101-3 Preparation for and Performance of Surveillance

This instruction describes the methods and considerations addressed when preparing and performing surveillance activities.

QUALITY ASSURANCE MANUAL - PROCEDURE DESCRIPTIONS

QUALITY ASSURANCE INSTRUCTIONS (Continued)

BRD-QA-3.101-4 Preparation and Issuance of Source Surveillance Reports

This instruction defines the requirements and provides the guidance for preparation and issuance of Source Surveillance Reports.

QUALITY ASSURANCE MANUAL - PROCEDURE DESCRIPTIONS

PROCUREMENT PROCEDURES

BRD-PR-1.1 Request for Proposal (RFP)

This procedure establishes requirements for requesting and amending proposals for specified equipment and material.

BRD-PR-1.2 Proposal Processing, Negotiation, and Contract Award

This procedure establishes requirements for processing Offeror proposals, negotiations, and issuance of a contract to the successful Offeror.

BRD-PR-1.3 Purchase Approval Requests (PUR)

This procedure provides for the preparation and processing of purchase approval requests and preparation of supporting documentation for the procurement of equipment and materials.

BRD-PR-1.4 Purchase Contract Amendments

This procedure establishes the requirements for processing purchase contract amendments.

BRD-PR-1.10 Documenting Communications for B&R Designed Equipment

This procedure provides the method of controlling communication between Stone & Webster, Vendor/Contractor, and Burns & Roe during the bidding cycle and after contract award.

BRD-PR-1.12 Technical Audit of Contractor Proposals

This procedure provides for conducting technical audits of proposals and contract amendments.

13. Section 6, paragraph 2.0 - In addition to the described tasks, the Construction Department shall prepare and issue procedures establishing a document control system for documents received and distributed for use at the site which prescribe quality assurance activities.
14. Section 6, paragraph 3.1, revise to read - Applicable procedures in Section 5 of the Quality Standards Manual, Engineering Assurance Manual, and the Quality Assurance Directives Manual establish the requirements to maintain master indexes of instructions, procedures, drawings, and procurement documents and to publish updated indexes in a scheduled manner. For example, the Quality Standard entitled "Quality Standards Procedural System" states as follows:

"7.1.7A. Applicability - The applicability of generic QS's to a major project shall be established during the procedure review cycle and documented in the Table of Contents and Project Applicability Matrix. Actual usage in part or whole will depend upon other project documents which establish the scope of work to be done by Stone & Webster. This matrix shall be reviewed and updated periodically depending on activity, with an annual update as a minimum. Major projects shall individually issue a Table of Contents for their Project QS Manual which addresses every master generic and project model QS applicable to the Project. The Table of Contents shall state adoption, projectization, and, if not used, shall so state. Further, if not used and a substitute project procedure is used (not a QS), it shall be noted in this Table of Contents to ensure procedural coverage of all program commitments."
15. Section 7, add new paragraph 1.7.1 as follows: Material procured with a Certified of Conformance as documentation of quality shall be receipt inspected periodically by Field Quality Control to verify compliance with procurement documents.

Renumber present 1.7.1 through 1.7.4.
16. Section 7, paragraph 1.7.2 (formerly 1.7.1), revise to read - Receipt inspection status shall be documented and shall be identified by markings, tags, or other appropriate means.
17. Section 7, paragraph 3.2 - In the third line, change "Test, Inspection, and Documentation Section of procurement specifications...." to read "procurement documents and inspection plans...."
18. Section 8, paragraph 2.0 - In addition to described tasks, the Construction Department shall receive items at the site, verify proper quantity, item type, and lack of shipping/handling damage, and notify FQC for receipt inspection. Items which are awaiting FQC receipt inspection for a period exceeding one working day shall be tagged with a Product Hold Tag by Construction and segregated when practical, pending FQC receipt inspection.

19. Section 10, paragraph 1.2, revise first sentence to read - Inspection requirements shall be translated into inspection procedures, inspection plans, and inspection reports to provide documentation of the inspection work required to ensure the specified quality.
20. Section 10, paragraph 1.3, revise to read - Sampling techniques may be utilized for inspecting a group of homogeneous items. If sampling is used to verify the acceptability of items, the sampling plan shall be based on a recognized standard sampling plan (MIL-STD-105D for attribute sampling, MIL-STD-414 for variables sampling) or other nationally recognized and accepted technique. The method utilized and conclusions obtained from sampling shall be documented to assure correct interpretation of the plan and the results. Quality Systems Division and Client approval of sampling plans for Category I items is required when the method is outside the scope of approved procedures or accepted techniques as described above.
21. Section 10, paragraph 2.0 - In addition to the described tasks, the Construction Department is responsible for notification to FQC when work approaches HOLD points.
22. Section 10, paragraph 3.2.4, revise to read - A Description of Method of Inspections with Equipment Requirements and Accuracy Criteria - Delineated in the appropriate Quality Assurance Department document, i.e., Quality Assurance Directive, Inspection Plan, etc.
23. Section 12, paragraph 1.2, revise to read - The control program shall include the following and shall be implemented in accordance with approved procedures.
24. Section 12, paragraph 1.2.1, revise to read - Positive identification of the equipment and its calibration status including the due date of the next calibration.
25. Section 12, paragraph 1.2.2, revise to read - A frequency of calibration schedule for types of equipment based on required accuracy, purpose, recognized industry standards, manufacturers' recommendations, usage factors, stability characteristics, and other conditions affecting the measurement.
26. Section 12, paragraph 1.2.3, revise to read - Written procedures describing the calibration control system. Standards traceable to national standards shall be used; if national standards do not exist, the basis for calibration shall be documented. Calibration standards used shall be calibrated, where possible, using standards of a greater accuracy, or when not possible, the basis of acceptance of the calibration shall be documented. Calibration of equipment shall be against standards that have an accuracy that assures the equipment being calibrated will be within required tolerance. When possible, calibration standards used shall have an accuracy at least four times that of the equipment being calibrated. When this is not possible or feasible, standards shall have a verifiable accuracy which will assure that the calibrated equipment will be within required tolerances.

CLINCH RIVER BREEDER REACTOR PLANT  
A DESCRIPTION OF THE CONSTRUCTOR  
QUALITY ASSURANCE PROGRAM

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CLINCH RIVER BREEDER REACTOR PLANT  
DESCRIPTION OF THE CONSTRUCTOR  
QUALITY ASSURANCE PROGRAM

0.0 INTRODUCTION

Stone & Webster Engineering Corporation (SWEC) is the constructor for the Clinch River Breeder Reactor Plant (CRBRP) Project. In this capacity, SWEC is responsible for management and performance of those tasks associated with the overall construction effort. This includes the responsibility to plan, implement, and manage the Constructor portion of the CRBRP overall quality assurance program. This program will be applied to activities within SWEC's contractual scope of work that affect safety related structures, systems, and components and those important to safety (as defined in Section 3.2, 7.1, and 9.13).

The SWEC CRBRP Project Quality Assurance Program is based on the Stone & Webster Topical Report, SWSQAP 1--74A, Rev. C, "Standard Nuclear Quality Assurance Program." Although some organizational elements and responsibilities have been shifted for this project, all requirements contained in SWSQAP 1-74A, Rev. C, which are applicable to SWEC's scope of work will be implemented. By accomplishing this, the SWEC Quality Assurance (QA) Program for CRBRP complies with the applicable requirements of 10CRF50, Appendix B and RDT F2-2. The correlation of 10CRF50, Appendix B and RDT F2-2 is shown in Figure 17.1-3.

The changes that have been made in the quality assurance organizational structure from that shown on SWSQAP 1-74A, Rev. C, have been made to respond to project conditions where SWEC does not have responsibility for engineering or design, as well as requirements of the Owner for the establishment of a project quality assurance organization. As a result, the responsibilities for implementing some requirements contained in SWSQAP 1-74A, Rev. C, have been shifted within the organizational elements of the QA Department. These changes in organization and responsibility are described in the following paragraphs.

0.1 ORGANIZATION

0.1.1 Organizational Arrangement

The SWEC management organization, including quality assurance management for the CRBRP Project is shown in Figure 17F-1. The QA Department organization is shown in Figure 17F-2. Figure 17F-3 shows the Project Quality Assurance Organization. The changes in the quality assurance organizational structure from that presented in SWSQAP 1-74A, Rev. C, for the Constructor program of the CRBRP Project are:

- A. Because SWEC has no engineering or design responsibility for CRBRP, these organizational elements are not represented.

- B. The position of CRBRP Project QA Manager has been created. The CRBRP Project QA Manager, who will be located at the project site, has overall authority and responsibility for quality assurance function, both administrative and operational, on the project. The Project QA Manager receives quality assurance direction from, and reports to, the QA Department Manager in SWEC Headquarters. The QA Department Manager reports to the Vice President, QA, who reports to the SWEC Company President. CRBRP Project policy is received through the interface shown in Figure 17F-1 with the Project Managers and/or the Senior Project Manager.
- C. The position of QA Program Administrator will not be established for the CRBRP Project. The Project QA Manager and the Project QA Staff will perform those functions normally assigned to the coordinator.
- D. Field Quality control Division personnel at the site and Procurement Quality Assurance personnel in the SWEC District Offices will receive Project direction from the Project QA Manager. Corporate policy, corporate administration, and corporate resource support will remain with the parent Headquarter's divisions.
- E. The Project QA Manager's Staff will be established to perform both quality assurance engineering and quality assurance management functions.
- F. The Quality Assurance Cost and Auditing Division in SWEC Headquarters will retain responsibility for audits of the overall SWEC CRBRP Project QA Program. Additionally, the Project QA Manager will staff and conduct an audit activity to perform required audits of subcontractors, the S&W CRBRP FQC organization, and others as requested or directed by the Owner.
- G. With respect to procurements, the site QA staff will be responsible for inspection planning normally performed by PQAD and for the evaluation of risk releases normally performed by Project Engineering. The field Procurement Department, in lieu of Project Engineering, will assume the responsibility for preparation of the Recommended Bidder's List.
- H. Since the engineering and design activities for CRBRP are the responsibility of others, the assignment of dispositions to nonconforming items identified by SWEC and which require an Engineering disposition will be the function of others. To facilitate inter-organizational processing, the SWEC Nonconformance and Disposition (N&D) Report System (referenced in Section 15) has been modified. The new system, designated as the Field Deviation and Disposition Report (FDDR) provides a method of interfacing with all responsible parties in order to report, evaluate, and disposition nonconformances. PQA will continue to report shop nonconformances using the SWEC N&D system.

1. Additional Modifications to SWSQAP 1-74A, Revision C

1. Section 1, paragraph 1.3, revise to read - Individuals or groups who audit, inspect, or otherwise provide acceptance verification of a quality activity (except for design or start-up operations) shall be from the quality assurance organization and shall not be the same individuals or groups responsible for performing the specific activity.
2. Section 1, add paragraph 1.4 as follows: The quality assurance organization shall be adequately staffed throughout the life of the project. This organization shall review the project scope, determine the personnel requirements to support quality assurance activities, and staff to provide required support. A Quality Assurance Representative shall participate in scheduling meetings and other day-to-day activities at the site and Headquarters as necessary to assure adequate qualified personnel, equipment, and procedures are available to perform quality activities in support of the engineering and construction schedule.
3. Section 1, paragraph 2.0 - In addition to the described tasks, the Construction Department shall develop management systems and methods to implement the quality assurance program for Construction Department activities.
4. Section 1, paragraph 2.0 - In addition to the described tasks, the Purchasing Department shall develop management systems and methods to implement the quality assurance program for Purchasing Department activities.
5. Section 2, add paragraph 1.10 as follows: All procedures which are used to implement this quality assurance program shall be consistent with the commitments of this program. The QA Organization shall review and concur with these quality related procedures in accordance with Appendix VI. Documentation of the review and concurrence shall be maintained.
6. Section 2, add paragraph 1.11 as follows: The status and adequacy of the overall Quality Assurance Program, as described herein, shall be assessed on a annual basis by the Stone & Webster Internal Audit Division or other organization having no direct relationship to the SWEC Quality Assurance Organization. This annual assessment will be achieved by an evaluation of compliance to and adequacy of corporate commitments contained in SWSQAP 1-74A, implementing measures including the project related assessments committed to in Section 18 of this document. Reports of this assessment and recommendation shall be submitted to the Office of the Chairman and President of SWEC and the SWEC Vice President and Manager of Quality Assurance.
7. Section 2, paragraph 1.8, revise to read: Indoctrination, training, and qualification programs shall be established and implemented as appropriate, such that:

- 1.8.1 Personnel receive indoctrination and training to familiarize them with the procedures and systems developed to govern and support quality related and quality assurance activities, including tests, inspections, examinations, and audits.
  - 1.8.2 Formal training programs shall be documented, including objectives, content of the program, attendees, and date of attendance.
  - 1.8.3 Personnel performing quality assurance functions shall be qualified, certified, and re-certified as required by applicable codes and standards.
  - 1.8.4 Certificates of qualification show the basis for qualification, including testing or proficiency testing when applicable, and the specific functions personnel are qualified to perform.
  - 1.8.5 The training program complies with the Regulatory Position in Regulatory Guide 1.58, with alternatives as noted in Appendix VII.
8. Section 4, paragraph 2.0 - In addition to the described tasks, the Construction Department is responsible for the preparation and processing of Purchase Requisitions for permanent plant equipment, materials, and services as assigned by the Owner or as necessary to support construction phase activities.
  9. Section 4, paragraph 2.1, revise as follows: First sentence - change to read: Quality Systems Division, or other personnel authorized in writing by the Chief Engineer, Quality Systems Division, shall be responsible....  
  
Second sentence - Review and approval shall verify that quality requirements are correctly stated, inspectable, and controllable; there are adequate acceptance and rejection criteria; and sufficient information exists pertaining to codes....
  10. Section 5, paragraph 2.0 - In addition to the described tasks, the Construction Department shall prepare and publish appropriate Construction Department procedures which govern the performance of Construction Department activities affecting quality.
  11. Section 5, paragraph 2.0 - In addition to the described tasks, the Project Management Department shall prepare a Project manual that provides overall direction to Project personnel, reference applicable detailed procedures and instructions, and contain Project unique procedures and instructions.
  12. Section 5, add paragraph 2.2.3 as follows: In addition to the described tasks, the Project Quality Assurance Organization shall prepare and publish procedures based on Quality Systems Division procedures without degradation which shall govern the performance of certain Project quality activities.

13. Section 6, paragraph 2.0 - In addition to the described tasks, the Construction Department shall prepare and issue procedures establishing a document control system for documents received and distributed for use at the site which prescribe quality assurance activities.
14. Section 6, paragraph 3.1, revise to read - Applicable procedures in Section 5 of the Quality Standards Manual, Engineering Assurance Manual, and the Quality Assurance Directives Manual establish the requirements to maintain master indexes of instructions, procedures, drawings, and procurement documents and to publish updated indexes in a scheduled manner. For example, the Quality Standard entitled "Quality Standards Procedural System" states as follows:

"7.1.7A. Applicability - The applicability of generic QS's to a major project shall be established during the procedure review cycle and documented in the Table of Contents and Project Applicability Matrix. Actual usage in part or whole will depend upon other project documents which establish the scope of work to be done by Stone & Webster. This matrix shall be reviewed and updated periodically depending on activity, with an annual update as a minimum. Major projects shall individually issue a Table of Contents for their Project QS Manual which addresses every master generic and project model QS applicable to the Project. The Table of Contents shall state adoption, projectization, and, if not used, shall so state. Further, if not used and a substitute project procedure is used (not a QS), it shall be noted in this Table of Contents to ensure procedural coverage of all program commitments."
15. Section 7, add new paragraph 1.7.1 as follows: Material procured with a Certificate of Conformance as documentation of quality shall be receipt inspected periodically by Field Quality Control to verify compliance with procurement documents.

Renumber present 1.7.1 through 1.7.4.
16. Section 7, paragraph 1.7.1 (formerly 1.7.1), revise to read - Receipt inspection status shall be documented and shall be identified by markings, tags, or other appropriate means.
17. Section 7, paragraph 3.2 - In the third line, change "Test, Inspection, and Documentation Section of procurement specifications...." to read "procurement documents and inspection plans...."
18. Section 8, paragraph 2.0 - In addition to described tasks, the Construction Department shall receive items at the site, verify proper quantity, item type, and lack of shipping/handling damage, and notify FQC for receipt inspection. Items which are awaiting FQC receipt inspection for a period exceeding one working day shall be tagged with a Product Hold Tag by Construction and segregated when practical, pending FQC receipt inspection.

19. Section 10, paragraph 1.2, revise first sentence to read - Inspection requirements shall be translated into inspection procedures, inspection plans, and inspection reports to provide documentation of the inspection work required to ensure the specified quality.
20. Section 10, paragraph 1.3, revise to read - Sampling techniques may be utilized for inspecting a group of homogeneous items. If sampling is used to verify the acceptability of items, the sampling plan shall be based on a recognized standard sampling plan (MIL-STD-105D for attribute sampling, MIL-STD-414 for variables sampling) or other nationally recognized and accepted technique. The method utilized and conclusions obtained from sampling shall be documented to assure correct interpretation of the plan and the results. Quality Systems Division and Client approval of sampling plans for Category I items is required when the method is outside the scope of approved procedures or accepted techniques as described above.
21. Section 10, paragraph 2.0 - In addition to the described tasks, the Construction Department is responsible for notification to FQC when work approaches HOLD points.
22. Section 10, paragraph 3.2.4, revise to read - A Description of Method of Inspections with Equipment Requirements and Accuracy Criteria - Delineated in the appropriate Quality Assurance Department document, i.e., Quality Assurance Directive, Inspection Plan, etc.
23. Section 12, paragraph 1.2, revise to read - The control program shall include the following and shall be implemented in accordance with approved procedures.
24. Section 12, paragraph 1.2.1, revise to read - Positive identification of the equipment and its calibration status including the due date of the next calibration.
25. Section 12, paragraph 1.2.2, revise to read - A frequency of calibration schedule for types of equipment based on required accuracy, purpose, recognized industry standards, manufacturers' recommendations, usage factors, stability characteristics, and other conditions affecting the measurement.
26. Section 12, paragraph 1.2.3, revise to read - Written procedures describing the calibration control system. Standards traceable to national standards shall be used; if national standards do not exist, the basis for calibration shall be documented. Calibration standards used shall be calibrated, where possible, using standards of a greater accuracy, or when not possible, the basis of acceptance of the calibration shall be documented. Calibration of equipment shall be against standards that have an accuracy that assures the equipment being calibrated will be within required tolerance. When possible, calibration standards used shall have an accuracy at least four times that of the equipment being calibrated. When this is not possible or feasible, standards shall have a verifiable accuracy which will assure that the calibrated equipment will be within required tolerances.

27. Section 15, paragraph 1.4 - Add "and 10CFR21" to end of sentence.
28. Section 15, add new paragraph 1.5 as follows: Nonconforming items shall either be corrected, or resolved as not having an adverse impact upon the test or test results, prior to the initiation of the preoperational test program on the item.
29. Section 18, paragraph 2.1, revise to read - The Vice President, Quality Assurance, shall review the implementation of each project's quality assurance program for compliance with the Preliminary Safety Analysis Report and Appendix B to 10CFR50. This shall consist of reviews of quality trend data, audit reports, and specific project reports, and verification of implementation of effective corrective action. At least annually, a formal program audit of the specific project quality assurance program shall be performed and documented to evaluate program effectiveness and determine whether the Preliminary Safety Analysis Report requirements are properly reflected in the various quality assurance manuals and are being, or are capable of being, fulfilled. These audits shall include pertinent external project-related activities such as, but not limited to, those performed by Construction, Purchasing, and Project Management Departments, and Engineering Assurance Division of the Engineering Department. Appropriate corrective action shall be identified. Copies of the program audit, and identified corrective action shall be submitted to responsible management to implement corrective action. Corrective action shall be tracked to completion.
30. Section 18, paragraph 3.2.1, line 2: Replace "total" with "each project."
31. Section 18, paragraph 3.2.2: Replace second sentence with: This evaluation shall be conducted by QACAD and reported to the Manager and Vice President of Quality Assurance. This program feature shall be assessed annually by the selected independent auditors identified in Item 0.1.1.1.6 above.
32. Section 19, paragraph 1.8, revise to read - Owner requirements and/or additions to the Project QA Program Manual shall be entered into the Quality Assurance Program Index (Division A of the Program Manual) or in Part 4.0, "Client Considerations," within each section and shall not be considered as a program revision.
33. Section 19, paragraph 1.9, add the following: In addition, any changes to the quality assurance program description which is included with the Safety Analysis Report, and have been previously approved by the NRC, will be submitted to the licensee for the purpose of obtaining NRC approval prior to implementation. The licensee shall be notified of organizational changes in the quality assurance organization within 30 days after the announcement for the further notification of these changes to the NRC.

34. Appendix II - Add the qualification requirements of the Project QA Manager for the CRBRP Project as follows: A minimum of ten years in quality assurance and related fields including manufacturing, construction, and/or installation activities. At least two years of this experience shall be associated with the nuclear field in either field or Headquarters project quality assurance assignments. He must have a Bachelor of Science or Arts degree.
35. Appendix VI - Add Project QA Manager to the approvals for: Project QA Program Description, Quality Standards (other than QS 5.1), Quality Assurance Directives, and Quality Control Instructions.
36. Appendix VII, revise Item D (Regulatory Guide 1.58) as follows:

Regulatory Guide 1.58, Revision 1, dated September 1, 1980, (ANSI N45.2.6 - 1978), "Qualification of Nuclear Power Plant Inspection, Examination, and Testing Personnel."

SWEC's QA program requirements commit to comply with this Regulatory Guide subject to the following alternatives:

1. ANSI N45.2.6 - 1978, Paragraph 2.4, "Written Certification of Initial Capability"

SWEC Position: Initial capability will be determined by an evaluation of the candidate's education and experience or by testing. If the candidate fails to meet the criteria established in Paragraph 3.5, subject to our alternatives stated below in Item 3, SWEC will evaluate the candidate by testing. Testing to demonstrate proficiency will be accomplished by a practical demonstration, oral or written examination, or by any suitable combination of the three. In all cases, the basis for the qualification and the results will be documented in an auditable manner and retained in the candidate's qualification file. Evaluation by testing may be optionally exercised at anytime in lieu of verified education and experience.

2. ANSI N45.2.6 - 1978, Paragraph 2.4, "Written Certificate of Qualification"

SWEC Position: For purposes of certification, SWEC will use the following disciplines on certificates of qualification to identify activities certified to perform:

- o Mechanical - (includes piping and instrumentation)
- o Electrical - (includes controls)
- o Civil - (includes concrete, structural and soils)
- o Special Processes (except NDT - see below) - (includes welding, painting, chemical, and cadwelding)

- o Quality - (includes supervising personnel who review or administer inspections, examinations, or tests over several disciplines, as well as multi-disciplines, such as receiving inspection, procurement quality assurance, documentation, etc.)
- o NDT Disciplines - (as delineated in SNT-TC-1A-1975)

Certification will be accomplished either by (1) education, experience and training, or (2) testing. The method used will be shown on the certificates. Results of testing and records of education, experience, and training will be maintained in the candidates qualification file.

3. ANSI N45.2.6 - 1978, Paragraph 3.5, "Education and Experience - Recommendation"

3.5.1 - Level I

1. Same as Standard
2. High School/General Education Development equivalent plus six months...or
3. Four year college graduation, plus one month of related experience or equivalent inspection, examination, or testing activities.

3.5.2 - Level II

1. One year of satisfactory performance as Level I or five years related experience in the corresponding inspection, examination, or test category or class, or
2. High School/General Education Development equivalent plus three years...or
3. Same as Standard
4. Same as Standard

3.5.3 - Level III

1. Six years of satisfactory performance as a Level II or 15 years of related experience in the corresponding inspection, examination, or test category or class...or
2. High School Graduation/General Education Development equivalent plus ten years...or
3. Same as Standard
4. Same as Standard

37. Appendix VII, add to Part 1:

- L. Regulatory Guide 1.144, Rev. 1, dated September 1980 (ANSI N45.2.12 - 1977), "Auditing of Quality Assurance Programs for Nuclear Power Plants" - commit to comply with Guide, subject to the following alternative:

Pre-audit and post-audit conferences are normally held as required by Sections 4.3.1 and 4.3.3 of ANSI N45.2.12 - 1977. In certain circumstances, when audits are of a limited scope, a documented, telephone conversation may be held in lieu of a face to face meeting.

- M. Regulatory Guide 1.146, dated August 1980 (ANSI/ASME N45.2.23 - 1978), "Qualification of Quality Assurance Program Audit Personnel for Nuclear Power Plants" - commit to comply with Guides.

0.1.2 Responsibility and Authority

The shift of quality assurance responsibilities to support the revised organizational structure is as follows:

- A. Because SWEC has no engineering and design responsibilities, these functions will be performed by others designated by the Owner as described in other sections of this PSAR. Additionally, as-built configuration information is provided by SWEC to others as designated by the Owner for incorporation in to the Project Baseline Documentation which will ultimately reflect the as-built configuration of the overall plant.
- B. The Project QA Manager is responsible for performing the quality assurance program management and administrative functions for the project quality assurance organization, as delegated by the QA Department Manager. In addition, the Project QA Manager is responsible for those tasks normally assigned to a QA Program Administrator. The QA Department Manager, located in Boston Headquarters, will provide quality assurance policy and guidance, the interface with corporate management, and access to other QA Headquarters divisions. In this position, the Project QA Manager has the organizational freedom and authority to identify quality problems, initiate, recommend, or provide solutions through designated channels, and verify implementation of corrective action. The Project QA Manager is also responsible for establishing necessary interfaces with other project participants on both informal and formal basis as designated by the Owner. The Project QA Manager shall also participate in the long and short range planning and scheduling activities of the Project to assure that based on Project goals and schedules, the overall quality assurance function has adequate resources to support all phases of Project work efficiently.
- C. The Project QA Staff will execute many of the Project QA Manager's assigned tasks for the Constructor Program.

D. The Quality Assurance Cost and Auditing Division in SWEC Headquarters will retain responsibility for audits of the overall SWEC CRBRP Project QA Program. Additionally, the Project QA Manager will staff and conduct an audit activity to perform required audits of subcontractors, the SWEC CRBRP FQC organization, and others as requested or directed by the Owner.

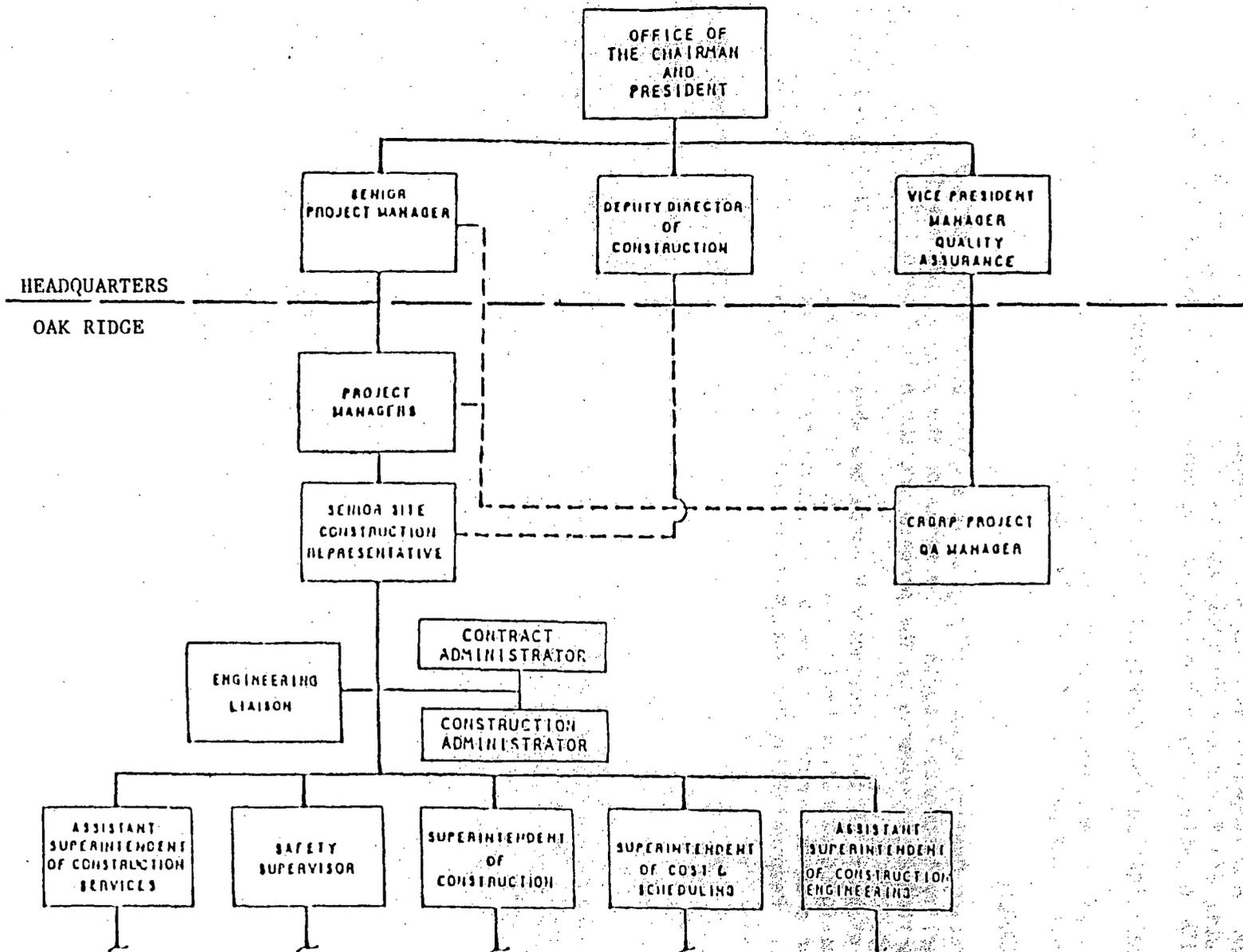
0.1.3 Qualification Requirements of the Project QA Manager

The qualification requirements of the Project QA Manager are described in Section 1.4.4.6 and paragraph 0.1.1.1.34, above.

0.2 PROGRAM

The Constructor Quality Assurance Program is a major portion of the overall Project Quality Assurance Program. The scope of the program and the type of project participation covered by the program are shown in Figure 17F-4.

The major elements of the Constructor Program are shown in Figure 17F-5. SWEC has been assigned execution responsibility for the full scope of the Constructor program except the area of preoperational testing and start-up activities. Responsibility for execution of activities related to those areas has been retained by the Owner.

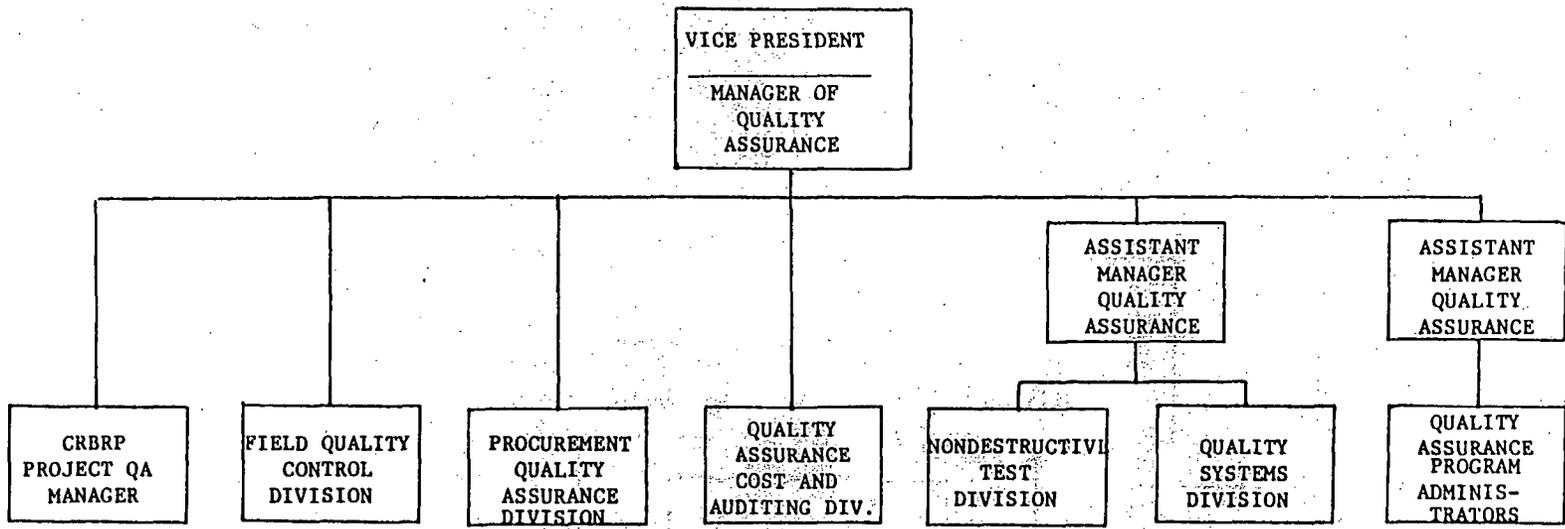


LEGEND  
 ——— RESPONSIBILITY  
 - - - COMMUNICATION & LIAISON

PROJECT ORGANIZATION FOR QUALITY ASSURANCE  
 CLINCH RIVER BREEDER REACTOR PLANT PROJECT  
 STONE & WEBSTER ENGINEERING CORPORATION  
 Figure 17F-1

17F-12

Amend. 70  
 Aug. 1982



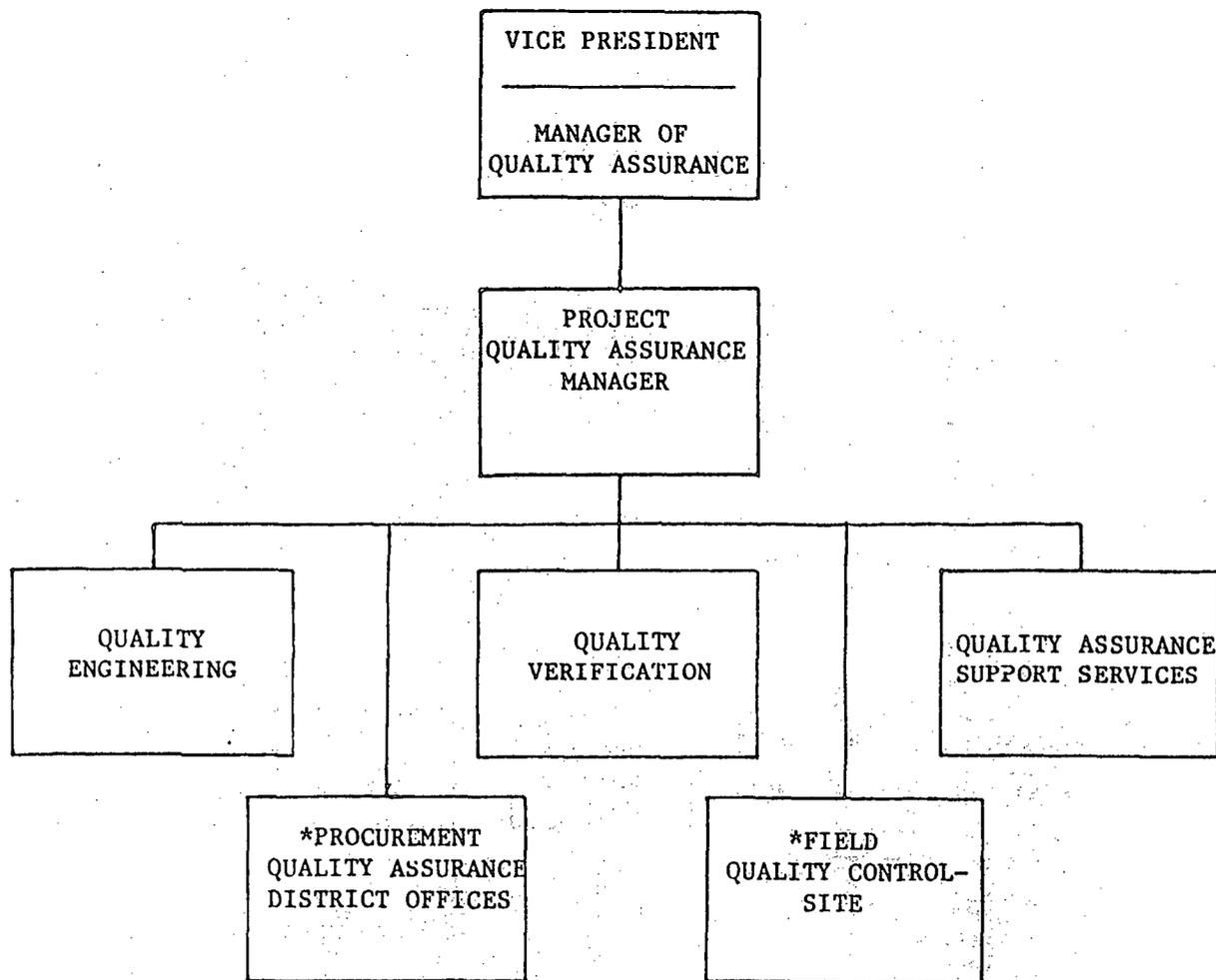
NOTE: PROJECT DIRECTION IS PROVIDED BY THE CRBRP PROJECT QA MANAGER TO OTHER ORGANIZATIONAL UNITS OF THE QA DEPARTMENT WHICH ARE PERFORMING ACTIVITIES IN SUPPORT OF THE PROJECT.

QUALITY ASSURANCE DEPARTMENT ORGANIZATION  
CLINCH RIVER BREEDER REACTOR PLANT PROJECT  
STONE & WEBSTER ENGINEERING CORPORATION

Figure 17F-2

17F-13

Amend. 70  
Aug. 1982



17F-14

\*NOTE: PROCUREMENT QUALITY ASSURANCE AND FIELD QUALITY CONTROL PERFORM VERIFICATION ACTIVITIES AS AN INTEGRAL PART OF THE PROJECT QUALITY ASSURANCE ORGANIZATION AND RECEIVE PROJECT DIRECTION FROM THE PROJECT QA MANAGER. CORPORATE ADMINISTRATION, CORPORATE POLICY, AND CORPORATE RESOURCE SUPPORT ARE RECEIVED FROM THEIR PARENT DIVISIONS IN BOSTON HEADQUARTERS.

PROJECT QUALITY ASSURANCE ORGANIZATION  
CLINCH RIVER BREEDER REACTOR PLANT PROJECT  
STONE & WEBSTER ENGINEERING CORPORATION

Figure 17F-3

Amend. 70  
Aug. 1982

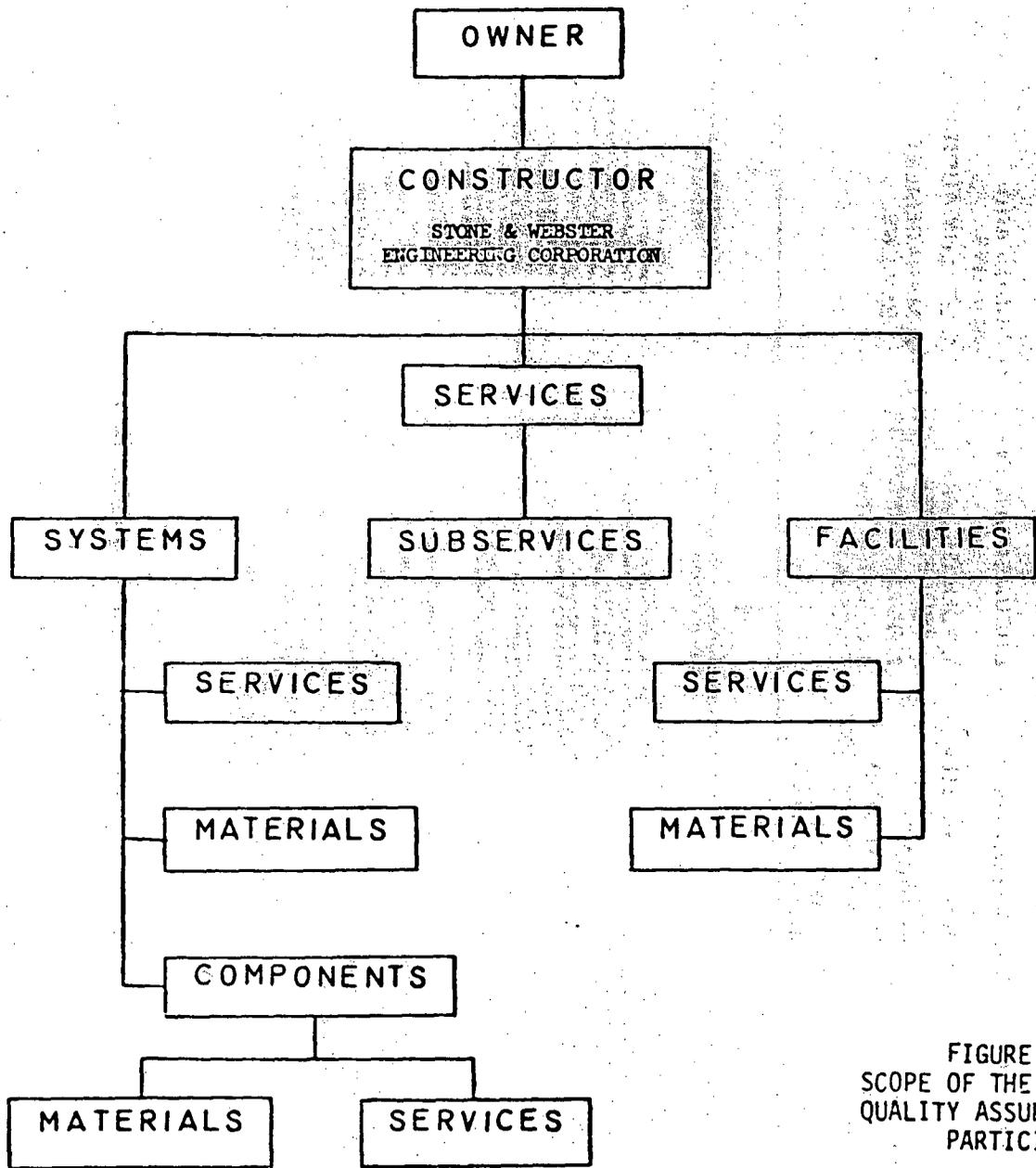


FIGURE 17F-4  
SCOPE OF THE CONSTRUCTOR  
QUALITY ASSURANCE PROGRAM  
PARTICIPATION

# CONSTRUCTOR PROGRAM ACTIVITIES

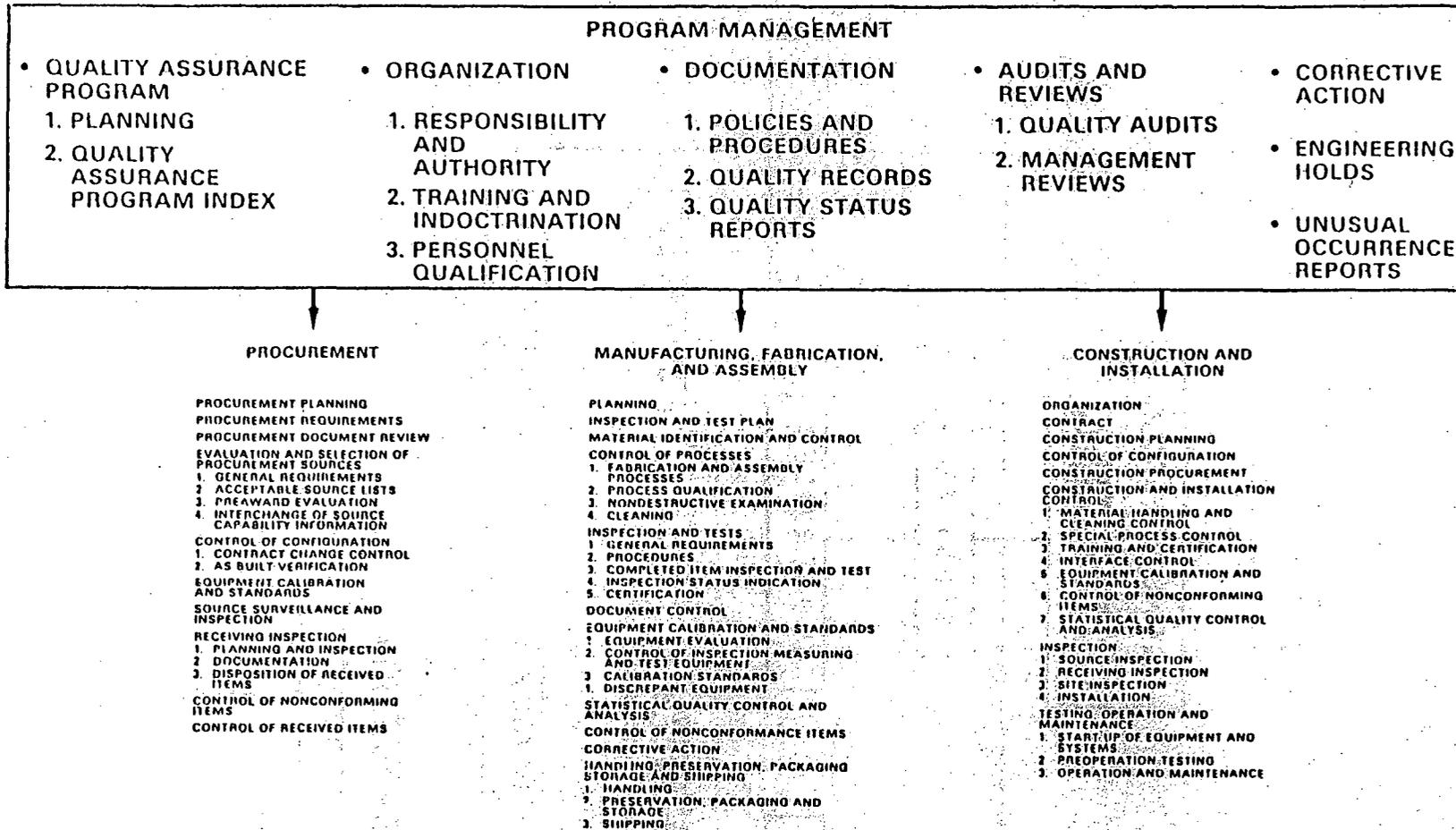


Figure 17F-5 Major Elements of the Constructor Program

17F-16

Amend. 70  
Aug. 1982

THE CLINCH RIVER BREEDER REACTOR PLANT  
PRELIMINARY SAFETY ANALYSIS REPORT

CHAPTER 17.0 - QUALITY ASSURANCE

APPENDIX G

RDT STANDARD F2-2, 1973

QUALITY ASSURANCE PROGRAM REQUIREMENTS

Supersedes  
RDT F 2-2T, June 1969

# RDT Standard

## QUALITY ASSURANCE PROGRAM REQUIREMENTS

**AUGUST 1973**

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\*U. S. Energy Research and Development Administration

Division of Reactor Research and Development

\*Cover amended

Amend. 55  
June 1980

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QUALITY ASSURANCE PROGRAM REQUIREMENTS

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**QUALITY ASSURANCE PROGRAM REQUIREMENTS**

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**1. INTRODUCTION**

1.1 Scope. This standard sets forth general requirements for planning, managing, conducting, and evaluating quality assurance programs for reactor development and test facility projects and associated processes, structures, components, and systems. These quality assurance requirements are based on proven practices and provide the means of control and verification whereby those responsible for project management can assure that the quality required for safe, reliable, and economical operation will be achieved. The objective of the programs covered by this standard is to assure that structures, components, systems, and facilities are designed, developed, manufactured, constructed, operated, and maintained in compliance with established engineering criteria. To achieve this objective, controls are to be established and implemented at predetermined points, and necessary action taken to prevent, detect, and correct any deficiencies.

The requirements contained in this standard are intended to cover the life of a project from concept through operation. The requirements have been arranged into the following areas, thereby enabling flexibility for selective application of those requirements that are appropriate to the project scope.

1.1.1 Management and Planning. Management and planning efforts include formulation, direction, and documentation of the entire quality assurance program; designation of organizational responsibilities for quality assurance; preparation of plans, procedures, and instructions; training and indoctrination of personnel; conduct of periodic, documented program audits, and reviews; maintenance of records; and preparation of quality status reports.

1.1.2 Design and Development. Design and development efforts in the quality assurance program include establishing, controlling, and verifying design. The development effort encompasses planning, testing, documentation, surveillance, and closed-loop review, reporting, and feedback of development information.

1.1.3 Procurement. Procurement efforts include the specification of quality assurance requirements in procurement documents, selection and surveillance of suppliers, and receipt and inspection of purchased items.

1.1.4 Manufacturing, Fabrication, and Assembly. Manufacturing, fabrication, and assembly efforts include conformance to drawings, standards, specifications, procedures, and instructions for the control of materials, components, and processes; performance of in-process and final assembly inspections, examinations, and tests; calibration of instruments and equipment; and control of nonconforming items.

1.1.5 Construction and Installation. Construction and installation efforts include assurance that the required quality is maintained through control of field fabrication, erection, and testing activities. Quality assurance in this area is achieved through continued compliance with design drawings, specifications, codes, and standards; equipment installation procedures and work instructions; handling, storage, and cleaning practices; and requirements for performing planned inspections, examinations, and preoperational tests.

1.1.6 Operation, Maintenance, and Modification. Operation, maintenance, and modification efforts include quality assurance through systematic planning of work; application of work instructions or operating procedures for controlling operation, maintenance, and modification; preparation of records and reports of operation experience; and performance of scheduled, periodic inspection and testing.

## 1.2 Definitions.

1.2.1 Characteristic. Any property or attribute of an item, process, or service that is distinct, describable and measurable as conforming or nonconforming to specified requirements.

1.2.2 Contractor. The individual or company entering into a contract, subcontract, or purchase order issued by the purchaser.

1.2.3 Failure. The inability of an item to perform within specified limits.

1.2.4 Incident. An unusual or unplanned occurrence affecting or potentially affecting the performance, reliability or safety of a reactor or test facility, or personnel safety, which requires or may require special evaluation, and corrective or preventive action to be taken.

1.2.5 Item. Any level of unit assembly, including system, subsystem, subassembly, component, part, or material.

1.2.6 Nonconformance. A deficiency in characteristic, documentation, or procedure which renders the quality of an item or service unacceptable or indeterminate.

1.2.7 Objective Quality Evidence. Any recorded fact or facts pertaining to the quality of an item, process, or service based on observation, measurement, or test, that can be verified.

1.2.8 Purchaser. The agency responsible for issuance and administration of a contract, subcontract, or purchase order imposing this standard or portions thereof.

1.2.9 Quality Assurance. The planned and systematic actions necessary to provide adequate confidence that a material, component, system, or facility will perform satisfactorily in service.

1.2.10 Quality Control. The quality assurance actions that control the attributes of the material, process, component, system, or facility in accordance with predetermined quality requirements.

1.2.11 Repair. The process of restoring a nonconforming item to an acceptable condition, although it does not conform to a specified requirement.

1.2.12 Rework. The process by which a nonconforming item is made to conform to specified requirements.

1.3 Applicability. The requirements of this standard shall apply to all activities from design and development through fabrication, construction, test, operation and maintenance that affect the performance and quality of any essential portion of a reactor, test facility, or development program, including engineered components associated with such facilities and programs.

For projects or programs of significant scope, complexity, and duration, this standard or entire sections thereof, shall be invoked. For those projects or programs whose scope, complexity, and duration do not warrant total application of this standard or entire sections thereof, the specific requirements of this or other standards that are essential to the assurance of quality shall be invoked in the specification. If any part of this standard is to be invoked, Section 1 shall be included.

Requirements of this standard and of other regulations, codes, standards and specifications applicable to the contract shall be invoked for systems, components, materials, processes, services, or other elements of work under the contract based upon their function, relative importance, and contribution toward the objectives of the program or project. The implementation of these specific requirements for given elements of work shall be defined in such documents as specifications, drawings, quality assurance program indexes, procedures, instructions, and the like.

1.4 Responsibility. The contractor shall establish and implement an effective program for the assurance of quality of items, processes or services which meets the applicable requirements of this standard and other pertinent regulations, codes and standards. The level of quality assurance activity established by the contractor shall be appropriate to the product and effective in causing deficiencies to be identified and promptly corrected by responsible line management. The contractor shall perform all those activities that are essential to the assurance of adequate quality of items, processes or services included in the program, or may delegate quality assurance activities to other organizations, such as subcontractors, suppliers or consultants, but shall retain prime responsibility for the adequacy of those activities.

The contractor shall identify specific quality assurance requirements to be invoked for individual systems, components, materials, processes, and services as appropriate for control of essential elements of work, and shall inform the purchaser of such requirements.

1.5 Relation to Other Requirements. The applicable requirements of this standard shall be satisfied in addition to the quality assurance requirements of other applicable regulations, codes, standards and specifications. The requirements of this standard shall not be interpreted in a manner that would result in a duplication or derogation of work effort.

1.6 Purchaser Actions. The quality assurance program of the contractor and of his subcontractors and suppliers will be subject to surveillance, inspection, evaluation, and audit by the purchaser or by his designated representative at any time during the course of the program. Such actions by or on behalf of the purchaser shall not relieve the contractor of his responsibility for compliance with contract requirements.

Upon request, the contractor shall furnish, or provide access to, contract-related quality assurance information, documents, records, material samples, and other items required by the purchaser or his designated representative. Representatives of the purchaser shall have access to the contractor's plant, facilities, and equipment for the purpose of inspection of work and materials.

1.7 Applicable Documents. The following documents are a part of this standard to the extent specified herein. The issue of a document in effect on the effective date of the referencing specification or procurement document, including any amendments also in effect on that date, shall apply.

1.7.1 RDT Standards.

RDT F 3-2T Calibration Program Requirements

## 2. MANAGEMENT AND PLANNING

2.1 Scope. This section covers the general management and planning actions necessary to develop and implement an effective quality assurance program in consonance with other project activities. The contractor's management and planning activities for quality assurance shall be well organized and disciplined and include organization, training, and indoctrination of personnel; development and implementation of program planning; generation of required documentation and reports; and performance of reviews and audits.

2.2 Quality Assurance Program. The contractor shall plan, establish, implement, and maintain a documented quality assurance program that utilizes those organizational and functional disciplines necessary to furnish objective evidence of required quality throughout all phases of contract performance. The program shall emphasize the prevention of conditions adverse to quality and assure prompt detection and correction of deficiencies.

2.2.1 Planning. The contractor's planning shall include all project activities affecting quality and shall provide for process controls, special equipment, capable personnel, and specific inspection, testing, surveillance and audit efforts necessary for verification of quality.

2.2.2 Quality Assurance Program Index. Contractors shall prepare and maintain current for the project, program, or area of work, an index of the procedures, instructions, or other documents, and their revisions, which will be used to implement the specific quality assurance requirements of the contract. The index shall make maximum use of existing documents and shall delineate, where appropriate, the applicability of individual documents for systems, components, materials, processes, and services to be provided under the contract. The index and referenced documents shall be approved by contractor management, and by the purchaser if required by the contract. In addition, the contractor shall prepare and maintain current, as an attachment to the index, an organization chart showing key personnel and functional responsibilities and authority for quality assurance activities.

### 2.3 Organization.

2.3.1 Responsibility and Authority. Organizational responsibility and authority for development, implementation, and management of the quality assurance program shall be clearly defined in the contractor's directives, policies, procedures, and instructions. Quality achievement shall be verified by individuals and organizations not directly responsible for performing the work, but who are responsible for checking, inspecting, auditing, or otherwise verifying that the work has been performed satisfactorily. The one responsible for direction of the quality assurance program shall have direct access to top management and shall report regularly on the status and adequacy of the quality assurance program. Personnel performing quality assurance functions shall have the organizational freedom, authority, and capability to identify and evaluate quality problems and to initiate, recommend, or provide solutions.

2.3.2 Training and Indoctrination. As part of the quality assurance program, the contractor shall determine the extent to which formal training and indoctrination programs are needed and shall conduct these programs accordingly. These programs shall be conducted for project managers, quality assurance engineers, designers, manufacturing personnel, construction personnel, and others whose work may have an effect upon, or who are responsible for verifying, quality. Training and indoctrination programs shall involve familiarization of personnel with technical objectives of the project, codes and standards to be used, and engineering and quality assurance practices to be employed, with guidance regarding limitations and capabilities.

2.3.3 Personnel Qualification. In addition to requirements for qualification of personnel stated in applicable codes and standards, the contractor shall assure that only qualified personnel are authorized to accept materials, products, processes or systems by required inspections and tests. This applies also to manufacturing or other personnel who perform inspections and tests that are not independently verified by qualified contractor personnel.

Qualification requirements shall be stated in writing, and shall include periodic requalification to assure continued proficiency and understanding of technical requirements. Qualification of personnel shall be based on demonstration of proficiency, skill, or knowledge. If it is found through subsequent examination or inspection that work has been improperly performed or accepted, management action shall be initiated to determine the cause of deficient work practices and the corrective action required to prevent recurrence. When appropriate, corrective action shall include revoking the authority of the individual responsible for improperly performing or accepting work and removing the individual from the work activity until he is requalified.

The contractor shall maintain records of personnel qualification status, including training and experience, results of examinations or tests to demonstrate proficiency or skill, and evidence of familiarity with applicable codes, standards, specifications, and procedures.

## 2.4 Documentation.

2.4.1 Policies and Procedures. Activities affecting quality shall be defined and documented by the contractor in appropriate directives, policies, procedures, instructions, drawings, and other technical documents. Such documents shall include the quantitative or qualitative provisions for ascertaining that the activities are accomplished in compliance with contract requirements.

2.4.2 Quality Records. The contractor shall maintain records sufficient to furnish documentary evidence of the performance of activities affecting quality, and for use in management of the program. Records must be readily retrievable, identifiable, and available to management, purchaser or designated representatives, and other authorized personnel during the course of the quality assurance program. Typical records to be maintained include quality assurance program index, procedures, instructions, personnel training records, quality audit reports, summaries of nonconformances,

incident and failure reports, corrective actions, and other records required by applicable sections of this standard.

2.4.3 Quality Status Reports. The contractor shall submit periodic quality assurance program status reports to the purchaser as required by the contract. The reports shall contain brief, narrative descriptions of quality assurance program progress and accomplishments; summaries of current problems, nonconformances, and failures, with their analysis and corrective action status; quality trend data; and results of program audits and management reviews.

## 2.5 Audits and Reviews.

2.5.1 Quality Audits. The contractor shall audit the quality assurance program both periodically and at major project milestones, as prescribed in Section 8.

2.5.2 Management Reviews. Quality assurance review meetings shall be held periodically by the contractor, with attendees including the contractor's project-management personnel. The reviews shall provide a means for assessing project quality accomplishments, discussing program audits, and resolving management problems.

2.6 Corrective Action. The contractor's quality assurance program shall provide for prompt detection and correction of all conditions adversely affecting quality, including failures, malfunctions, incidents, trends, deficiencies, deviations, nonconformances, and defective materials. The contractor shall establish and maintain methods for verifying and determining the cause of an adverse condition and for initiating necessary improvements and corrections to preclude repetition. Quality trends shall be analyzed to furnish a basis for improvement in work performance. The corrective action system shall extend to subcontractors, and suppliers. Identification of the adverse condition, its cause, and the corrective action taken shall be recorded and reported to appropriate levels of management.

2.7 Engineering Holds. The contractor shall establish and implement procedures for the identification, reporting and management of engineering holds imposed during design, procurement, fabrication, construction and installation, and operations activities. Engineering holds, which may result from design uncertainties or changes, discrepancy or nonconformance reports, waivers, insufficient documentation, or other circumstances, shall be identified in drawings, drawing lists, or other documents, and shall define the limits beyond which work shall not proceed. The contractor shall prepare periodic hold reports, to describe each outstanding hold, the action required to remove the hold, the organization or individual responsible for resolution, and the need date for resolution.

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### 3. DESIGN AND DEVELOPMENT

3.1 Scope. This section describes the quality assurance program requirements to be implemented by the contractor to control design and development activities. The requirements include planning, definition and control, development and qualification testing, documentation, and auditing.

3.2 Design Planning. The contractor's planning of design activities shall include outlining the approach and measures to be used in achieving project objectives. Planning for these activities shall be outlined and documented in appropriate form, such as procedures, practices, tables, charts, and diagrams. Milestones at which design criteria, standards, specifications, drawings, procedures, and other engineering documents will be prepared, reviewed, approved, released, and integrated into the design effort shall be delineated. Designs, materials, components, and processes requiring development shall be defined, as well as the level of effort to be applied in verifying quality. Interrelationships among those responsible for preparation of designs, coordination of interfaces, and the lines of communication shall be defined. The planning and outlining of design activities shall be kept current and shall indicate the status and progress of design effort.

3.3 Design Definition and Control. The contractor shall establish and implement methods for controlling design activities to assure that applicable design criteria, codes, standards, practices, and requirements for those materials, structures, components, systems, facilities, and processes to which this standard applies are defined and correctly translated into specifications, drawings, procedures, and instructions. The contractor shall establish and implement methods for coordinating and interfacing with other participating organizations to assure compliance with these requirements during the design and development phase and throughout succeeding phases of fabrication, testing, construction, and operation.

3.3.1 Design Criteria. The contractor shall define and document criteria stating the requirements to be satisfied by the design. These criteria shall include the project performance objectives, operating conditions, and requirements for safety and availability, as well as the requirements for materials, fabrication, construction, testing, operation, maintenance, and quality assurance.

3.3.2 Codes, Standards, and Practices. The contractor shall establish and enforce procedures to assure that appropriate codes, standards, and practices for design, materials, fabrication, construction, testing, inspection, and operation of components, structures, systems, facilities, and processes are defined, documented, and employed. The contractor shall employ, where applicable, AEC, ANSI, ASME, ASTM, and other recognized codes, standards, and practices, including those of the contractor.

Where such recognized engineering codes, standards, and practices are nonexistent or inadequate to meet the needs of the project, the contractor shall develop new or supplemental codes, standards, and practices. Any proposed development of new or supplemental codes, standards, and practices for

project use shall be subject to authorization by the purchaser prior to initiation of efforts. In developing such codes, standards, and practices, the contractor shall coordinate with other appropriate organizations and shall furnish copies of proposed codes, standards, and practices as directed by the purchaser.

Codes, standards, and practices which the contractor proposes to employ shall be thoroughly identified and referenced in design criteria, analyses, descriptions, plans, specifications, drawings, and other engineering documents.

**3.3.3 Engineering Studies.** The contractor shall conduct and document engineering studies sufficient to establish that the design meets the design criteria, that it is based on proven practices, and that it is adequate for the intended service. Engineering studies should focus on those aspects involved in the intended service, such as operation, maintenance, in-service inspection and safety, and be based on analysis of reactor physics, structural stress, thermal, hydraulic, environmental, and other effects. Engineering studies should include analysis of "trade offs" and alternatives, identify weaknesses, and provide for incorporation of appropriate preventative design features, operating and maintenance practices, and safety precautions.

**3.3.4 Parts, Materials, and Processes.** The contractor shall establish methods for the selection, standardization, identification, and application review of essential parts, materials, and processes to be used in the project.

The contractor shall select parts, materials, and processes on the basis of proven experience or qualification for the intended service. Where applicable parts, materials, and processes have been developed and qualified by AEC or other appropriate programs or are reflected in applicable recognized standards, they shall be used; where necessary parts, materials, and processes have not been so qualified, the contractor shall recommend to the purchaser appropriate action. If development or qualification testing efforts are necessary, the conduct of such efforts will require coordination by the contractor with other on-going AEC programs. The contractor shall make every effort to reduce the variety of parts, materials, and processes through standardization.

**3.3.5 Design Descriptions.** The contractor shall prepare design description documents for essential components, systems, and facilities as required by the purchaser and in accordance with the latest Atomic Energy Commission-Reactor Research and Development instructions. Design descriptions are intended to provide a means to define and integrate the various technical, operational, and safety considerations involved; maximize application of past experience; relate research, development, test, and backup design efforts; identify interfaces; and serve as a common technical basis for other project activities. Design descriptions provide a technical reference for detailed component specifications, operational test procedures, and safety analysis reports.

3.3.6 Specifications, Drawings, and Instructions. The contractor shall prepare specifications, drawings, instructions, and other engineering documents necessary to define specific design requirements. These documents shall include as applicable, requirements for detail design, materials, fabrication, construction, installation, testing, inspection, maintenance, cleaning, packaging, shipping, storage, operation, and quality assurance.

3.3.7 Identification. The contractor shall establish procedures for identifying materials, parts, components, and processes on drawings, specifications, and other engineering documents. The identification system shall allow for traceability, through the use of lot numbers, heat numbers, part numbers, serial numbers, or other appropriate means, between engineering documents and products. Those materials, parts, and components requiring specific traceability to original certification data shall be so designated.

3.3.8 Acceptance Criteria. The contractor shall identify within appropriate design documents those criteria to be used for acceptance. The documents shall specify the check points during the work process at which compliance with the criteria will be accomplished and verified.

3.3.9 Interface Control. The contractor shall establish methods for definition and control of design interfaces among other project participants and design organizations. To the extent practicable, a common identification system shall be used by all design organizations on the items and documents for a given design interface. The contractor shall establish procedures for the exchange of required design data and for prompt analysis and resolution of design interface problems.

#### 3.4 Document Review and Control.

3.4.1 Document Reviews. The contractor shall review and evaluate specifications, drawings, analyses, and other significant engineering documents and their changes before issuance. These reviews and evaluations shall be conducted systematically, with procedures and checklists used to verify completeness and adequacy with respect to contract requirements, engineering standards, design practices, and intended application.

3.4.2 Document Control. The contractor shall provide for controlled release of design documents authorized for use. The controls shall assure that design documents and their changes are properly prepared, coordinated, and released by authorized persons; distributed to prescribed parties and maintained current; and are complete. The contractor's document-release and change-control system shall provide for a final review, approval, and signoff by engineering and quality assurance personnel. Changes to approved design documents shall be reviewed and approved by the same organization that performed the original review and approval, unless the contractor or purchaser designates another responsible organization.

3.4.3 Engineering Drawing Lists. The contractor shall prepare and maintain complete and current lists of engineering drawings, including subcontractor and vendor drawings, which are applicable to the work. For

each drawing, the list shall include: specific identification of the applicable revision; level of approval required, i.e., which organizations must take approval action; and current status, e.g., in preparation, issued for approval, released for use.

**3.5 Design Reviews.** The contractor shall conduct planned and documented design reviews in accordance with procedures to verify that the design meets requirements. Design reviews are intended to provide assurance that studies, calculations, and analyses involving nuclear effects, electrical, mechanical, thermal, hydraulic, safety, reliability, maintainability, and other pertinent considerations are complete and correct; that research and development programs and tests associated with the design provide optimal benefits to the design; that materials and design interface are compatible; that maximum use is made of qualified, standardized, or approved parts, materials, components, and processes; that accessibility for in-service inspection, maintenance, or repair is adequate; and that acceptance criteria for inspections and tests are delineated. Design reviews shall be held to discuss and resolve technical problems concerning design adequacy among the design contractor, the purchaser, and other project participants.

The contractor shall identify those components and systems for which independent formal design reviews are to be scheduled and conducted by the responsible design organization. Design reviews shall be independent in the sense that the reviewers have no direct responsibility for the design, but are technically competent and may be from the same organization that prepared the design. Participation in design reviews should be interdisciplinary, involving key technical personnel in the areas of design, manufacturing, testing, quality assurance, operation, and maintenance, as well as project management and consultants, as appropriate. Joint design reviews with other participating contractors shall be held by the responsible design organization when design interfaces are under consideration.

Hold points shall be established in the project beyond which further design work or initiation of fabrication shall not proceed pending an independent design review. Each design review shall be documented by the contractor in a report that shall include a synopsis of significant problems, decisions, and assigned action items. Design review reports shall be reviewed, approved, and issued by the responsible design organization and submitted to the purchaser as required by the contract.

**3.6 Development.** The contractor shall establish and implement methods for assuring quality in the development of materials, processes, equipment, components, or design concepts defined in project design as required to demonstrate, evaluate, or substantiate the fulfillment of the design objectives.

**3.6.1 Development Planning.** The contractor's development efforts shall be planned and documented in coordination with project design efforts. Planning shall include the delineation of objectives of the development effort; the materials, components, systems, or processes to be developed; and the quality assurance standards, practices, and procedures to be employed. Planning shall also define the test criteria, the applicable

specifications and procedures, the method of selecting test items, the facilities and support equipment required for testing, the types of data to be acquired, and the methods for reporting test results and resolving problems.

3.6.2 Development and Qualification Testing. The contractor shall direct development and qualification testing toward evaluation of the performance capability under various conditions as required by the design. Implicit in this requirement are identification and the eliminating or minimizing of potential problems and failure modes. Testing shall be conducted in strict accordance with written and approved specifications and procedures. The design shall be modified as dictated by test data acquired during development testing. The modified design shall be sufficiently tested to assure performance in accordance with design requirements.

3.6.3 Test Article Control. The contractor shall verify that articles undergoing test are handled, stored, cleaned, and controlled in accordance with specified requirements.

3.6.4 Development Reviews. The contractor shall establish and implement procedures for reviewing development criteria, development testing, and evaluation and application of development results. Development reviews shall be conducted by contractor personnel responsible for design, testing, quality assurance, project management, and others as appropriate. These reviews shall assure that meaningful development criteria are prepared; that testing is required, conducted, and completed in accordance with established development objectives; and that results of development activities meet the need of and are applied to design or other phases of the project.

3.7 Failure Reporting and Corrective Action. The contractor shall establish and implement procedures for reporting, verifying, analyzing, and correcting failures, including those that occur during development and qualification testing. The procedure shall provide assurance that the cause and mode of each failure are determined, that potential safety and availability implications are evaluated, and that corrective action is taken in accordance with 2.6.

A failure report shall be prepared to identify the failed item and its origin or source of manufacture and shall describe the failure, the test status at time of failure, the probable cause and mode of failure, and the recommended corrective action. The contractor shall include a summary of failures and their corrective action status in the periodic quality assurance program status reports required by 2.4.3.

3.8 Quality Records. The contractor shall compile and maintain records and data generated during design and development. Typical records include codes, standards, practices, design description, specifications and drawings, design data and studies, design review reports, development plans, procedures and test reports, and failure reports. Copies of records shall be distributed within the contractor's organization to other participating organizations as appropriate and provided to the purchaser as required.

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3.9 Quality Audits. The contractor shall regularly audit quality assurance activities related to the design and development phase in accordance with the requirements of Section 8.

#### 4. PROCUREMENT

4.1 Scope. This section includes quality assurance program requirements to be satisfied by a contractor during the procurement phase of a project. The requirements include procurement planning, selection and evaluation of procurement sources, preparation and review of procurement documents, control of configuration, source and receiving inspection activities, control of finished items, and recording and auditing of procurement activities. The contractor shall employ those controls necessary to assure that procurement functions are accomplished in accordance with the contract and any contract-specified codes, standards, drawings, and specifications.

4.2 Procurement Planning. The contractor, in planning his procurement activities, shall document in outline form, such as tables, charts, or other appropriate means, the methods to be used to accomplish the procurement and related quality assurance activities. The planning shall identify milestones during the project when procurement documents will be prepared, reviewed, approved, and released for bid. The planning shall provide for evaluation and selection of potential suppliers and shall identify source and receiving inspection activities and controls to be used for acceptance and disposition of purchased items. Contractor procurement planning and outlining of the work effort shall be kept current to reflect the progress and status of the activities.

4.3 Procurement Requirements. Contracts, purchase orders, work authorizations, and changes thereto, shall include or reference specific, selected requirements of this standard and other applicable regulations, codes and standards for the assurance of quality of each purchased item or service. Procurement documents shall identify the quality assurance documentation to be prepared and submitted, such as quality assurance indexes, inspection and test plans, process control, nondestructive examination and cleaning procedures, reports and records, as appropriate, and shall specify submittal dates and approval requirements. Requirements for access to subcontractor or supplier records and facilities for the performance or witnessing of inspections, examinations or tests by the purchaser shall be defined. Applicable quality assurance requirements shall be extended to the work of lower tier subcontractors and suppliers.

4.4 Procurement Document Review. The contractor shall establish and implement procedures whereby design, procurement, quality assurance, and project-management personnel shall review procurement documents to assure that requirements are complete and appropriate. Subsequent reviews of procurement contracts and purchase orders shall also be made to assure that changes made in quality assurance requirements during contract negotiation and after contract award are duly incorporated.

#### 4.5 Evaluation and Selection Of Procurement Sources.

4.5.1 General Requirements. The contractor shall select procurement sources primarily on the basis of demonstrated capability to provide a similar product, process, or service in accordance with the requirements of the

request for proposal (RFP). When records are not available to indicate quality capabilities, the facilities, organizations, and quality assurance functions of the potential sources shall be evaluated to determine their adequacy.

4.5.2 Acceptable-Source List. The contractor shall establish and maintain lists of suppliers who have demonstrated their capability to provide acceptable specific products or services and shall use the lists in selecting sources for similar products or services.

4.5.3 Pre-Award Evaluation. Sources for procurement of complex or high-cost products or services shall be evaluated by qualified contractor personnel prior to contract award to determine capability of the source to perform in accordance with the requirements of the RFP. A procurement source's history of quality performance shall be considered as an element of this evaluation.

4.5.4 Interchange of Source-Capability Information. The contractor shall obtain and make use of available information on supplier capabilities with respect to products, processes, services and quality performance.

#### 4.6 Control of Configuration.

4.6.1 Contract Change Control. The contractor shall establish and implement procedures to assure control of approved changes in contracts, design drawings, specifications, test procedures, inspection instruction, and other procurement documents. As part of these procedures, affected organizations, including designers, material suppliers, and manufacturers, shall be notified of changes; and the contractor shall receive verification of timely incorporation of changes. Materials, products, processes, drawings, specifications, and other items affected by the change shall be re-identified when required by the design.

4.6.2 As-Built Verification. The contractor shall establish and implement procedures to verify that the asbuilt configuration of purchased items conforms to applicable codes, specifications, drawings, and other contractual requirements, including authorized changes.

4.7 Measuring and Test Equipment Calibration and Control. The contractor shall establish and implement procedures for the selection, use, calibration, adjustment, maintenance and control of all measuring and test equipment used to accomplish contract requirements, during all phases of work, in accordance with RDT F 3-2.

4.8 Source Surveillance and Inspection. The contractor shall establish and implement procedures for maintaining surveillance at the source of materials and services. Source surveillance procedures shall be established in accordance with the relative importance, complexity, and quality of items being procured and shall provide a means for determining the effectiveness of the quality assurance program. When required, the contractor shall assign personnel to the supplier's facility to check, inspect, or witness the

receiving and identification of raw material; the fabrication, processing, or testing activities; and the preparation of items for shipment. Special effort shall be made to inspect items at the earliest practical time so that deficiencies may be detected and corrected before assembly or subsequent work precludes inspection. Source surveillance and inspection may not be required when the quality of an item can be verified to conform to specifications or drawings by review of certified test reports, inspection upon receipt, or other means.

#### 4.9 Receiving Inspection.

4.9.1 Planning and Inspection. The contractor shall establish and implement procedures for receipt, inspection, test, and distribution of items delivered by suppliers. Receiving inspection shall be coordinated with source surveillance and inspection activities.

The contractor shall inspect or test purchased items upon receipt for cleanness and dimensional, chemical, physical or other characteristics as appropriate to verify conformance to specified requirements. The contractor shall routinely or periodically validate supplier-furnished material certifications by means of independent analyses or overchecks. The contractor's receipt inspection planning shall define the necessary inspections and tests and shall provide for inspection density adjustment depending upon source, quality performance history, lot size and other factors.

Inspection instructions and test procedures shall provide for verification of characteristics in accordance with acceptance criteria in contract drawings and specifications. Emphasis shall be placed on assuring that items have not been damaged in shipment and that interface characteristics that influence subsequent fabrication, construction, or end use are verified. Special examinations or tests required at the point of receipt shall be identified and conducted in accordance with contract requirements.

Sampling inspection methods may be used when: (1) tests are destructive or (2) inherent characteristics, inspection records, or noncritical applications of the material or product indicate that a reduction of inspection will not jeopardize the quality, reliability, or design intent of the material or product. The use of sampling inspection methods other than those stated in the contract shall be subject to approval for use by the purchaser.

4.9.2 Documentation. The contractor shall review and provide appropriate approval of supplier-generated documents, such as drawings, manuals, certifications, test results, and inspection data for completeness, acceptability, and conformance to contract requirements before accepting completed items.

4.9.3 Disposition of Received Items. Materials or products found to be damaged upon receipt shall be identified and withheld from inspection or end use until disposition is decided. Acceptable materials and products shall be identified as to inspection status and processed to storage or end-use

areas. Nonconforming materials and products shall be identified, segregated, and disposed of in accordance with 4.11.

4.10 Control of Nonconforming Items. The contractor shall develop and implement procedures to control purchased items that do not conform to contract requirements. The procedures shall provide for prompt identification, documentation, segregation, technical review, and disposition of nonconforming purchased items. Significant nonconformances that cannot be reworked to conform to requirements shall receive a technical review, and resultant decisions to accept, repair, or return a nonconforming item to its source for correction shall be supported by records of all cases submitted for action. When deficiencies are detected during contract performance, the contractor shall promptly feed back all information necessary for correction to the supplier or source. The contractor shall maintain active coordination with suppliers to assure rapid resolution of quality problems.

Items rejected by the contractor and later resubmitted by the supplier shall be identified as resubmittals. In each case, the supplier shall refer to the contractor's rejection document and shall furnish evidence to show that the cause for rejection has been corrected.

4.11 Control of Received Items. The contractor shall establish and implement procedures for identifying, controlling, handling, and storing received materials and equipment. These procedures shall provide for maintaining records of marking and identification to assure that the items and pertinent data can be traced to their origin in accordance with contract requirements. Controls shall be implemented to protect items that deteriorate from environmental exposure or which may be damaged during handling operations. Material or equipment that deteriorates with age shall be identified, and controls implemented to assure utilization during its useful life.

4.12 Quality Audits. The contractor shall regularly audit quality assurance functions related to procurement, in accordance with Section 8.

## 5. MANUFACTURING, FABRICATION, AND ASSEMBLY

5.1 Scope. This section includes quality assurance requirements to be satisfied by the contractor during manufacturing. The requirements include manufacturing planning; control of materials and processes; inspection or testing of in-process or completed items; control of nonconforming items; preparation for shipping; recording and auditing of activities. The requirements are intended to assure that the quality of items manufactured by the contractor will conform to contract requirements.

5.2 Planning. The contractor shall establish and implement those procedures and instructions required to assure that fabrication, processing, and assembly activities of manufacturing are planned and conducted in accordance with requirements of the contract and its specified documents. Contractor planning activities shall include identification and sequencing of fabrication, processing, and assembly functions and their associated inspection and testing activities.

5.3 Inspection and Test Plan. The contractor's quality assurance program shall provide for the necessary detailed planning of inspection and test activities related to fabrication, processing, and assembly operations. An inspection and test plan shall be prepared, either as separate documents identified with the parts, components, or assemblies, or as an integral part of the contractor's work instructions. The inspection and test plan shall consist of a flow chart, diagram, or narrative description of the sequence of activities for fabrication, processing, assembly, inspection, and test and shall indicate the type of characteristics to be measured, the methods of examination, and the applicable acceptance criteria.

The contractor's inspection and test plan shall establish those inspection and test points from raw materials through fabrication, processing, and assembly at which conformance of parts, components, and subsystems to design requirements will be verified.

The plan shall be submitted to the purchaser for approval prior to implementation. When mandatory hold points, which require inspection of selected characteristics of an item or process or witnessing of testing by the purchaser, and beyond which work is not to proceed without the written consent of the purchaser, are established by the purchaser, such hold points shall be identified in the contractor's inspection and test plan.

5.4 Material Identification and Control. Materials and items subjected to fabrication, processing, or assembly operations shall be identified and controlled throughout manufacturing in accordance with requirements established in specifications, drawings, or other technical documents. Identification shall be indicated either on the fabricated item or assembly or in related records. Controls shall be exercised at all points necessary to assure that only accepted materials and items are used. Materials and items that deteriorate with age shall be marked to indicate the date when useful life began or the date when useful life will expire. The contractor shall provide for proper control, preservation, and storage of materials or items furnished by the purchaser.

## 5.5 Control Of Processes.

5.5.1 Fabrication and Assembly Processes. To assure that the required quality is achieved, the contractor shall establish and implement procedures and instructions for the control of fabrication and assembly processes, including metallurgical, chemical, bonding, welding, coating, and plating. Emphasis shall be placed on prevention, elimination, and correction of nonconformances at the earliest possible stage.

Process controls shall include: shop orders, process sheets, travelers, inspection instructions, and other shop documents prepared as supplements to specifications, codes, and standards; verification of adequacy of shop documents; assurance of compliance; and maintenance of records.

When a fabrication or assembly process must be conducted in a special environment, such as in a vacuum or an inert atmosphere, the process controls shall assure that the required environment is maintained.

Tooling, jigs, fixtures, and other equipment used for process control and precision inspection of dimensions, contours, and locations shall be identified in planning documents. Such items of equipment shall be closely controlled and inspected prior to use and at prescribed intervals to assure that their required accuracy is maintained.

5.5.2 Process Qualification. The contractor shall qualify procedures for performance of designated processes before fabrication is started and to the extent required by the contract. Upon request of the purchaser, the contractor shall furnish qualification documents for approval, including procedures and drawings and the results of tests and inspections.

5.5.3 Nondestructive Examination. Nondestructive examination procedures for processes such as radiography, ultrasonic examination, liquid penetrant examination, and magnetic particle examination shall be qualified and controlled to assure that results provide accurate, uniform, and reproducible indications of actual quality. Nondestructive examinations shall be performed in accordance with qualified procedures and specified acceptance criteria.

5.5.4 Cleaning. The contractor shall prepare and implement procedures to assure that lubricants, chemicals, materials, precision parts, components, assemblies, and systems are cleaned under controlled conditions as specified in the contract, and that required cleanness is maintained.

## 5.6 Inspections and Tests.

5.6.1 General Requirements. Throughout the manufacturing cycle, the contractor shall perform or have performed inspections and tests in accordance with established plans, instructions, and procedures. The contractor shall verify that inspection and test prerequisites are met, that appropriate instruments and devices are used, and that inspections and tests are performed in the proper sequence under suitable environmental conditions.

The contractor shall establish, implement, and maintain procedures to detect, analyze, and record any nonconformances and to assure that appropriate corrective action is taken and completed. The contractor shall assure that results of inspections and tests are recorded and can be traced to the individual responsible.

The contractor shall assure that inspection stations are located at appropriate points of fabrication, processing, and assembly so that parts, components, assemblies, processes, and fabrication methods are inspected and tested and data recorded according to plans and procedures.

The contractor shall furnish inspection and test results and related data to the purchaser on request.

**5.6.2 Procedures.** The contractor shall provide procedures, instructions, and checklists that clearly describe the appropriate inspections and tests for materials, work in process, and completed articles as required by the code, standard, specification, and the contract. In addition, the criteria for acceptance or rejection of product shall be included. All characteristics required to be reported by the code, standard, specification, or contract shall be examined as prescribed by procedures and instructions and the results recorded on checklists or other documents appropriate to the inspection or test.

Instructions and procedures shall be revised and updated as required to reflect design or contract changes.

**5.6.3 Completed Item Inspection and Test.** Upon completion of manufacturing, fabrication, or assembly, the contractor shall inspect and test the parts, materials, components, assemblies, or systems before they are delivered and installed. Each completed item shall be inspected for completeness, markings, calibration, adjustments, freedom from damage, deterioration or contamination, safe operating condition or other attributes to provide objective evidence of conformance to contract requirements.

Modifications, repairs, or replacements made after completion of inspections and tests shall require reinspection and retest to the extent necessary to verify acceptability and assure compatibility with component, assembly, subsystem, and system interfaces.

**5.6.4 Inspection Status Indication.** The contractor shall establish a system whereby markings, routing cards, stamps, or other means are used to indicate the status of inspections and tests performed on individual items and to provide a means for ensuring that only acceptable supplies and services are used in the completed item.

**5.6.5 Certification.** When required by the contract, the contractor shall certify that all items furnished by the contractor conform to specified code, standard, specification, and contract requirements. Certification shall include certified reports of all required tests, analyses, inspections, and examinations, and shall be identified to the applicable item.

5.7 Document Control. In accordance with the requirements of 3.4.2, the contractor shall establish and implement procedures for release and change control of documents related to fabrication, processing, and assembly. The contractor shall monitor document-release and change-control activities to assure that the latest authorized documents are used in work areas.

5.8 Measuring and Test Equipment Calibration and Control. The contractor shall establish and implement procedures for the selection, use, calibration, adjustment, maintenance and control of all measuring and test equipment used to accomplish contract requirements, during all phases of work, in accordance with RDT F 3-2.

5.9 Statistical Quality Control and Analysis. In addition to the statistical methods required by the contract, statistical planning, analysis, and testing techniques may be used by the contractor when such procedures afford advantages in maintaining the required quality. Sampling plans may be used when tests are destructive or when quality records and inherent characteristics of the item or the nonessential nature of its application indicate that inspection or testing can be reduced without jeopardizing quality. If the contractor uses sampling plans, the purchaser will reserve the right to review such plans for approval before they are implemented by the contractor. Any sampling plan used must provide valid confidence that required quality will be achieved and that any defect that might be in a lot accepted under a sampling plan will not result in an adverse condition with respect to safety, operability, and reliability.

5.10 Control of Nonconforming Items. The contractor shall establish, implement, and maintain procedures for control of parts, materials, components, systems, and processes that do not conform to requirements of the applicable design drawings, codes, standards, specifications, or other contractual documents. The procedures shall provide for the prompt detection, recording, verification, technical review, and disposition of nonconforming items. The contractor shall identify and segregate all nonconforming items to prevent their unauthorized use or shipment. Hold areas shall be provided for storage of nonconforming items. The contractor shall maintain records of all nonconformances and the corrective actions taken, and the records shall provide data for analysis and reference. Acceptance, rejection, repair, rework or retest of nonconforming items shall be accomplished in accordance with documented procedures and instructions acceptable to the purchaser. The acceptance or rejection of nonconforming items offered for delivery will be the prerogative of the purchaser. The contractor shall obtain prior approval from the purchaser for the disposition of all nonconformances which result in either repair or waiver of the specified requirements.

Nonconforming items furnished by suppliers shall be controlled as prescribed in 4.11.

5.11 Corrective Action. Contractor quality assurance functions shall provide for detection of conditions adversely affecting quality and for corrective action and feedback in accordance with the requirements of 2.6.

## 5.12 Handling, Preservation, Packaging, Storage, and Shipping.

5.12.1 Handling. The contractor shall develop and implement handling practices, procedures, and instructions as required by applicable codes, standards, and specifications. Special carts, boxes, containers, hoists, manipulators, and transport vehicles shall be used during fabrication and assembly operations when damage due to handling might otherwise result.

Where special precautions are required during handling or lifting of items to prevent damage because of weight, size, susceptibility to shock damage, high nil-ductility transition temperature, or other considerations, detailed instructions or procedures shall be prepared and implemented. Items not specifically covered by special instructions or procedures shall be handled in accordance with sound handling practices. The responsible organization shall ensure that operators of handling and lifting equipment are competent, experienced and properly supervised.

5.12.2 Preservation, Packaging, and Storage. Contractor quality assurance programs shall provide procedures and instructions for the preservation, packaging, and storage of items. The contractor shall assure that items subject to deterioration or damage through exposure to air, moisture, or other environments during fabrication, processing, assembly, and interim storage periods are cleaned and have preservative applied at such points and by such methods as required to preclude damage. Items being packaged for shipment shall be preserved in accordance with contract requirements. Items subject to damage shall be packaged in such a manner, and with such materials, as required to prevent damage. Packaging requirements shall allow for conditions that could affect the item at the contractor's plant, in transit to the destination, and at the destination. Items to be stored shall be adequately protected against deterioration and damage. Periodic inspections shall be performed to detect deterioration or damage, and corrective action shall be taken as required.

5.12.3 Shipping. The contractor shall provide for inspection and control of all items shipped from his plant to assure that:

1. Items to be shipped have received and satisfactorily passed the required inspections and tests:
2. Items have been preserved and packaged in accordance with applicable specifications and procedures.
3. Items and packaging have been properly identified.
4. Devices to record conditions during shipping have been provided.

5.13 Quality Records. In accordance with the requirements of 2.4, inspection, test, and other data related to the quality status of parts, components, assemblies, and systems shall be collected, processed, analyzed, and distributed to pertinent areas within the contractor organization, to sources of supply when appropriate, and to the purchaser when required by the contract.

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Examples of records include acceptance test data, inspection and test reports, material certifications, welder qualifications, quality audit reports, summaries of nonconformances, and corrective actions.

5.14 Quality Audits. The contractor shall regularly audit quality assurance functions related to fabrication and assembly operations in accordance with the requirements of Section 8.

## 6. CONSTRUCTION AND INSTALLATION

6.1 Scope. This section covers the basic quality assurance requirements to be satisfied by the contractor during the construction phase of nuclear reactor and test facilities projects. These quality assurance program requirements are intended to assure that structures, components, and systems essential to safety, operability, and reliability are installed, constructed, and tested at the plant or facility site in conformance with contract requirements and applicable codes, standards, specifications, and drawings.

6.2 Organization. Contractor personnel performing quality assurance functions shall be independent of direct control by site construction organizations. The authority and responsibility of personnel performing quality functions shall be defined by the contractor and shall give these personnel the freedom to examine materials and workmanship; identify and evaluate the problems; and initiate, recommend, or provide their solutions.

6.3 Contract Review. The contractor shall review the contract, design drawings, specifications, and interface requirements prior to start of work. Participants in the review shall include representatives of the purchaser and the construction contractor, particularly the cognizant design, construction, and quality assurance personnel. The significant or important requirements of the contract, design drawings, and specifications shall be reviewed to assure that the construction organization is aware of requirements.

The need for special controls, processes, equipment, and personnel training shall be reviewed. In projects with multiple contractors or subtier contractors, the review participants shall include representatives of the organizations responsible for quality assurance functions and work activities.

6.4 Construction Planning. The contractor shall delineate the construction and installation work and the quality assurance requirements for this phase. The planned activities shall be outlined to define the systematic, sequential progression of work and shall be documented by appropriate means such as charts and diagrams. The items to be procured, fabricated in the shop or field, constructed, and installed shall be defined; and the qualified personnel, organizations, or contractors supplying the items or services shall be identified. The procedures and work instructions necessary to comply with contract requirements such as those for special processes, surveillance, inspection, test, repairs and rework, cleaning, identification, and operation of the equipment, systems or facilities shall be identified, and provisions shall be made for their preparation, approval, release, and control. Methods to be used for the collection, handling, and disposition of records, data, and reports shall be designated. This outline of planned activity shall be kept current and shall depict the progress and status of work activity and quality verification.

6.5 Control of Configuration. The contractor shall establish and implement a system for the control and verification of configuration, including

control of design changes, identification for traceability, and as-built configuration, in accordance with the requirements of 3.3.

The contractor shall prepare and implement procedures that assure control of documents required for construction and installation and for timely incorporation of authorized changes. These documents include the drawings and specifications, work instructions, quality control procedures, inspection instructions, and testing procedures. The system shall provide for the documents to be distributed to or removed from the proper points in time to assure that work and quality functions are accomplished in accordance with the latest applicable documents.

6.6 Construction Procurement. In accordance with the appropriate provisions of Section 4, the contractor shall establish and implement procedures for controlling and verifying that purchased material, equipment, and services, whether purchased directly by the contractor or through other contractors, conform to quality requirements. The procedures shall provide for reviewing purchase orders and contracts for appropriate quality assurance requirements; evaluating and selecting procurement sources; surveillance, inspection, and testing of items at the source when required to ascertain product quality; furnishing of objective evidence of quality by the source; examination of products on receipt; and prompt correction of nonconforming items.

6.7 Construction and Installation Control.

6.7.1 Material, Handling, and Cleaning Control. Procedures to assure control of material; proper handling, lifting and storage practices; and cleaning and contamination control shall be prepared and implemented by the contractor. Such procedures shall be in accordance with the requirements of 5.4.

6.7.2 Special Process Control. For special construction and examination processes, including placement of concrete, welding, heat treating, cleaning, and nondestructive examination, the contractor's quality assurance program shall assure that process control standards, specifications, and instructions are available and used at the work site and are enforced to assure that processing equipment and the required environments are properly maintained.

6.7.3 Interface Control. The contractor shall provide for the definition and control of construction and installation interfaces. This control shall provide assurance of a coordinated effort among the various project participants.

6.7.4 Measuring and Test Equipment Calibration and Control. The contractor shall establish and implement procedures for the selection, use, calibration, adjustment, maintenance and control of all measuring and test equipment used to accomplish contract requirements, during all phases of work, in accordance with RDT F 3-2.

6.7.5 Control of Nonconforming Items. The contractor shall implement a system that assures control of nonconforming material resulting from construction operations. This system shall include provisions for corrective action and feedback and shall comply with the requirements of 5.10.

6.7.6 Statistical Quality Control and Analysis. The contractor may utilize statistical sampling plans and analysis methods in accordance with the requirements of 5.9.

6.7.7 Indication of Status of Components and Systems. The contractor shall establish and implement methods to indicate, by tagging or other appropriate means, the status of components and systems to prevent their inadvertent operation where such operation would be detrimental to the quality of components or systems.

6.8 Inspection. The contractor shall establish and maintain an inspection system that assures control of the construction work effort. This system shall include the following quality control elements.

6.8.1 Source Inspection. The contractor shall establish and implement plans and procedures for source surveillance and inspection in accordance with 4.9.

6.8.2 Receiving Inspection. The contractor shall prepare and implement procedures for inspecting materials and equipment on arrival at the construction site in accordance with 4.10. These procedures shall define the extent to which items are uncrated and recrated and the points of critical interest that are to be inspected. The procedures shall require that an inspection report be prepared that indicates the quality status of the item being received.

6.8.3 Site Inspection. The contractor shall provide a system for performing inspection at the construction site, with adequate personnel and clearly defined instructions to assure that the quality of materials, work in process, and completed construction conforms to contract requirements. Inspection instructions shall include acceptance criteria.

6.8.4 Installation Inspection. The contractor shall plan and perform inspections and tests to be performed after installing assemblies, subsystems, and systems. Inspection instructions and test procedures shall be prepared in accordance with the requirements of 6.4. Inspections and tests shall be conducted to the extent necessary to verify that installation operations have been accomplished in accordance with design drawings, specifications, and codes stipulated in the contract. The contractor shall provide objective evidence to verify that the as-built configuration of installed assemblies, subsystems, systems, and facilities conforms to applicable codes, specifications, drawings, and other contractual requirements, including authorized changes.

## 6.9 Testing, Operation, and Maintenance.

6.9.1 Start-up of Equipment and Systems. The contractor shall establish check points and procedures to assure that, as a minimum, the following items are evaluated prior to start-up operations:

1. Completeness of construction activities leading up to the point of start-up as outlined by construction work planning.
2. Cleanness of items.
3. Availability of start-up procedures.

6.9.2 Preoperation Testing. Preoperation testing plans and procedures shall be prepared and reviewed by the contractor to assure compliance with safety standards, prevention of damage to the item being tested, and conformance to testing requirements of the contract.

6.9.3 Operation and Maintenance. Procedures shall be established and implemented by the contractor for operating and maintaining equipment and systems that are used for construction purposes and which will eventually become an integral part of the finished project, as well as for assuring the integrity and quality of such items.

6.10 Quality Assurance Records. The contractor shall systematically compile and maintain records and data generated during the construction phase. Typical records include material certifications and identification data for traceability; special process and personnel certification and test reports; inspection and test reports; design drawings, specifications, procedures; and reports of nonconformance. These records shall correctly identify the as-built project and furnish objective evidence of quality. The records shall be indexed, filed, and maintained to allow access for retrieval and review of information; and all records shall be protected against deterioration and damage. The record file shall be maintained by the contractor and transmitted to the purchaser or his designee.

6.11 Quality Audits. The contractor shall regularly audit the quality assurance activities related to construction and installation in accordance with the requirements of Section 8.

## 7. OPERATION, MAINTENANCE, AND MODIFICATION

7.1 Scope. This section covers the quality assurance program requirements to be satisfied by the contractor during the operation and maintenance phase of a project. The requirements include: planning for operating and maintaining plant, equipment, and facilities; control of operating modes or conditions and maintenance of systems and components; training and certification of personnel; control of modifications; preparation of records; and the auditing of methods and activities. These requirements are intended to assure that controls are established and maintained and that plants and equipment are operated, maintained, and modified in accordance with the contract and its applicable codes, standards, drawings, specifications, operating permits, and predetermined safety restrictions.

7.2 Operation, Maintenance, and Modification Planning. The contractor's planning of his operation, maintenance, and modification activities shall include preparation of documents that describe in outline form, such as by appropriate charts, diagrams, or schedules, the start-up checkouts, tests, and inspections required to place the plant into operation and the operational modes and their essential testing and in-service inspections required to sustain operation in accordance with project objectives. Maintenance and testing program planning shall be integrated to provide procedures that identify systems, components, facilities, parts, materials, and processes; administrative controls; and check points for maintenance activity review, evaluation, corrective action, and feedback. Needs shall be identified for shop and field work areas. The personnel, equipment, and services required for receiving, handling, cleaning, inspecting, repairing, storing, and dispensing activities performed in given work areas shall be identified and described. Planning shall also provide for the preparation of incident reports, quality status reports, collection and evaluation of performance data, and feedback of information to designers. Planning and outlining of the work effort shall reflect the progress and current status of activities.

### 7.3 Organization.

7.3.1 Responsibility and Authority. Organizational responsibilities and authorities for operation, maintenance, and modification shall be established and delineated in writing. Personnel responsible for management and control of plant or facility operation, maintenance and modification shall be identified. The mode of operations shall be defined, and organizational interfaces and lines of communication shall be indicated in procedures.

7.3.2 Training and Certification. The organization responsible for plant operation and maintenance shall assure that operating and maintenance personnel are trained and qualified in accordance with established operating procedures and specifications. The training program shall include instructions, testing, and on-job training as required to assure continued personnel proficiency and shall provide for qualified alternate or replacement personnel. Training shall provide for periodic practice of these

procedures to familiarize personnel with their use and to assess their effectiveness. The contractor shall maintain records of personnel qualifications and certifications.

7.4 Operation Control. The contractor shall establish and implement a systematic method for placing the plant, facility, or equipment into operation and meeting operating directives and requirements.

7.4.1 Operating Objectives. The objectives of operation of the project shall be clearly stated. These objectives shall identify the end results to be achieved and shall indicate the boundaries and interfaces with other projects or organizations. The statement of objectives shall include delineation of operating conditions for functional systems and their equipment and for the project.

7.4.2 Procedures. The contractor shall establish and implement certified operating procedures, run sheets, work instructions, and checklists. Pre-start-up checkout and evaluation procedures shall be prepared for checking each system and its interaction with other systems for completeness and operational worthiness. Operating procedures and work instructions shall be prepared for predetermined conditions of normal and abnormal or upset operation. Methods and procedures to be implemented during emergency or faulted conditions shall also be prepared, and a plan formulated for periodic practice of these procedures to familiarize personnel with their use and to assess their effectiveness.

7.4.3 As-Built Verification. The contractor shall verify the completeness of the construction process and assure that equipment has been procured, constructed, and installed as described by the drawings and specifications. The contractor shall verify that modifications or revisions subsequent to the design phase of the project are reflected in the as-built drawings and specifications. The contractor shall verify that objectives and performance defined during the design phase have not been degraded during subsequent phases of the project.

7.4.4 Technical Specifications. Specifications shall be prepared that clearly define the operating capabilities of the facility, its systems, and equipment. These specifications shall identify design features and establish operating limits and requirements for the systems and equipment to be operated. The safeguards and procedures to be established and implemented shall be delineated.

7.4.5 Document Control. The contractor shall establish and implement methods that assure control of documents required for operation, including procedures, specifications, and analyses, and to provide for their approval prior to release for operational use. These controls shall provide for the timely revision and updating of such document.

7.4.6 Operation Reviews. The contractor shall establish and implement methods for reviewing the operating objectives, the analysis of operational readiness and safety, the results of inspections and tests, and the methods and procedures to be employed in operating the project. The reviews shall be conducted by contractor personnel responsible for design, operating, maintenance, testing, quality assurance, and project management. These reviews shall assure that operations to be performed have been planned in accordance with the established objectives and facility capabilities and are conducted in accordance with plans and procedures. The procedures shall be updated to reflect current operating practices.

7.4.7 Indication of Status of Components and Systems. The contractor shall establish and implement methods to indicate, by tagging or other appropriate means, the status of components and systems to prevent their inadvertent operation where such operation would be detrimental to the quality of components or systems.

7.5 Maintenance Control. The contractor shall establish and implement methods for assuring that the contract-specified requirements of the maintenance program are fulfilled. The contractor shall conduct his maintenance program in accordance with planned methods and under management controls that assure that equipment, systems, and facilities are maintained in accordance with project objectives. The types of maintenance activity, including preventive failure, replacement, remote, and overhaul maintenance, required to assure that components, systems, or facilities are maintained to project requirements shall be defined. These maintenance activities shall include, but not be limited to, lubrication, preplanned replacement of components, and replacement of items or equipment indicating deterioration from use.

7.5.1 Maintenance Policy. Contractor policies related to the maintenance program shall be defined and documented. These policies shall identify the objectives of the program, assign responsibilities for their implementation, and state resources to be applied and method of use.

7.5.2 Work Instructions. Maintenance work shall be identified, and work instructions shall be prepared that prescribe the activities to be performed. The work instructions shall include drawings, specifications, procedures, manuals, and data either generated by the contractor or assembled from subcontractor and supplier sources. The instructions shall emphasize special precautions indicated by contractor experience or by supplier-generated data and regulatory requirements.

7.5.3 Special Processes. The contractor shall provide for control of processes, tools, and devices required for plant or facility maintenance.

7.5.4 Parts and Materials. The contractor shall conduct procurement activities in accordance with the requirements of Section 4. The contractor shall provide for the control of spare parts and components used for replacement. The controls shall assure that, during all phases of operation, maintenance, and modification, quality conforms to that established by the design. Controls of handling and storage shall include provisions for maintenance of markings and identification records, protection of items

subject to deterioration through environmental exposure or to damage during handling operations, and use of materials or equipment subject to age deterioration. Inventory and logistic controls shall consider rate of use, importance of item or service, and project maintenance objectives.

**7.5.5 Documents.** Control shall be maintained during preparation, review, approval, and use of manuals, procedures, instructions, drawings, and specifications. Documents shall be maintained to reflect current status, including authorized changes. Controls shall provide for removing all obsolete documents from points of issue and use.

**7.5.6 Maintenance Review.** The contractor shall review the documents that define maintenance activities to assess their completeness and applicability to the work to be performed. Management shall review maintenance performance to evaluate organizational effectiveness, job performance, and compliance with procedures and work instructions. Contractor management shall assure that corrective action is taken when problems are encountered and that data, trends, and performance-history information are provided to the appropriate project organization.

**7.6 Modifications.** The contractor shall establish and implement a systematic method of controlling modifications of plant, equipment, services, or facilities during the operation and maintenance phase of the project. The contractor shall employ those control and assurance elements of the quality assurance program that apply within each phase of project modification activity, as described by this standard and required by the contract. The contractor shall develop and implement procedures for testing modified components, subsystem and systems. The testing shall establish component, subsystem, or system integrity and shall provide for preoperational evaluation of performance prior to system operation.

**7.7 Surveillance.** The contractor shall maintain continuing surveillance, by means of overview, witnessing, or monitoring of operations, maintenance, refueling, experiment handling, modification or repair, and other related activities, to assure compliance with established regulations, requirements, standard practices and procedures, and work instructions. Surveillance shall include the examination of maintenance data, inspection and test results, operating logs, or other pertinent records to verify technical accuracy and completeness. Surveillance methods, such as the use of instrumentation to monitor equipment and the application of statistical analysis to determine component degradation or failure trends also shall be employed, as appropriate.

**7.8 Inspection and Testing.** The contractor shall perform inspection and tests required to assure that items, equipment, and systems are being maintained and are performing at specified capability levels necessary to achieve project objectives. Inspection and test activities shall include those necessary to meet in-service inspection requirements of contract-specified codes and standards; evaluation of the performance capability of essential emergency and safety systems and equipment; and verification of the calibration and integrity of instruments and instrument systems. Inspections and test shall be planned and performed in accordance with approved procedures. The

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contractor shall establish and implement controls to assure that inspections and tests are performed as scheduled and the results are documented. Contractor controls shall assure that detected deficiencies are corrected and the deficient items are reinspected or retested.

7.9 Measuring and Test Equipment Calibration and Control. The contractor shall establish and implement procedures for the selection, use, calibration, adjustment, maintenance and control of all measuring and test equipment used to accomplish control requirements, during all phases of work, in accordance with RDT F 3-2.

7.10 Incident Reporting and Corrective Action. The contractor shall establish a closed-loop method of reporting, analyzing, and correcting incidents or failures that occur during operation or maintenance activities in accordance with RRD incident reporting instructions. Controls shall be maintained to assure that each incident is identified, its cause is determined, and effective corrective action is accomplished. Incident reports shall be prepared and include a description of the incident, operating conditions at the time, and subsequent corrective action. Incident reports shall contain sufficient information to permit an evaluation to be made of the possible safety and reliability implications. These reports shall be provided to top management and the purchaser.

7.11 Quality Assurance Records. The contractor shall maintain records throughout the operation, maintenance and modification phase of the project. Typical records include as-built drawings, operating logs, personnel certifications, calibration history, operational reviews, maintenance data, inspection and test results, incident reports with corrective action status, and quality audits.

7.12 Quality Audits. The contractor shall regularly audit quality assurance activities related to operation, maintenance, and modification in accordance with Section 8.

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## 8. QUALITY ASSURANCE AUDITS

8.1 Scope. This section covers requirements for auditing and evaluating quality assurance programs established by contractors in accordance with the applicable requirements of this standard. These basic elements include: planning and performance of audits and evaluations; evaluation of contractor procedures, activities, and products; reporting of audit and evaluation results to management, including recommendations for corrective action; and follow-up to assure achievement and effectiveness of corrective actions.

The requirements of this section shall apply to the contractor in performing self-audits and may be applied by the purchaser or its designated agency in conducting independent audits of the contractor's quality assurance program.

8.2 Planning. The contractor shall provide for preparation of a written plan for audit and evaluation, scheduling and notification of proposed audits and evaluations, designation of the responsible organization, and assignment of specific areas to be audited or evaluated. The plan shall delineate the criteria, methods, procedures, and formats for each audit and evaluation. Checklists shall be prepared for each quality assurance activity or the product to be audited and shall include the quality characteristics to be evaluated.

8.3 Evaluation of Quality Assurance Methods. The contractor shall evaluate quality assurance methods, procedures, and instructions for the control and verification of activities affecting quality. Quality assurance methods shall be evaluated by experienced personnel not having direct responsibilities for the methods being audited.

8.4 Activity Audits. The contractor shall conduct audits of activities affecting quality on a regular basis. Such activities include designing, purchasing, fabricating, processing, assembling, handling, cleaning, storing, shipping, inspecting, testing, installing, operating, maintaining, repairing, and modifying. Activities shall be audited by the contractor to determine the status of compliance with requirements of the quality assurance program, established quality assurance procedures and instructions, and applicable standards and codes. Such audits should be conducted by personnel familiar with procedures, standards, and codes applicable to the areas being reviewed, but who have no specific line responsibility in such areas.

8.5 Product Audits. The contractor shall periodically audit inspection areas and re-inspect randomly selected material, product, or processing that has already been inspected, accepted, and appropriately identified as accepted by inspection personnel. The number of samples re-inspected must be sufficient to provide objective evidence of inspection effectiveness.

8.6 Nondestructive Examination Audits. The contractor shall periodically audit nondestructive examination and personnel certification procedures to

verify that applicable specifications, standards, and codes set forth in the contract have been implemented and their requirements are being met.

The contractor shall periodically audit the certification process to assure that personnel certified to perform special processes have satisfactorily passed tests indicating their competence in accordance with the requirements of applicable specifications and standards. Results of such audits and of examinations of work performed shall be used to determine if personnel need additional training and re-certification.

Nondestructive examination results, such as test data, readouts, and film, shall be periodically audited by the contractor to verify accuracy of equipment and adequacy of interpretation of examination results.

8.7 Records Audits. Results of inspections, tests, and nondestructive examinations shall be audited by the contractor to assure adequacy and availability.

8.8 Reporting and Corrective Action. Results of each audit and evaluation of quality assurance methods and activities conducted by the contractor shall be reported to and reviewed by management. Summaries of audit findings with corrective actions shall be prepared and submitted to top management and the purchaser.

Contractor quality assurance management personnel shall take necessary action to assure that any deficiency in quality assurance methods and functions is corrected. Deficient areas shall be reaudited as frequently as necessary until the required corrections have been made.

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QUALITY ASSURANCE PROGRAM REQUIREMENTS

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## AMENDMENT 1

This amendment forms a part of RDT F 2-2  
dated August 1973

1. Page 11, 3.4.1: Change to read:

3.4.1 Engineering Document Review and Approval. The contractor shall establish and implement procedures that provide for the review and approval of specifications, drawings, analyses and other significant engineering documents, including changes thereto, before issuance. Reviews and evaluations shall be conducted systematically to verify completeness, correctness, and adequacy with respect to project or contract requirements, engineering standards, design practices, and intended application. Approval authority shall be evident through sign off by personnel designated as responsible for establishing the technical requirements. Other personnel shall participate in review and approval activities as required by the contractor's procedures. Changes to approved engineering documents shall be reviewed and approved by the same organizations that performed the original review and approval unless the contractor, with purchaser approval, designates another responsible organization.

2. Page 11, 3.4.2: Change to read:

3.4.2 Document Control. The contractor shall establish and implement procedures that assure the control of engineering documents authorized for release and use. Such controls shall assure that engineering documents and changes thereto are properly prepared, coordinated, and released by authorized personnel; distributed to prescribed organizations and locations; and that obsolete, incorrect, and inappropriate documents are removed from points of issue or use.

3. Page 15, 4.4: Change to read:

4.4 Procurement Document Review. The contractor shall establish and implement procedures whereby designated personnel shall review procurement documents and changes thereto to assure that requirements are complete and appropriate.

4. Page 19, 5.3: Change second paragraph to read:

The contractor's inspection and test plan shall establish those inspections and test points from raw materials through fabrication, processing, and assembly at which conformance of parts, components, and systems to design requirements will be verified. For pressure-retaining components, the inspection and test plan shall provide for direct wall thickness measurements of the pressure boundary. The inspection and test plan shall specify for purchaser approval the type, frequency, and location of wall thickness measurements as well as the measurement techniques to be used.

5. Page 25, 6.5: Add a third paragraph:

Provisions shall be made for the evaluation and approval of field or supplier-generated documents by designated personnel.

6. Page 30, 7.4.5: Change to read:

7.4.5 Document Control. The contractor shall establish and implement procedures that assure control of preparation, review, approval, release, change, distribution, and use of documents required for operation, maintenance, and modification activities. Documents, including procedures, specifications, operational analyses and objectives, and inspection and test results, shall be reviewed and approved by designated personnel prior to issuance for use.

7. Page 32, 7.5.5: Delete.

8. Page 35, 8.4: Add a second paragraph:

The contractor shall audit engineering, procurement, and other significant documents, including changes thereto, to verify accuracy, completeness, and currentness and to cause the correction of deficiencies by responsible management.

# RDT STANDARD

UNITED STATES ATOMIC ENERGY COMMISSION  
DIVISION OF REACTOR RESEARCH AND DEVELOPMENT

RDT F 2-2, Amendment 2  
DATE March 1974  
PAGE 1 OF 1

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## QUALITY ASSURANCE PROGRAM REQUIREMENTS

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### AMENDMENT 2

This amendment forms a part of RDT F 2-2  
dated August 1973

1. Page 2, 1.2.4: Change to read:

1.2.4 Unusual Occurrence. An unusual or unplanned event having programmatic significance such that it adversely affects or potentially affects the performance, reliability, security, or safety of a reactor or test facility; or causes injury or potential hazard to personnel which may require special evaluation, correction, or preventive action to be taken.

2. Page 4, 1.7.1: Add:

RDT F 1-3T Preparation of Unusual Occurrence Reports

3. Page 7, 2.6: Change to read:

2.6 Corrective Action. The contractor shall establish and implement procedures to assure that conditions adverse to quality, including unusual occurrences, unsatisfactory practices, deficiencies, failures, malfunctions, deviations, nonconformances, and defective material, are documented and corrected by responsible management and technical personnel. The cause of the adverse condition shall be determined and action taken to minimize or prevent recurrence. Quality trends shall be analyzed for improvement in work practices. Corrective action shall be extended to the work of subcontractors and suppliers, as appropriate.

4. Page 7, 2.8: Add:

2.8 Unusual Occurrence Reporting. The contractor shall establish and implement procedures for the detection, reporting, analysis, and correction of unusual occurrences during all phases of work in accordance with the requirements of RDT F 1-3.

5. Page 33, 7.10: Delete.

Amend. 55  
June 1980

# RDT STANDARD

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION  
DIVISION OF REACTOR RESEARCH AND DEVELOPMENT

RDT F 2-2 Amendment 3 (7-11-75)

DATE August 1973 E3

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## QUALITY ASSURANCE PROGRAM REQUIREMENTS

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### 1. INTRODUCTION

1.1 Scope. This standard sets forth general requirements for planning, managing, conducting, and evaluating quality assurance programs for reactor development and test facility projects and associated processes, structures, components, and systems. These quality assurance requirements are based on proven practices and provide the means of control and verification whereby those responsible for project management can assure that the quality required for safe, reliable, and economical operation will be achieved. The objective of the programs covered by this standard is to assure that structures, components, systems, and facilities are designed, developed, manufactured, constructed, operated, and maintained in compliance with established engineering criteria. To achieve this objective, controls are to be established and implemented at predetermined points, and necessary action taken to prevent, detect, and correct any deficiencies.

The requirements contained in this standard are intended to cover the life of a project from concept through operation. The requirements have been arranged into the following areas, thereby enabling flexibility for selective application of those requirements that are appropriate to the project scope.

1.1.1 Management and Planning. Management and planning efforts include formulation, direction, and documentation of the entire quality assurance program; designation of organizational responsibilities for quality assurance; preparation of plans, procedures, and instructions; training and indoctrination of personnel; conduct of periodic, documented program audits, and reviews; maintenance of records; and preparation of quality status reports.

1.1.2 Design and Development. Design and development efforts in the quality assurance program include establishing, controlling, and verifying design. The development effort encompasses planning, testing, documentation, surveillance, and closed-loop review, reporting, and feedback of development information.

1.1.3 Procurement. Procurement efforts include the specification of quality assurance requirements in procurement documents, selection and surveillance of suppliers, and receipt and inspection of purchased items.

1.1.4 Manufacturing, Fabrication, and Assembly. Manufacturing, fabrication, and assembly efforts include conformance to drawings, standards, specifications, procedures, and instructions for the control of materials, components, and processes; performance of in-process and

project use shall be subject to authorization by the purchaser prior to initiation of efforts. In developing such codes, standards, and practices, the contractor shall coordinate with other appropriate organizations and shall furnish copies of proposed codes, standards, and practices as directed by the purchaser.

Codes, standards, and practices which the contractor proposes to employ shall be thoroughly identified and referenced in design criteria, analyses, descriptions, plans, specifications, drawings, and other engineering documents.

3.3.3 Engineering Studies. The contractor shall conduct and document engineering studies sufficient to establish that the design meets the design criteria, that it is based on proven practices, and that it is adequate for the intended service. Engineering studies should focus on those aspects involved in the intended service, such as operation, maintenance, in-service inspection and safety, and be based on analysis of reactor physics, structural stress, thermal, hydraulic, environmental, and other effects. Engineering studies should include analysis of "trade offs" and alternatives, identify weaknesses, and provide for incorporation of appropriate preventative design features, operating and maintenance practices, and safety precautions.

3.3.4 Parts, Materials, and Processes. The contractor shall establish methods for the selection, standardization, identification, and application review of essential parts, materials, and processes to be used in the project.

The contractor shall select parts, materials, and processes on the basis of proven experience or qualification for the intended service. Where applicable parts, materials, and processes have been developed and qualified by ERDA or other appropriate programs or are reflected in applicable recognized standards, they shall be used; where necessary parts, materials, and processes have not been so qualified, the contractor shall recommend to the purchaser appropriate action. If development or qualification testing efforts are necessary, the conduct of such efforts will require coordination by the contractor with other on-going ERDA programs. The contractor shall make every effort to reduce the variety of parts, materials, and processes through standardization.

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3.3.5 Design Descriptions. The contractor shall prepare design description documents for essential components, systems, and facilities as required by the purchaser and in accordance with the latest ERDA instructions. Design descriptions are intended to provide a means to define and integrate the various technical, operational, and safety considerations involved; maximize application of past experience; relate research, development, test, and backup design efforts; identify interfaces; and serve as a common technical basis for other project activities. Design descriptions provide a technical reference for detailed component specifications, operational test procedures, and safety analysis reports.

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3.3.6 Specifications, Drawings, and Instructions. The contractor shall prepare specifications, drawings, instructions, and other engineering documents necessary to define specific design requirements. These documents shall include as applicable, requirements for detail design, materials, fabrication, construction, installation, testing, inspection, maintenance, cleaning, packaging, shipping, storage, operation, and quality assurance.

3.3.7 Identification. The contractor shall establish procedures for identifying materials, parts, components, and processes on drawings, specifications, and other engineering documents. The identification system shall allow for traceability, through the use of lot numbers, heat numbers, part numbers, serial numbers, or other appropriate means, between engineering documents and products. Those materials, parts, and components requiring specific traceability to original certification data shall be so designated.

3.3.8 Acceptance Criteria. The contractor shall identify within appropriate design documents those criteria to be used for acceptance. The documents shall specify the check points during the work process at which compliance with the criteria will be accomplished and verified.

3.3.9 Interface Control. The contractor shall establish methods for definition and control of design interfaces among other project participants and design organizations. To the extent practicable, a common identification system shall be used by all design organizations on the items and documents for a given design interface. The contractor shall establish procedures for the exchange of required design data and for prompt analysis and resolution of design interface problems.

### 3.4 Document Review and Control.

3.4.1 Engineering Document Review and Approval. The contractor shall establish and implement procedures that provide for the review and approval of specifications, drawings, analyses and other significant engineering documents, including changes thereto, before issuance. Reviews and evaluations shall be conducted systematically to verify completeness, correctness, and adequacy with respect to project or contract requirements, engineering standards, design practices, and intended application. Approval authority shall be evident through sign off by personnel designated as responsible for establishing the technical requirements. Other personnel shall participate in review and approval activities as required by the contractor's procedures. Changes to approved engineering documents shall be reviewed and approved by the same organizations that performed the original review and approval unless the contractor, with purchaser approval, designates another responsible organization.

3.4.2 Document Control. The contractor shall establish and implement procedures that assure the control of engineering documents authorized for release and use. Such controls shall assure that

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engineering documents and changes thereto are properly prepared, coordinated, and released by authorized personnel and distributed to prescribed organizations and locations. | C1  
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3.4.3 Engineering Drawing Lists. The contractor shall prepare and maintain complete and current lists of engineering drawings, including subcontractor and vendor drawings, which are applicable to the work. For

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Amend. 55  
June 1980

## 8. QUALITY ASSURANCE AUDITS

8.1 Scope. This section covers requirements for auditing and evaluating quality assurance programs established by contractors in accordance with the applicable requirements of this standard. These basic elements include: planning and performance of audits and evaluations; evaluation of contractor procedures, activities, and products; reporting of audit and evaluation results to management, including recommendations for corrective action; and follow-up to assure achievement and effectiveness of corrective actions.

The requirements of this section shall apply to the contractor in performing self-audits and may be applied by the purchaser or its designated agency in conducting independent audits of the contractor's quality assurance program.

8.2 Planning. The contractor shall provide for preparation of a written plan for audit and evaluation, scheduling and notification of proposed audits and evaluations, designation of the responsible organization, and assignment of specific areas to be audited or evaluated. The plan shall delineate the criteria, methods, procedures, and formats for each audit and evaluation. Checklists shall be prepared for each quality assurance activity or the product to be audited and shall include the quality characteristics to be evaluated.

8.3 Evaluation of Quality Assurance Methods. The contractor shall evaluate quality assurance methods, procedures, and instructions for the control and verification of activities affecting quality. Quality assurance methods shall be evaluated by experienced personnel not having direct responsibilities for the methods being audited.

8.4 Activity Audits. The contractor shall conduct audits of activities affecting quality on a regular basis. Such activities include designing, purchasing, fabricating, processing, assembling, handling, cleaning, storing, shipping, inspecting, testing, installing, operating, maintaining, repairing, and modifying. Activities shall be audited by the contractor to determine the status to compliance with requirements of the quality assurance program, established quality assurance procedures and instructions, and applicable standards and codes. Such audits should be conducted by personnel familiar with procedures, standards, and codes applicable to the areas being reviewed, but who have no specific line responsibility in such areas.

The contractor shall audit the preparation of engineering, procurement, and other significant documentation, including changes thereto, to verify adequacy, completeness, and currentness and to cause the correction of deficiencies by responsible management.

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8.5 Product Audits. The contractor shall periodically audit inspection areas and re-inspect randomly selected material, product, or processing that has already been inspected, accepted, and appropriately

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June 1980

identified as accepted by inspection personnel. The number of samples re-inspected must be sufficient to provide objective evidence of inspection effectiveness.

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Nondestructive examination results, such as test data, readouts, and film, shall be periodically audited by the contractor to verify accuracy of equipment and adequacy of interpretation of examination results.

8.7 Records Audits. Results of inspections, tests, and nondestructive examinations shall be audited by the contractor to assure adequacy and availability.

8.8 Reporting and Corrective Action. Results of each audit and evaluation of quality assurance methods and activities conducted by the contractor shall be reported to and reviewed by management. Summaries of audit findings with corrective actions shall be prepared and submitted to top management and the purchaser.

Contractor quality assurance management personnel shall take necessary action to assure that any deficiency in quality assurance methods and functions is corrected. Deficient areas shall be reaudited as frequently as necessary until the required corrections have been made.

# RDT STANDARD

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION  
DIVISION OF REACTOR DEVELOPMENT AND DEMONSTRATION

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DATE August 1973

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## QUALITY ASSURANCE PROGRAM REQUIREMENTS

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### 1. INTRODUCTION

1.1 Scope. This standard sets forth general requirements for planning, managing, conducting, and evaluating quality assurance programs for reactor development and test facility projects and associated processes, structures, components, and systems. These quality assurance requirements are based on proven practices and provide the means of control and verification whereby those responsible for project management can assure that the quality required for safe, reliable, and economical operation will be achieved. The objective of the programs covered by this standard is to assure that structures, components, systems, and facilities are designed, developed, manufactured, constructed, operated, and maintained in compliance with established engineering criteria. To achieve this objective, controls are to be established and implemented at predetermined points, and necessary action taken to prevent, detect, and correct any deficiencies.

The requirements contained in this standard are intended to cover the life of a project from concept through operation. The requirements have been arranged into the following areas, thereby enabling flexibility for selective application of those requirements that are appropriate to the project scope.

1.1.1 Management and Planning. Management and planning efforts include formulation, direction, and documentation of the entire quality assurance program; designation of organizational responsibilities for quality assurance; preparation of plans, procedures, and instructions; training and indoctrination of personnel; conduct of periodic, documented program audits, and reviews; maintenance of records; and preparation of quality status reports.

1.1.2 Design and Development. Design and development efforts in the quality assurance program include establishing, controlling, and verifying design. The development effort encompasses planning, testing, documentation, surveillance, and closed-loop review, reporting, and feedback of development information.

1.1.3 Procurement. Procurement efforts include the specification of quality assurance requirements in procurement documents, selection and surveillance of suppliers, and receipt and inspection of purchased items.

1.1.4 Manufacturing, Fabrication, and Assembly. Manufacturing, fabrication, and assembly efforts include conformance to drawings, standards, specifications, procedures, and instructions for the control of materials, components, and processes; performance of in-process and

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each drawing, the list shall include specific identification of the applicable revision; level of approval required, i.e., which organizations must take approval action; and current status, e.g., in preparation, issued for approval, released for use.

3.5 Design Reviews. The contractor shall conduct planned and documented design reviews in accordance with procedures to verify that the design meets requirements. Design reviews are intended to provide assurance that studies, calculations, and analyses involving nuclear effects, electrical, mechanical, thermal, hydraulic, safety, reliability, maintainability, and other pertinent considerations are complete and correct; that research and development programs and tests associated with the design provide optimal benefits to the design; that materials and design interface are compatible; that maximum use is made of qualified, standardized, or approved parts, materials, components, and processes; that accessibility for in-service inspection, maintenance, or repair is adequate; and that acceptance criteria for inspections and tests are delineated. Design reviews shall be held to discuss and resolve technical problems concerning design adequacy among the design contractor, the purchaser, and other project participants.

The contractor shall identify those components and systems for which independent formal design reviews are to be scheduled and conducted by the responsible design organization. Design reviews shall be independent in the sense that the reviewers have no direct responsibility for the design, but are technically competent and may be from the same organization that prepared the design. Participation in design reviews should be interdisciplinary, involving key technical personnel in the areas of design, manufacturing, testing, quality assurance, operation, and maintenance, as well as project management and consultants, as appropriate. Joint design reviews with other participating contractors shall be held by the responsible design organization when design interfaces are under consideration.

Hold points shall be established in the project beyond which further design work or initiation of fabrication shall not proceed pending an independent design review. Each design review shall be documented by the contractor in a report that shall include a synopsis of significant problems, decisions, and assigned action items. Design review reports shall be reviewed, approved, and issued by the responsible design organization and submitted to the purchaser as required by the contract.

3.6 Design Verification Testing. Measures shall be established and documented to assure that design verification testing activities are identified, performed, and controlled. Design verification testing includes the testing of materials, components, features, subassemblies, systems or processes to verify design or process adequacy, or to obtain quantitative data for use in the establishment of designs or process parameters.

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3.6.1 Test Requirements. Design verification test requirements shall be defined and documented in test criteria, requests for approval-in-principle, test specifications, test requests, product specifications, design descriptions, or other engineering documents. Test requirements shall include the following provisions as appropriate:

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1. Test objectives.
2. Technical requirements and restraints.
3. Identification of items or processes to be tested.
4. Test facilities to be used and any modifications.
5. Evaluation of measuring and test equipment.
6. Tests to be performed.
7. Data acquisition and reduction requirements.
8. Pre- and post-test examinations.
9. Readiness reviews.
10. Acceptance limits.
11. Archive samples.
12. Disposition of test items.
13. Documentation and reporting requirements.

Test requirements and acceptance criteria and changes thereto shall be specified or approved by the responsible design organization, unless otherwise designated. Approval requirements and authorizations for planning, procedures, and changes to these shall be defined.

3.6.2 Planning. Design verification testing activities shall be planned in accordance with the test requirements and coordinated with other design activities. Planning shall include the definition of organizational responsibilities, the procedures to be used, and the sequence of activities and milestones. Statistical test design may be used when economically warranted. Planning shall also include provision for personnel and equipment protection and other actions to be taken in the event of failure or malfunction.

3.6.3 Procedures. Design verification testing activities shall be performed in accordance with written procedures and changes thereto which incorporate test requirements, acceptance criteria, and test methods. Test procedures shall identify test prerequisites including calibrated instrumentation, trained personnel, readiness of test facilities, equipment, supplies and test items, suitable environments, and verification of data acquisition capability, as appropriate.

3.6.4 Test Items. Measures shall be implemented for the identification, characterization, control, and ultimate disposition of test items. Such measures shall verify that test items have been properly fabricated, calibrated, analyzed, cleaned, handled, stored, shipped, inspected, and protected against loss or damage. Essential features of the test item shall be characterized and documented, prior to and upon completion of testing. Test items which will be used in a facility as operating units shall meet all requirements specified for such units before incorporation into the facility.

3.6.5 Test Equipment and Fluids. Measures shall be implemented to verify that the range, accuracy, and precision of test equipment are commensurate with the test requirements. Measures shall also be implemented to verify that test fluids are characterized and controlled in accordance with the test requirements.

3.6.6 Data Acquisition Equipment and Method. Data acquisition instrumentation, analytical standards and methods, and data collection and reduction methods shall be evaluated prior to use to verify accuracy, stability, and repeatability. The evaluation results shall be documented.

a. Commercially available instrumentation or standard methods for which sufficient information exists need not be evaluated if used in accordance with established practice.

b. When possible, specially designed instrumentation and methods shall be checked out under conditions which will be encountered in testing to verify suitability for use.

Data acquisition equipment shall be calibrated, adjusted, or maintained prior to use or at prescribed intervals according to equipment stability, and the results documented.

3.6.7 Readiness Reviews. Measures shall be implemented for the performance of documented test readiness reviews to verify that all prerequisites have been satisfied.

3.6.8 Failure Analysis. Measures shall be implemented for the documented analysis of significant failures during testing. Significant failures include any unplanned, premature or incipient failure of test items and test equipment. Such measures shall provide for the determination of cause and mode of failure, an evaluation of effect on safety or operability, the corrective action to preclude recurrence, and reporting to appropriate organizations.

3.6.9 Test Results. Measures shall be implemented for the recording, analysis, and reporting of design verification test results.

3.6.10 Test Review. Measures shall be implemented for the documented review of design verification test results by the responsible design organization to determine whether the test requirements have been satisfied. Such reviews may be performed separately or as a part of the design review process of 3.5.

3.6.11 Test Records. Measures shall be implemented for the retention of test data and results, failure analyses, test reviews, reports, and other pertinent documents.

3.7 Item Qualification. Items, whose adequacy for service cannot be fully verified through studies or calculations, shall be qualified through design verification testing, similarity to a previously qualified item, or use experience. Design verification testing shall be performed on prototypic items under conditions which are equal to or more severe than those specified for in-service use. Similarity to the previously qualified item shall be demonstrated and documented in all pertinent aspects, such as design, manufacturing methods, and intended service application. Successful in-service experience shall cover the full, maximum range of design conditions.

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3.8 Quality Records. The contractor shall compile and maintain records and data generated during design and development. Typical records include codes, standards, practices, design description, specifications and drawings, design data and studies, design review reports, development plans, procedures and test reports, and failure reports. Copies of records shall be distributed within the contractor's organization to other participating organizations as appropriate and provided to the purchaser as required.

3.9 Quality Audits. The contractor shall regularly audit quality assurance activities related to the design and development phase in accordance with the requirements of Section 8.

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areas. Nonconforming materials and products shall be identified, segregated, and disposed of in accordance with 4.11.

4.10 Control of Nonconforming Items. The contractor shall develop and implement procedures to control purchased items that do not conform to contract requirements. The procedures shall provide for prompt identification, documentation, segregation, technical review, and disposition of nonconforming purchased items. Significant nonconformances that cannot be reworked to conform to requirements shall receive a technical review, and resultant decisions to accept, repair, or return a nonconforming item to its source for correction shall be supported by records of all cases submitted for action. When deficiencies are detected during contract performance, the contractor shall promptly feed back all information necessary for correction to the supplier or source. The contractor shall maintain active coordination with suppliers to assure rapid resolution of quality problems.

Items rejected by the contractor and later resubmitted by the supplier shall be identified as resubmittals. In each case, the supplier shall refer to the contractor's rejection document and shall furnish evidence to show that the cause for rejection has been corrected.

4.11 Control of Received Items. The contractor shall establish and implement procedures for identifying, controlling, handling, and storing received materials and equipment. These procedures shall provide for maintaining records of marking and identification to assure that the items and pertinent data can be traced to their origin in accordance with contract requirements. Controls shall be implemented to protect items that deteriorate from environmental exposure or which may be damaged during handling operations. Material or equipment that deteriorates with age shall be identified, and controls implemented to assure utilization during its useful life.

4.12 Quality Audits. The contractor shall regularly audit quality assurance functions related to procurement, in accordance with Section 8.

4.13 Alloy Verification. Items identified by the purchaser shall be checked by appropriate nondestructive tests to verify that they conform to the specified alloy types. The checks shall be performed at the time permanent identification is applied to a part, at the time of assembly, or just prior to shipment, except that parts, subassemblies or assemblies with permanent identification applied may be checked at the contractor's receipt inspection. The contractor shall demonstrate or justify, to the satisfaction of purchaser, that the test devices or methods will reliably detect incorrect materials.

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Examples of records include acceptance test data, inspection and test reports, material certifications, welder qualifications, quality audit reports, summaries of nonconformances, and corrective actions.

5.14 Quality Audits. The contractor shall regularly audit quality assurance functions related to fabrication and assembly operations in accordance with the requirements of Section 8.

5.15 Alloy Verification. Items specified by the purchaser shall be checked in accordance with 4.13, except for permanently identified items with previous, documented checks showing acceptability. The checks shall be performed at the time of assembly or when permanent identification is applied to a part.

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6.9 Testing, Operation, and Maintenance.

6.9.1 Start-up of Equipment and Systems. The contractor shall establish check points and procedures to assure that, as a minimum, the following items are evaluated prior to start-up operations:

1. Completeness of construction activities leading up to the point of start-up as outlined by construction work planning.
2. Cleanness of items.
3. Availability of start-up procedures.

6.9.2 Preoperation Testing. Preoperation testing plans and procedures shall be prepared and reviewed by the contractor to assure compliance with safety standards, prevention of damage to the item being tested; and conformance to testing requirements of the contract.

6.9.3 Operation and Maintenance. Procedures shall be established and implemented by the contractor for operating and maintaining equipment and systems that are used for construction purposes and which will eventually become an integral part of the finished project, as well as for assuring the integrity and quality of such items.

6.10 Quality Assurance Records. The contractor shall systematically compile and maintain records and data generated during the construction phase. Typical records include material certifications and identification data for traceability; special process and personnel certification and test reports; inspection and test reports; design drawings, specifications, procedures; and reports of nonconformance. These records shall correctly identify the as-built project and furnish objective evidence of quality. The records shall be indexed, filed, and maintained to allow access for retrieval and review of information; and all records shall be protected against deterioration and damage. The record file shall be maintained by the contractor and transmitted to the purchaser of his designee.

6.11 Quality Audits. The contractor shall regularly audit the quality assurance activities related to construction and installation in accordance with the requirements of Section 8.

6.12 Alloy Verification. Items specified by the purchaser shall be checked in accordance with 4.13, except for permanently identified items with previous documented checks showing acceptability. The checks shall be performed at the time of installation or assembly.

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CHAPTER 17.0 - QUALITY ASSURANCE

APPENDIX H

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THE CLINCH RIVER BREEDER REACTOR PLANT  
PRELIMINARY SAFETY ANALYSIS REPORT

CHAPTER 17.0 - QUALITY ASSURANCE

APPENDIX I

A DESCRIPTION OF THE GE-ARSD-RM  
QUALITY ASSURANCE PROGRAM

GENERAL ELECTRIC COMPANY  
ADVANCED REACTOR SYSTEMS DEPARTMENT  
SUNNYVALE, CALIFORNIA

CLINCH RIVER BREEDER REACTOR PLANT  
A DESCRIPTION OF THE GE-ARSD-RM  
QUALITY ASSURANCE PROGRAM

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## APPENDIX I

### CLINCH RIVER BREEDER REACTOR PLANT

#### A DESCRIPTION OF THE GE-ARSD-RM

#### QUALITY ASSURANCE PROGRAM

### 0.0 INTRODUCTION

A Quality Assurance Program has been established by the General Electric (GE) Company's Advanced Reactor Systems Department (ARSD) to assure conformance to contractual requirements for the Clinch River Breeder Reactor Plant (CRBRP). The contractual requirements invoke Quality Assurance Program Requirements by means of the U.S. Department of Energy Standard RDT F2-2 through Amendment 3.

GE-ARSD is a major participant on the CRBRP in the role of a Reactor Manufacturer (RM), having been delegated by Westinghouse ARD-LRM, the execution of responsibility for the design, procurement and manufacture of NSSS systems, components and services, including a portion of the Project's Quality Assurance Program as shown on Figure 171-1.

The Quality Assurance Program established to meet contractual requirements contains those elements necessary to comply with the requirements of Code of Federal Regulations, Part 50, Appendix "B", "Quality Assurance Criteria for Nuclear Power Plants and Fuel Processing Plants" (10CFR50, Appendix "B") for GE-ARSD scope of work. This appendix describes how the Quality Assurance Program meets the applicable criteria of 10CFR50, Appendix "B".

The practices described herein will be applied to the planning, design, procurement, and manufacture of those systems, components, and structures defined in Sections 3.2 and 7.1 of the PSAR that are assigned to GE-ARSD and covered in the Contract Scope of Work.

## 1.0 ORGANIZATION

### 1.1 GE-ARSD PRODUCT ASSURANCE ORGANIZATION

GE's organizational structure for performing quality-related activities associated with management, design engineering, procurement, and manufacture of NSSS systems, components and services, and the responsibilities and authorities of key positions within the GE organization, are described in Section 1.4 of the PSAR. GE's organization chart is shown on Figure 1.4-8. The Management organization structure having responsibility for GE's quality program is presented in Figure 171-2. Their responsibilities are described below:

The Department General Manager of GE-ARSD reports directly to the Vice-President and General Manager, Energy Systems and Technology Division and has overall responsibility for the GE-ARSD Quality Program. These responsibilities include:

- (a) Report promptly significant quality problems to the Division Vice-President and General Manager, Energy Systems and Technology Division, for communication through appropriate channels to the Sector Executive. In addition, when these problems involve significant legal and/or reputation risks, communicate the problems to Corporate Legal Operation and/or Corporate Public Relations Operations (Corporate Relations Staff).
- (b) Establish and issue supporting procedures and take other actions for fulfilling the requirements of the Corporate Product Quality Policy.
- (c) Notify the Staff Executive, Product Quality, Technical Resources Staff (Corporate Technology Staff) of any situation which entails field replacement or rework of a substantial nature.
- (d) Provide for an annual independent review and assessment of the effectiveness of the Department Quality Assurance Program, including its compliance with appropriate contractual requirements (eg., RDT and ANSI).

The Department General Manager has responsibility and authority to issue and implement a Department Product Quality Policy. Authority to deviate therefrom is reserved to the General Manager. He has delegated the execution of the following responsibilities:

(1) The Section Managers, Clinch River Project, Technology and Special Projects, and Engineering have the responsibility and authority to:

- (a) Define the quality requirements and standards for the products associated with the project(s) assigned by the Department General Manager to the Section and insure that all customer needs and reasonable expectations are recognized and defined consistent with Department and Company policy.
- (b) Approve the quality program to be employed on Section products.

- (c) In conjunction with Product Assurance and Services Section, assure that Section work is accomplished in compliance with the applicable quality program and that each product meets the established quality requirements.
- (d) In conjunction with Product Assurance and Services Section, insure that supplier's work is accomplished in compliance with the applicable quality program for those projects assigned to the Section.

In addition, the Section Manager - Clinch River Project has the responsibility and authority to:

- (a) Convey to the supplier, the Department's quality requirements and standards for each procured product.
- (b) In conjunction with Product Assurance surveillance, assure that supplier work is accomplished in compliance with contract imposed quality requirements.
- (c) Assure that administrative specifications applied to the supplier meet all quality needs and requirements by obtaining appropriate reviews and approvals prior to incorporating the specification into a contract.

(2) The Section Manager, Applications Engineering and Planning has the responsibility and authority to:

- (a) Convey the customer's quality requirements and standards as defined by contract, for each product to each responsible section.
- (b) Assure that the quality of product service rendered after sale and delivery meets reasonable expectations of the customer.

(3) The Section Manager, GE-ARSD Financial Operations has the responsibility and authority to provide sound financial information, consistent with quality objectives.

(4) The GE-ARSD Legal Counsel has the responsibility and authority to:

- (a) Keep Department Management apprised of current laws and regulations applicable to the achievement and maintenance of product quality for products of the Department.
- (b) Assist Department management in formulating product quality requirements in light of laws and regulations applicable to Department products and advise management regarding potentially significant legal and/or reputation risks involved in identified product quality problems.

(5) The Manager, GE-ARSD Employee Relations, has the responsibility and authority to:

- (a) Insure the creation and maintenance of a Department environment in which employees at all levels will have an attitude of striving for excellence in the performance of their work.
- (b) Conduct suitable programs to ensure employee motivation.
- (c) Insure the employment of professional employees who are qualified for the high technology work in the Department.

The organization of GE-ARSD's Product Assurance and Services Section is presented in Figure 171-3 and is described below:

- (6) The Manager, Product Assurance and Services, has the responsibility and authority to:
- (a) Assure that each Department product delivered to a customer meets the specified quality requirements.
  - (b) Identify quality problems in the multifunctional Quality Assurance Program Activities and ensure their satisfactory resolution.
  - (c) Insure that all new work proposals conform to applicable codes and standards, and that appropriate quality requirements are defined.
  - (d) Insure that significant risk to the Company quality reputation are detected, reduced to an acceptable level, and/or after notifying the Project Manager communicated to the Department General Manager for his information and/or action.
  - (e) Design and maintain a Quality Assurance Program for each Department Product.
  - (f) Obtain customer based Quality Measurement Data.
  - (g) Furnish the Staff Executive, Product Quality Technical Resources Staff (Corporate Technology Staff) with the Department Product Quality Policy and revisions as issued.
  - (h) Prevent shipment of unsatisfactory products.
  - (i) Insure, by appropriate verification activities, that Department work at the supplier's plants is accomplished in compliance with the applicable quality program.

The Manager of Product Assurance and Services reports at the same organizational level as the highest line managers having direct responsibility for performing quality-related activities, and has the organizational freedom and authority to identify quality problems and ensure satisfactory resolution, and to control further processing, delivery, installation or operation of an item having a deficiency or unsatisfactory condition until proper disposition has occurred.

The Manager, Product Assurance Clinch River Project reports to the Manager, Product Assurance and Services with reporting lines to the Manager, Clinch River Project, the Department General Manager and the Vice President and General Manager of the Energy Systems and Technology Division. The Manager, Product Assurance, Clinch River Project has the organizational freedom and authority to identify quality problems and ensure satisfactory resolution and to control further processing, delivery, installation or operations of an item having a deficiency or unsatisfactory condition until proper disposition has occurred.

The authority to stop work is retained by the Department General Manager. The Manager of Product Assurance and Services and the Manager, Product Assurance Clinch River Project are authorized to prevent shipment of unsatisfactory products.

The Manager of Product Assurance and Services and the Manager, Product Assurance-CRP are responsible for immediate notification to affected management, of conditions that in their opinion, require the stopping of engineering or manufacturing work in-process. Affected management, upon notification by the Manager of Product Assurance and Services of conditions that the Manager of Product Assurance and Services determines require the stopping of work, shall immediately evaluate such conditions and inform the Manager of Product Assurance and Services of the actions to be taken. The affected manager has the option to stop work activities in his area of responsibility until conditions are corrected to the satisfaction of the Manager of Product Assurance and Services and the Manager Product Assurance-CRP. If the affected Manager elects not to stop work, and the Manager of Product Assurance and Services determines that the planned corrective actions are insufficient to warrant the continuance of work, the Manager of Product Assurance and Services has the authority to require that the affected manager immediately justify his actions to the Department General Manager. The Department General Manager will decide the actions to be taken and informs the affected Manager, and the Manager of Product Assurance and Services, and the Manager, Product Assurance-CRP.

The Department General Manager is continually involved in appraising the status of the quality program and the accomplishments of the Product Assurance and Services organization. This is accomplished by means of Monthly Quality Status Reports and Management Review Meetings.

A Monthly Quality Status Report containing quality assurance progress and accomplishments, current problems, non-conformances and failures with their analysis and corrective action status, quality trend data, and results of program audits and management reviews, is prepared and transmitted to the LRM, the Department General Manager, and the Vice President and General Manager of Energy Systems and Technology Division. The Manager of Product Assurance and Services and the Manager, Product Assurance-CRP meet with the Department General Manager on a regular basis to discuss the status of the Department's quality program and accomplishments of the Product Assurance and Services organization.

The GE-ARSD General Manager will also have an Independent review and assessment of the effectiveness of the GE-ARSD Quality Assurance Program performed annually.

This review to determine the adequacy of the QA program and its compliance with RDT F2-2 and 10CFR50, Appendix "B" will be preplanned, documented, and will identify necessary corrective actions. These corrective actions will be communicated to the responsible organization and tracked to assure completeness.

The responsibility for assuring compliance with the quality assurance requirements of CRBRP is delegated by the Manager of Product Assurance and Services to the Manager, Product Assurance - Clinch River Project and this position has no other duties or responsibilities unrelated that would prevent full attention to Quality Assurance matters. The Manager, Product Assurance - Clinch River Project has the responsibility for devising, developing and ensuring the effective execution of the Project's quality assurance program for the GE scope of the CRBRP project. In performing this function he identifies requisite quality assurance activities, approves or concurs in plans and procedures developed for implementation, recommends delegation of responsibility to lower tier organizations for implementation with appropriate approval in the requirements and implementation documentation of the lower tier organizations, plans and performs control and verification activities to ensure effective program execution, and manages and directs the activities of assigned staff members to accomplish the quality assurance program management activities.

In performing these activities he is supported by the Manager, Quality Engineering and Verification-Equipment Projects and the Manager, Quality Engineering & Verification-Plant Systems. They have for their scope of work the responsibility of devising, developing and ensuring effective execution of the Project's quality assurance program. These programs include the design, manufacture, test, and delivery of major components. They plan and perform surveillance of internal procurement control, plan and perform surveillance of vendors activities including source inspection of product, perform follow up on audits of the supplier quality assurance activities, and initiate, coordinate, and cause closure of product nonconformances and audit findings. Also, the Manager, Product Assurance - Clinch River Project is responsible to the Manager, Product Assurance and Services for implementation of quality assurance activities in support of all products produced directly by ARSD. On the Clinch River Project, this will include quality planning, quality engineering, and quality control activities in response to quality assurance requirements defined by the project organization. He provides verification of ARSD engineering, procurement, fabrication, and test activities carried out in support of Project equipment or components supplied directly by ARSD. This will include supplier source surveillance and receiving inspection of materials, as well as in-process inspection of ARSD manufacturing and test operations. He also has responsibility for the maintenance of in-house quality systems, including the issue and control of ASME code manuals as specified for certification of "N", "NPT" and "U" stamp requirements. In fulfilling these responsibilities, the Manager, Product Assurance - Clinch River Project has a staff consisting of a Quality Engineering function, a Quality Control function, and a Quality Systems function.

The Manager, Product Assurance Audits, is responsible to the Manager, Product Assurance and Services for conducting an internal and external audit program consistent with the CRBRP Quality Assurance Program requirements. In response to requests from the Manager, Product Assurance, Clinch River Project - (i.e. task definitions and schedules), he develops audit plans and schedules to meet Clinch River Project needs. He is responsible for conducting an internal audit program on CRBRP Engineering and Procurement activities, including the preparation and issuance of audit schedules, the assembly of a qualified audit

team, the preparation of corrective action requests and the follow-up action required to assure effective corrective actions are implemented. He is also responsible for conducting an external audit program of supplier activities including the preparation and issuance of audit schedules, assembling a qualified audit team, preparing findings and soliciting corrective action through contractual channels and the follow-up action required to assure effective corrective actions are implemented.

The size of the QA organization is determined from the above scopes of work and the current GE-ARSD scope of work.

Management Review Meetings of the CRBRP are held regularly by the Manager, Clinch River Project. The CRP staff and the Manager, Product Assurance-Clinch River Project present the status of the Project for their areas of responsibility at these meetings to the GE-ARSD staff. The Manager, Product Assurance-Clinch River Project discusses the status of the Quality Assurance Program at these meetings.

In addition to these project review meetings, management review meetings are held periodically by the Manager of Product Assurance and services with the Manager, Product Assurance - Clinch River Project to evaluate the overall CRBRP Quality Status.

The collection and maintenance of Product Assurance generated quality records is the responsibility of the Manager, Product Assurance - Clinch River Project, the Manager, Quality Assurance, the Manager, Product Assurance Audits, and the Manager, Management Systems.

## 1.2 PRODUCT ASSURANCE AND SERVICES MANAGER'S QUALIFICATIONS

The Manager, Product Assurance and Services and Managers, Product Assurance CRP, Product Assurance Audits, Quality Engineering and Verification, and Quality Engineering shall have the following minimum qualifications:

Education - Shall be a graduate of a four-year accredited Engineering College or University with a degree in Engineering or Science.

### Experience -

General: Shall have a minimum of 10 years experience in quality engineering, or manufacturing, associated with nuclear facilities or other high technology product areas.

Specialty: Shall possess a broad knowledge and understanding of Industry and Government Codes, Standards and Regulations defining quality assurance requirements and practices. Shall have a working knowledge and understanding of quality assurance methods and their application. Shall have at least one year experience in Quality Assurance or be given a Quality Assurance orientation course upon appointment.

Managerial: Shall be experienced in organizing, directing and administering an overall program or activity, or a major portion of an overall program having broad scope and application. Shall have experience in the supervision of personnel and planning and management of other resources needed to conduct an extensive quality assurance program.

The Manager, Quality Control, shall have the following minimum qualifications:

Education - BS Degree, Industrial Engineering preferred. However, suitable Industrial experience is acceptable.

Experience -

General: See Product Assurance Managers' Qualifications above.

Specialty: See Product Assurance Managers' Qualifications above.

Managerial: See Product Assurance Managers' Qualifications above.

The Manager, Quality Systems shall have the following minimum qualifications:

Education - BS Degree, Engineering or Science preferred. However, suitable Industrial experience is acceptable.

Experience -

General: Shall have a minimum of ten years experience in quality, engineering and/or quality systems involving high rigor quality hardware.

Specialty: Shall have a working knowledge of applicable industry and Government Codes, Standards and Regulations defining quality assurance program requirements. Shall have specific knowledge of quality assurance methods as applied to design, manufacturing, assembly, test and supplier control activities.

Managerial: Shall have experience and training in management planning, organizing, integrating and measurement of quality systems or similar functions.

## 2.0 QUALITY ASSURANCE PROGRAM

GE-ARSD's Product Quality Policy states:

"It is the policy of the Department that:

- a) All products offered be consistent with the public interest and applicable laws and regulations.
- b) All products offered be such as to validate buyers' selection of the price-performance combination involved and thereby contribute positively to the Company's product quality reputation.
- c) In every market segment served, the Department pursues the objective of achieving a reputation for product quality that either equals or exceeds that of any competitor serving the same segment."

This policy is implemented by the Department General Manager within the Department by assignment of prime and contributing responsibility for Management of the Quality Assurance Program as described in Section 1.0 of this Appendix.

The GE-ARSD CRBRP QA Program is documented in the CRBRP Quality Assurance Program Index (QAPI). The QAPI is a document which provides a listing of those GE-ARSD Procedures, Instructions, or other Documents, to be utilized in implementing the specific quality assurance requirements for the program, and includes an organizational chart that identifies key personnel and their functional responsibilities and authorities for quality assurance activities. The QAPI is issued with implementation direction by the Clinch River Project Section Manager to those functions and/or individuals having the responsibility for implementation of quality-related activities. The QAPI is reviewed and revised as necessary to reflect audit corrective actions and procedure changes. The QAPI is approved by the Manager, Product Assurance - Clinch River Project and is subject to review and approval by the LRM. The initial issue and all revisions of the QAPI are distributed both internally and externally under controlled distribution with acknowledgement receipt required.

Table 171-1 shows a matrix correlating the Quality Assurance Program implementing documents to the criteria requirements of 10CFR50, Appendix "B". Attachment 171-1 provides a synopsis of the GE-ARSD QA Program Documents. The measures describing how GE-ARSD meets the criteria of 10CFR50, Appendix "B" are contained in the other sections of this appendix.

The docket date of the CRBRP PSAR was April 11, 1975. Regulatory guides to be addressed prior to that date and other factors to be considered are as follows:

- (1) Regulatory Guides in Subsection V. See PSAR Sections 1.1, 17.0 and 17.1.2.1 and the answers to Questions 411.1 and 411.2.
- (2) 10 CFR Part 50, 50.55a. See PSAR Sections 17.1.2.1, 3.1, 3.2 and 7.1

- (3) 10 CFR Part 50, 50.55(e) in accordance with the quality assurance program. See PSAR Section 17A.15.1.
- (4) 10 CFR Part 50, Appendix A, General Design Criteria 1. See PSAR Sections 17.0.5, 17.1.2.6 and 3.1.1.
- (5) ASME B&PV Code Section III. See PSAR Sections 17.1.2.6 and 3.2.2.

The Department policy requires that written procedures will be established and issued to fulfill the requirements of the Corporate Product Quality Policy. These procedures are reviewed and approved by all section managers including Product Assurance. Authority to deviate from the Quality Policy is reserved to the Department General Manager. Prime responsibility for implementation verification is assigned to the Manager of Product Assurance and Services to monitor and measure the performance of the management and implementation areas to ensure their performance is in compliance with the program.

The GE-ARSD CRBRP Quality Assurance (QA) Program is established to comply with the contractual requirements of RDT Standard F2-2 which is applicable to

GE-ARSD's scope of work on CRBRP. This program, established to meet the contract requirements, also contains those program elements necessary to comply with the criteria of 10CFR50, Appendix "B" as applicable to GE-ARSD's scope of work.

The major elements of the GE-ARSD CRBRP QA Program are shown in Figure 171-4 and are applied to the safety-related structures, systems, and components as listed in Sections 3.2 and 7.1 of the PSAR within GE's scope of work. Each of the program elements as shown in Figure 171-4 is executed by GE-ARSD. GE-ARSD delegates the execution of these elements, when appropriate, to suppliers, however, GE-ARSD retains responsibility for adequate implementation and performance by their suppliers.

The QA program includes measures for the development, control, and use of computer codes. These measures include procedural direction and these procedures are subject to the audit program, see Section 18.0.

GE-ARSD establishes personnel requirements through the use of position guides. Qualified personnel with formal training and/or experience are assigned to the established positions. A periodic formal performance evaluation of each incumbent by his next higher level of management is documented. A Department-wide personnel training program is utilized to insure a knowledge and understanding of Department policies, instructions, and procedures. Corporate and Nuclear Energy Business Group job-related training programs are also utilized. For NDE and Control of Special Processes, personnel are trained and qualified in accordance with applicable codes, standards and procedures.

Documentation for formal training and qualification program include the objectives, content of the program, attendees and date of attendance. Certificates of qualification clearly delineate the specific functions personnel are qualified to perform and the criteria used to qualify personnel in each function.

GE-ARSD has established training and indoctrination programs to assure that personnel performing quality-related activities understand the requirements and applicability of QA Program requirements. New employees are required to attend an orientation session which includes a familiarization of the technical requirements of CRBRP and engineering and quality program practices. Training sessions are also conducted to provide instruction in the Policies and Procedures to be employed to project/program personnel, quality assurance engineers, designers, procurement, and manufacturing personnel. Personnel who perform inspections, tests, and non-destructive examinations are required to be trained and qualified for each area of specialty before they can perform the activity. Training is conducted in accordance with appropriate procedures.

Inspections and tests performed at GE-ARSD are conducted in accordance with prescribed instructions prepared for the specific item under consideration. The preparation of these instructions, including the criteria considered, is discussed in Section 10.0 of this appendix. GE-ARSD does assure for all acceptance tested and deliverable CRBRP equipment, that quality-related activities are performed with specified equipment and under suitable environmental conditions, special skills or processes are used as necessary, and that pre-requisites have been satisfied prior to inspection and test.

GE-ARSD procurement documents implement pertinent requirements of 10CFR50, Appendix "B" by identifying the QA Codes and Standards, or portions thereof, contractually imposed on GE-ARSD and other contractual requirements which must be complied with by the Supplier and described in the Supplier's QA programs to insure that the contract requirements imposed on GE-ARSD properly passed on to the Supplier and are traceable. In some instances, depending on the item being processed, extracts from the applicable Codes and Standards and other contractual requirements are included verbatim in the procurement documents.

GE-ARSD reviews subcontractor and supplier QA Programs against the GE-ARSD contractually imposed portions of applicable Codes and Standards and any additional QA requirements included in the contractual document.

The principle objectives of the QA program and key functions and elements which it contains are not expected to change over the duration of this project. However, circumstances may make advisable changes in the organization, or in the implementing details, and such changes will be made in accordance with normal management practices. This PSAR QA description will be reviewed annually to assure that all required changes have been documented, and it will be updated as necessary. Substantive changes in organization are transmitted to the customer through the monthly Quality Status Report.

### 3.0 DESIGN CONTROL

CRBRP design activities at GE-ARSD are performed within Clinch River Project and Engineering Sections. Control, approval, and management of the design activities is exercised by Clinch River Project Section.

Assignment of design responsibility is made by the Clinch River Project and Engineering Section Managers to appropriate subsection managers, who in turn assign the design responsibility to a functional or technical discipline unit manager. The unit manager makes individual assignments to a responsible engineer for performing the effort. The unit manager assigned responsibility is supported by the other functional and technical units as required.

The contractual design basis is defined to the responsible design organizational units by means of a Project Master Plan and Work Breakdown Structure Dictionary issued by the Clinch River Project Section which provides the delineation of the program work scope, identification of each item to be delivered, and assignment of responsibility. Interim direction to accomplish tasks or other work efforts not specifically identified is accomplished by means of the issuance of Project Directives. The scope of the design program includes activities associated with the preparation and review of design documents including the correct translation of applicable regulatory requirements and design bases into design, procurement and procedural documents. Included in the scope are such activities as field design engineering; physics, seismic, stress, thermal, hydraulic, radiation, and the SAR accident analyses; associated computer programs; compatibility of materials; accessibility for inservice inspection, maintenance, and repair; and quality standards.

System Design Descriptions (SDDs) provide the principal means of design definition and control for each CRBRP system for which GE-ARSD has responsibility. The SDD is a comprehensive technical document utilized to: define and integrate the various technical, operational, and safety considerations involved; identify interfaces; and serve as a common technical basis for project activities. The SDDs are responsive to the Overall Plant Design Description (OPDD) requirements and provide a technical reference and control for detailed component specifications, operational test procedures, and safety analysis. The Equipment Specifications ("E" Specs) similarly provide the control for components, and define the design, fabrication, quality assurance, testing, handling and shipping requirements. The "E" Specs are responsive to the SDD requirements. The SDDs and "E" Specs are prepared and issued as specifications. Where required, principal design data are submitted to the LRM for approval prior to project use.

Design definition and control is established through a technical documentation structure such that the approved document set, when issued, provides assurance that applicable design criteria, code, standards, practices, and requirements for materials, structures, components, systems, facilities and processes, are defined and correctly translated into specifications, drawings, and work procedures and instructions. Each level in the design definition structure provides requirements that constrain and control the next lower tier of documents.

During the conduct of the design effort, the responsible engineer conducts a study to determine what codes and standards, and their specific requirements, are applicable to the system or component under consideration, and the adequacy of such codes and standards. When existing codes and standards are judged to be inadequate, he initiates appropriate action to improve the code or standard. The applicability of the codes and standards is specified in the appropriate design documentation. An element of each document review and approval, is the consideration and application of the code or standard to the design.

Measures have been established to assure: that appropriate quality requirements, codes and standards are specified in design documents; that parts, materials, and processes are selected on the basis of experience and qualification for the intended service; that design interfaces within GE-ARSD, and with other Project participants, are defined and controlled; that designs are verified by appropriate methods and personnel; that design definition documentation is approved and issued by appropriate organizations; and that design changes and deviations are subject to the same measures as applied to the original design.

The responsible engineer defines the quality standards that are appropriate for his design, and documents those standards in the specifications, drawings, or other technical documents. These documents are reviewed in accordance with established procedures, and changes or deviations from the quality standards are identified and controlled. Changes to quality standards are handled in the same manner as any other technical changes to the affected documents. Deviations are classed as changes if they apply to the full set (or lot) of production items. If deviations apply only to a specific item of hardware, they are identified and controlled within the Product Assurance and Services Section. Each deviation is documented as a non-conformance item and is resolved with participation of the appropriate technical, management, and supporting organizations.

The responsible engineer identifies and includes in appropriate planning, those engineering studies necessary to substantiate the adequacy of the design for its intended application. Engineering analysis studies focus on those aspects and considerations involved in the intended services; such as, operation, maintenance, in-service inspection, reliability, availability and safety. The studies are based on analysis of reactor physics, structural stress, thermal, hydraulic, environmental, and other effects, and other applicable technical considerations. Engineering studies are documented in engineering memoranda and formal reports and are included among the engineering work records. Computer codes that are used to perform and/or support final design and analysis activities are identified and controlled and procedures are established to assure that such codes are verified as to the adequacy of the results they produce.

The results of the engineering studies and analyses produce criteria to be satisfied by the design. These criteria are defined and documented within design documentation. The design criteria include performance objectives, operating conditions, regulatory requirements, safety and availability, materials, fabrications, construction, testing, operation, maintenance, and quality requirements.

Design documentation includes specifications, drawings, and instructions, as necessary, to define the specific requirements for detail design, materials, fabrication, construction, installation, testing, inspection, maintenance, cleaning, packaging, shipping, storage, operation, and quality assurance. Design documentation is reviewed by competent specialists in many different fields to assure design producibility, manufacturability, inspectability, and testability in accordance with the established technical requirements for the design. Design drawings are checked to assure that dimensions and tolerances are proper and compatible with their interface requirements.

Acceptance criteria for inspection and test are developed by the responsible engineer during the design phase and are identified in the design definition documentation. The acceptance criteria provide the basis for acceptance or rejection of each designated quality characteristic and, when appropriate, specify the points at which compliance will be accomplished and verified.

Identification and control of design interfaces is accomplished by the responsible engineer and documented by means of SDDs, "E" Specs and Interface Control Drawings (ICDs). The fundamental control document for functional interface data is the SDD which identifies the system interfaces including referencing supporting control documents, i.e., ICDs, and together with ICDs, completely defines requirements for every interface within a system. The "E" Spec is similarly utilized to define the functional interfaces for components.

ICDs are documents that identify the physical interface characteristics necessary to ensure compatibility between mating pieces of equipment. ICDs are distributed to, and used by project participants for assuring compatibility of systems and/or components. Interface requirements are transmitted to interfacing organizations and concurrence is obtained prior to issue. Proposed changes are coordinated with interfacing organizations prior to implementation. For the CRBRP Project, the Manager, Project Integration and Control who reports to the Manager - Clinch River Project, has been delegated the responsibility for coordinating the control of interfaces within GE-ARSD's scope of responsibility, and for providing liaison between GE-ARSD and other project participants concerning interfaces.

Prior to the issuance of SDDs and "E" Specs, Controlled Information Data Transmittals (CINDTs) are used as a control method for transmitting and receiving working level design data.

Distribution and control of design documents and their changes is described in Section 6.0 of this Appendix.

The Managers of the responsible design organizations within GE-ARSD are responsible for determining the degree and extent of design verification necessary to assure the adequacy of finished designs. Each discrete design or

design aspect, or change of design for, or having an effect upon a system, equipment, component or service, is, as appropriate, verified for design adequacy by a design review, independent calculation, independent checking or a qualification testing program. The factors utilized in determining the extent of design verification are the relative importance of the design action to safety and reliability, the uniqueness of the design, and the complexity of the design. The Manager of the responsible design organization designates an independent reviewer or review team to perform the independent calculation, independent checking or perform the design review. GE-ARSD procedures require that inspection and test specifications be a subject for design review, and they are included on the design review checklist. Reviewers are technically competent individuals who have no direct responsibility for the design under consideration, but may be from the same organization (Section, Subsection or Unit). Design reviews and independent calculations, independent checking and their subsequent documentation, are planned, conducted and documented in accordance with written procedures. Design reviews are shown on Project plans and schedules which are subject to LRM approval. The responsible manager is required to resolve the review team findings. When qualification testing is utilized as the verification method, the test program includes requirements for testing under the most adverse design conditions. The testing is performed as early as possible prior to installation of plant equipment or prior to the point when the installation would become irreversible.

All pertinent operating modes are considered in determining these adverse design conditions. The control measures applied to qualification test are described in Section 11.0 of this Appendix.

Independent checking is a preplanned activity for those aspects of the design which require detailed comparison of the design to the design requirements; for example - interface compatibility, design method, calculation agreement and materials requirements. It is accomplished by review of design documents by an independent reviewer. Verification is recorded on the appropriate review documentation by approval/approved with comments/disapproval statements.

Required design verification for the level of design activity accomplished is performed prior to release for procurement, manufacture, construction or release to another organization for use in other design activities except in those cases where this timing cannot be met such as when insufficient data exists. In all cases the design verification shall be completed prior to relying upon the component, system, or structure to perform its function.

Design and verification documentation that are subject to procedural control include but are not limited to specifications, calculations, computer programs, system descriptions and drawings including flow diagrams, piping and instrument diagrams, control logic diagrams, and electrical single line diagrams.

The responsibilities of the verifiers are described in the procedures and include the extent of the documentation which varies depending upon what is verified, the method of verification, and the extent of verification required.

GE-ARSD drawings, specifications and instructions are reviewed, approved and issued in accordance with established procedures. An Engineering Review Memorandum (ERM) is utilized to record the review and comments of individuals having competence to determine whether the technical document under consideration adequately conforms to applicable contract and standards requirements within his assigned areas of review. This review is conducted prior to approval for issue. The ERM is used to designate and record areas of review, reviewers, document status, configuration control level, comments and signatures. Review areas include interface compatibility, producibility, code compliance, materials engineering, verification of design adequacy, calculation verification, System Design Description (SDD) conformance, quality requirements, safety (and licensing) conformance, and others as appropriate. The responsible engineer with the concurrence of his manager, determines the areas of review required for the particular document.\* The review always includes a review of quality requirements by Product Assurance engineers to evaluate quality characteristics and requirements, and verify that the document contains or references the appropriate requirements to achieve and verify required quality. The Manager - Licensing and Reactor Systems identifies those documents requiring his review to evaluate requirements essential to safety and/or licensing.

The responsible engineer evaluates and resolves the comments received during the review process. The responsible engineer reviews the final document with the prior reviewers when there is a significant change or a significant comment is not included in the final document. The Manager assigned responsibility for preparation of the document is responsible for verifying that technical requirements and objectives have been met, necessary reviews completed, and comments resolved prior to approving the document for issue.

All changes to design data which have been baselined (i.e., approved by LRM or equivalent) are initiated by an Engineering Change Proposal (ECP) which is the vehicle for identification of the change, documentation of the impact of the change, and for obtaining approval of the change. The Engineering Change Notice (ECN), is the vehicle for making precise changes to specific design documents and implements the ECP. The review, approval, and release is accomplished in the same manner as the original design document.

Discovery of a design deficiency or error in issued, or released, design documents, that if undetected would have adversely affected safety-related structures, systems or components, are documented and corrected, as discussed in Section 16.0 of this Appendix.

\*The scope of the review process is governed by the safety-related aspects of the design represented by the document. For those designs that have a role in prevention or mitigation of the consequences of postulated accidents that could cause undue risk to the health and safety of the public.

Parts, materials and processes are selected by the responsible engineer on the basis of proven experience or qualification for the intended service. For CRBRP, a common set of material data, extrapolation, and interpretations contained in the Nuclear Systems Materials Handbook (NSMH) are the basis for design definition. However, for items designed to the ASME Boiler and Pressure Vessel Code, the Code data takes precedence. If needed materials property data does not exist either in the ASME code or the NSMH, provisions exist to obtain approval to use other materials property data, by submitting such data to the CRBRP Materials Task Group. Application reviews are conducted for essential parts, materials, or processes, and include, as applicable, (1) evaluation, analysis and tradeoff studies, (2) coordinating and interfacing with other participants, (3) document reviews, and (4) design reviews.

Design documents including changes, and review and approval and verification records, are collected, stored, and maintained as described in Section 17.0 of this Appendix.

#### 4.0 PROCUREMENT DOCUMENT CONTROL

Procurements are initiated by a Material Request (MR). The MR identifies the material, equipment, and services to be purchased, references the applicable technical documents and quality requirements, and contains approval signatures. Procurements are initiated by the responsible engineer for procurement of plant hardware, or by a procurement specialist for the Fabrication Shop materials.

Preparation of technical documents (i.e., drawings and specifications) for use in the procurement of material, equipment, and services is the responsibility of the responsible engineering manager having technical cognizance over the material, equipment, and services to be purchased as discussed in Section 3.0 of this Appendix. Included (or referenced) in the technical documents are design basis technical requirements, including the applicable regulatory requirements, components and material identification requirements, drawings, specifications, codes, standards, test and inspection requirements and special process instructions, as appropriate.

The requestor prepares the MR in accordance with documented procedures assuring that the recorded information is accurate and legible; referenced documents are included with the procurement package; end product identification is recorded, and vendor and sub-vendor quality requirements are specified.

The Quality Assurance Engineer reviews the procurement package to verify that QA Program requirements are correctly stated, inspectable and controllable, and that there are adequate acceptance or rejection criteria. In addition, by audit, the QA organization verifies that procurement documents have been prepared, reviewed and approved in accordance with the Department procedures.

The MR is required, as a minimum, to be approved by the requestor's manager, an authorized Product Assurance representative, and an authorized financial representative.

The MR, completed and approved, provides direction to Procurement to prepare a document (Purchase Order, Subcontract, etc.) which becomes the "contract" between the supplier and GE-ARSD. Procurement documents contain the requirements as approved on the MR.

Procurement documents are reviewed by the Quality Assurance Engineer to verify that the MR requirements were correctly included as specified by the MR.

Material Request Changes are reviewed in accordance with the same procedures and are subject to the same review and approval requirements as the original documents and provides direction for change to the procurement document. MRs and procurement documents for spare or replacement parts, of safety-related structures, systems and components, are subject to identical controls as applicable to those used for original equipment.

GE-ARSD procedures require that prior to contract award, each contending vendor of safety-related, complex and high cost materials, equipment and services, be evaluated by Product Assurance (and other Department functions as appropriate) to determine the capability of the supplier to meet the procurement quality requirements. An approved supplier list is maintained current and used by Procurement to determine that each supplier is an acceptable source prior to placement of the purchase order. A check to verify approved vendor status is also made when the Quality Assurance Engineer reviews the purchase order.

Procurement documents are collected, stored, and maintained as described in Section 17.0 of this Appendix.

## 5.0 INSTRUCTIONS, PROCEDURES AND DRAWINGS

The GE Policy Procedures system is structured to conform with the criteria for 10CFR50, Appendix "B" as described herein. The system includes Department Policies and Instructions (BRs) and Fabrication and Test Procedures. Also where appropriate, functional routines are used by a manager to control the area of responsibility. The Department Policies and Instructions are prepared, maintained, and published by the Manager, Management Systems. A Policy and Instruction Board which is chaired by the Manager, Management Systems is comprised of representatives of each Section including Product Assurance and Services. The Board reviews and concurs in the Department Policies and Instructions with final approval reserved to the Department General Manager. Amendments are treated in a like manner.

Department Policies and Instructions (BRs) delineate the sequence of actions to be accomplished in the preparation, review, approval, and control of instructions, procedures, and drawings, and they provide overall direction for the conduct of Department business. Interim authorization is provided therein for the preparation of other derivative documents such as Fabrication and Test Procedures which cover specific fields of interest in more detailed form. The responsibility for the preparation, maintenance and publication of the Department Policies and Instructions is assigned to the Manager, Management Systems. All new, revised or amended procedures are approved by the General Manager following internal evaluation.

The department policies and instructions provide authority to do engineering work in a disciplined manner. They give direction in critical areas such as, design reviews, control of engineering changes, design verification, use of codes and standards, and other aspects of engineering work.

Fabrication and Test Procedures (FTP) delineate requirements for fabrication personnel in the planning and performance of fabrication, processing, assembly, test, and shipping of manufacturing items and the operation of the fabrication facilities. The responsibility for the preparation, maintenance, publication, and approval of Fabrication and Test Procedures is assigned to the Manager, Fabrication Operations.

Drafting Routines, included within the Drafting Manual, implement Department Instructions to the extent of prescribing specific practices affecting engineering documents, e.g., drawings, associated lists and specifications. The responsibility for the preparation, maintenance and publication of these documents is assigned to the Manager, Drafting and Documentation.

Manufacturing Process Instructions (MPIs) are prepared to define control Instructions and parameters for complex or repetitive fabrication processes. MPIs are approved by responsible managers in the fabrication and product assurance organizations prior to issue and are referenced on the Work Order Record (WOR).

Quality Control Instructions (QCIs) are prepared that delineate quantitative and qualitative acceptance criteria. The responsibility for the preparation, maintenance, publication and approval of Quality Control Instructions is assigned to the Manager, Product Assurance and Services.

The Department Instructions provide quantitative and qualitative acceptance criteria to verify that important activities have been satisfactorily accomplished.

Department Instructions assign the responsibility to the Quality Assurance Engineer for reviewing drawings, specifications, and fabrication documents to ensure the inclusion of quantitative and qualitative acceptance criteria prior to release for fabrication.

Instructions for the fabrication of items manufactured by ARSD are in Work Order Records (WORs). WORs are prepared for each manufactured item and, in conjunction with Manufacturing Process Instructions (MPIs) and Quality Control Instructions (QCIs), define fundamental processes (such as, welding, standardized inspections, and non-destructive examination) to be used in fabricating any item. The WOR delineates the sequence of fabrication, references applicable technical documents, identifies inspection and customer or Authorized Inspector hold points or witness points. Each operation is required to be signed and dated to provide evidence that the operation has been completed by an authorized individual.

## 6.0 DOCUMENT CONTROL

GE-ARSD produces large variety of documents in support of its work on CRP. The following types of documents are considered to be critical to the definition, documentation, and control of the safety related aspects of hardware and therefore, have strictly controlled review, approval, and issuance requirements:

- a. Design documents (e.g., drawings, specifications, stress reports, safety, reliability and other analyses) including documents related to definition and verification of computer codes that are used to substantiate designs.
- b. Purchase Requests.
- c. Instructions and procedures for such activities as fabrication, modification, installation, test, and inspection.

- d. As-built drawings.
- e. Quality Assurance and Quality Control Manuals.
- f. Topical reports that substantiate designs.
- g. PSAR/FSAR.
- h. Nonconformance reports.
- i. Preoperational test specifications.

Procedures for the review, approval, and issuance of these documents and changes thereto are issued as department instructions and assure technical adequacy and inclusion of appropriate quality requirements prior to implementation. The QA organization, or an individual other than the person who generated the document but qualified in quality assurance, reviews and concurs with these documents with regard to QA-related aspects. Drawings and specifications are reviewed by a product assurance and services section employee other than the one who produced them to assure that documents have been produced and issued in compliance with procedures.\*

Approved changes are included in instructions, procedures, drawings, and other documents prior to implementation of the change.

Procedures are issued that assure that obsolete or superseded documents are removed and replaced by applicable revisions in work areas in a timely manner.

Master lists identify the current revision of instructions, procedures, specifications, drawings, and procurement documents. These lists are updated periodically and distributed to predetermined responsible personnel.

An Engineering Review Memorandum (ERM) is utilized to record the review and comments of individuals having technical competence to determine whether the drawings, specifications, and test procedures, under consideration, adequately conform to applicable standards within his assigned area of review as discussed in Section 3.0 of this Appendix.

Engineering Change Proposals (ECPs) and Engineering Change Notices (ECNs) are utilized in accordance with established procedures to initiate and approval changes to issued drawings and specifications.

The ECP is a document that describes a proposed change to issued engineering documentation, and which when approved, authorizes the implementation of the change to the documents. The ECN is a document that records in detail, the changes to an issued engineering document and which initiates implementation by the Drafting and Documentation Unit. The issued ECN is delivered to the

\*Also, Quality Assurance audits are performed to assure that the documents are produced and issued in compliance with the requirements of the procedures.

affected organization, e.g. Manufacturing or Procurement, for immediate change in the technical requirements. Revision of the affected document is concurrently accomplished by the Drafting and Documentation Unit.

Procedures require that all changes excepting those of a clerical type be reviewed and approved, as a minimum, by the same organizations that reviewed and approved the original document.

Change authority and approval is achieved by means of ECPs. Following the ECP approval, the change implementation utilizing the ECN is directly accomplished in the affected documents, which are then released in revised form to the users. Records are maintained on the approval status of changes in-process and this information is readily available.

Standard distribution lists are prepared and maintained to provide for internal and external distribution with required quantities for issued drawings and specifications.

Document distribution and control is effected by two functional groups - A Communication Document Control (CDC) and a Technical Document Center (TDC). The CDC maintains files on correspondence, both internal and external. The TDC files and controls technical documents, such as, specifications, drawings, procedures, etc. Distribution lists are maintained to provide revised or changed documents to responsible personnel. Additionally, a library facility maintains files on general information and technical reports of a general nature.

An Engineering Drawing List is prepared and maintained as a complete and current list of drawing and specifications, including supplier drawings which are applicable, and is distributed as a minimum to Responsible Managers. The Responsible Managers disseminate the information to assure that proper and current documents are utilized.

Documents controlled in accordance with the above procedures include: design specifications and design, manufacturing, construction and installation drawings.

The review, approval and issue controls for the CRBRP Quality Assurance Program Index (QAPI) was previously discussed in Section 2.0 of this appendix. The GE-ARSD procedures and instructions referenced in the QAPI are reviewed, approved, and issued in accordance with established procedures as discussed in Section 5.0 of this appendix. Section 4.0 of this appendix describes procurement document control.

GE-ARSD receives controlled distribution copies of the licensing and principal design documents, i.e. SDDs issued by the Project. These copies are received in the Technical Document Center (TDC), where they are logged and then distributed to Responsible Managers. The Responsible Manager receiving the document is required to acknowledge receipt in writing to the TDC. The TDC acknowledges receipt to the issuing organization. Revisions to these documents are received and acknowledged in the same manner.

Manufacturing, inspection, and testing instructions are included or referenced on the shop traveler as discussed in Section 5.0 of this appendix. The Work Order Record (WOR) specifies the applicable revision of the referenced MPI or QCI. All revisions to WORs are controlled and require approval by the same organization that originally approved the WORs. Revisions to MPIs or QCIs require a corresponding revision to the WOR prior to implementation. The Work Order Record will normally remain with the item being fabricated until the final inspections are completed to assure that the proper revision of instructions are utilized. For special cases where the item is sent outside of GE-ARSD for vendor operations (e.g., special NDE), the item is identified with its Work Order Record Number, but the Work Order Record itself stays with the Manager, Fabrication Operations or his delegate, until the item is returned to GE-ARSD and they can be reunited.

Document control, relative to source and receiving inspection of purchased items, is described in Section 7.0 of this appendix.

## 7.0 CONTROL OF PURCHASED MATERIAL, EQUIPMENT, AND SERVICES

Procedures and practices are established and documented to provide assurance that purchased material, equipment, and services, whether purchased directly or through subcontractors, conform to the procurement document requirements. The QA engineer or design engineer originate requirements or add requirements after document review. Procurement incorporates the requirements into procurement documents in accordance with approved procedures. These measures include provisions, as appropriate, for the following:

- o source evaluation and selection,
- o review and approval of supplier work plans and procedures,
- o appropriate objective evidence of quality furnished by the contractor,
- o inspection, surveillance, and audit at the source in accordance with written procedures during design, manufacture, inspection and test to verify compliance with quality requirements,
- o examination of items upon delivery in accordance with written procedures, and
- o review and acceptance of quality records required to be delivered with the item to the plant site.

The measures described here are applied to all safety-related structures, systems and components not fabricated within GE-ARSD's facilities. In the event another General Electric Company Division or Department is awarded a contract to be a supplier to GE-ARSD, the measures described here are applicable.

Source evaluation and approval activities are initiated during review of the Material Request (MR) by the Quality Assurance Engineer as discussed in Section 4.0 of this Appendix. Instructions are entered on the MR, defining to the purchasing organization the approval level to which a supplier must be qualified. Approved Supplier Listings contain information such as the product or service for which the supplier has been approved, and the quality level (including ASME Code) for which they are approved suppliers. The method of supplier evaluation may include past performance, supplier Quality Assurance Program Manual review, and/or on-site survey.

Whenever Purchasing proposes to use a supplier that is not listed on the approved supplier list or is listed with a lower approval level, a request for evaluation is initiated by Purchasing to Quality Assurance, who is responsible for performing the appropriate evaluation of the supplier's Quality Assurance Program. When appropriate, qualified Engineering, Manufacturing, Procurement, etc., personnel participate in the supplier evaluation to ensure that a supplier possesses specific capabilities. Results of supplier evaluations are documented and maintained on file at GE-ARSD.

The Quality Assurance engineer following review and approval of the procurement package, discussed in Section 4.0 of this Appendix, directs the preparation of Source Inspection Plans (SIPs) and/or Receiving Inspection Plans (RIPs). The SIP or RIP specifies the characteristics to be verified by inspection or test and the point at which the inspection will be performed.

The SIP or RIP is approved by Quality Assurance Management. The SIP or RIP includes provision for verification sign-off of each requirement specified. Supplier-generated documents, including design and manufacturing drawings and manufacturing and inspection plans for complex equipment, are evaluated to determine those characteristics, and supporting documentation, to be verified by in-process inspection or witness by GE-ARSD. Notification of these inspection and witness points is made to the supplier. Source inspection is performed at these points (prior to release for shipment) upon notification by the supplier. Source inspection may not be required when all quality characteristics to be verified are accessible for inspection upon receipt, or the quality of the items can be verified by review of test reports, or by performance of acceptance test.

The SIPs or RIPs define where specific characteristics are to be verified or inspected. Source and Receiving Inspection Plans define applicable inspection criteria, quantitative and qualitative. Receiving inspection of supplier-furnished material, equipment and services for both nuclear and commercial "off-the-shelf" items, is performed in accordance with predetermined RIPs prior to use or installation to verify that:

- 1) The material, component, or equipment is properly identified and corresponds with receiving documentation.
- 2) Required inspection records, or certificates of conformance which attest to the acceptance of material, components, and equipment are available and acceptable. These records are supplied to the LRM or site in accordance with contract requirements.
- 3) Items accepted and released are identified as to their inspection status prior to forwarding them to a controlled storage area, or releasing them for installation or further work.
- 4) Nonconforming items are segregated, controlled and clearly identified until proper disposition is made as discussed in Section 15.0 of this Appendix.

The results of source surveillance, inspection and receiving inspection are recorded on the SIPs or RIPs and provide appropriate objective evidence along with the certifications of conformance statements of the quality of material, equipment and services furnished by the supplier.

Source surveillance and inspection is performed or controlled by Product Assurance and Services personnel. For major procurements, resident representatives may be assigned to the supplier's facility. Receiving inspection is performed by QC inspectors.

Personnel performing inspection, test and surveillance functions are qualified as described in Section 10.0 of this Appendix.

A Vendor Case Record routine is specified as part of the quality requirements and is utilized by the supplier to report nonconformances to procurement requirements dispositioned "accept as is" or "repair," as described in Section 15.0 of this Appendix.

Suppliers' certificates of conformance are verified as follows:

- (a) Material overchecks are periodically performed on selected materials to verify the accuracy of the supplier's certificates of conformance.
- (b) NDE suppliers' inspection and test report results are verified by comparing results obtained with test specification requirements and/or by verifying their NDE results (e.g. by reading of X-ray films).

For processes such as welding, suppliers' weld qualification samples may be independently verified when appropriate to achieve the required level of quality.

GE-ARSD plans and performs, as appropriate, in-process surveillance and inspections, final source inspections and/or receiving inspections to verify conformance with specified requirements.

Quality audits are scheduled and performed by Product Assurance Audits to verify supplier compliance with specified quality requirements. These audits are performed as described in Section 18.0 of this Appendix. Requests for corrective action are submitted through Purchasing to the Suppliers for areas determined to be deficient.

The controls for spare and replacement parts procured by GE-ARSD are identical to those described in this section of this Appendix.

## 8.0 IDENTIFICATION AND CONTROL OF MATERIALS, PARTS AND COMPONENTS

Procedures are established to define engineering requirements for identification of materials, parts, and components. The identification requirements include such items as model or part number, marking method, and nameplate location. The LRM has provided GE-ARSD the CRP equipment identification numbering structure for use in establishing identification requirements in specifications and drawings.

The identification requirements for materials, parts and components are established by the responsible engineer during the initial design. Identification of materials, parts and components is maintained as required throughout manufacturing, fabrication, assembly, test and shipment to the customer.

Identification and control of materials (including consumables), parts and components fabricated by GE-ARSD are specified by procedures. These procedures provide the means for assuring that only correct and acceptable items are used during manufacture. Physical identification is specified and utilized to the maximum extent practical. Identification is made either on the item or on records traceable to the item. Where identification marking of the item is used, the marking is applied in a manner that will not affect the item's function or quality.

Raw materials are identified by tagging or other specified means. Identification includes Purchase Order Number, item number, applicable specification number/drawing number, material type, heat, etc.

Materials are introduced into the fabrication process utilizing the Work Order Record/shop traveler which provides traceability and material identification requirements throughout fabrication, assembly, testing and shipping.

The QC Inspector verifies that specified materials are being used and are correctly identified with the Work Order Record number. As fabrication of parts, subassemblies, partially fabricated subassemblies, and assemblies progresses, re-identification is accomplished as prescribed by the shop planning. The QC Inspector verifies such re-identification operation.

Nonconforming materials, parts and components are identified and segregated as described in Section 15.0 of this Appendix.

Requirements for identification of purchased items are identified in procurement documents in Section 4.0 of this Appendix.

Purchased materials, parts and components are verified when received to assure that the identification conforms to the requirements specified by the Purchase Order, drawing or specification as described in Section 7.0 of this Appendix and is traceable to certifications. Only those materials, parts or components that conform to their identification requirements are accepted and released.

Records that provide traceability of materials, parts or components quality history are accumulated and maintained as described in Section 17.0 of this Appendix.

## 9.0 CONTROL OF SPECIAL PROCESSES

Special process requirements are specified as part of the technical documentation as described in Section 3.0 of this appendix. The criteria for establishing special process consists of two (2) basic categories.

- (1) NDE where the results can be correlated to the control of essential parameters.
- (2) Fabrication processes such as welding, heat treating, bonding, coating, soldering, plating, hard surfacing and cleaning.

Special processes performed at GE-ARSD, such as welding, heat treating, nondestructive examination and others are accomplished under controlled conditions. Personnel performing special processes are qualified (in accordance with written procedures) and certified as required by codes or other contractual documents. QA approves the criteria established to qualify the process, witnesses the qualification performance as appropriate and approves the results of the qualification performance. Also, Quality Assurance verifies the accomplishment of the special process operations.

Special process operations are identified on the Work Order Record (WOR) and specify the specific procedure or instruction to be utilized.

Nondestructive examination procedures are prepared or approved by a Level II examiner to define nondestructive examination requirements. The procedures define the methods, equipment, acceptance standard and final examination record requirements. A nondestructive examination report is completed for each examination performed which documents the technique used, the examination results and identification of the certified examiner, who performed the inspection by signature, level and date. In addition, the certified examiner signs and dates the WOR. NDE personnel are qualified and certified in accordance with ASNT, SNT-TC-1A. Personnel are periodically recertified. Records that substantiate nondestructive examination personnel qualifications are maintained by ARSD.

Welding procedure specifications are prepared by a welding engineer and are maintained in a GE-ARSD welding manual. Welding procedure specifications contain the methods and the essential and non-essential variables. Welding procedures and personnel are qualified in accordance with applicable codes, standards, or other contract requirements. The welding procedure specifications, the record of welding procedure qualification tests, welder performance qualification tests, and the certified test reports are maintained as quality records.

Heat treatment operations, including post weld heat treatments, specified on the Work Order Record when subcontracted to heat treat suppliers are controlled as described in Section 4.0 of this Appendix. Heat treatment records in the form of time temperature charts, or data with furnace identification, are obtained for each operation and are maintained as quality records.

Cleaning and other special processes when used are documented in written procedures prepared by Manufacturing Engineering.

Control of special processes for purchased items is specified on procurement documents as described in Section 4.0 of this Appendix and verified as described in Section 7.0 of this Appendix.

## 10.0 INSPECTION

Inspection and acceptance testing is performed by Quality Assurance personnel who are organizationally independent from organizations responsible for performance of the activity being inspected. Inspection and testing are performed to procedures by trained and qualified personnel. Qualification is based on demonstration of proficiency, skill, knowledge or experience. It is the responsibility of Quality Assurance management to assure that personnel under their direction receive appropriate training, maintain qualifications current and receive remedial training when quality trends indicate the need for retraining.

Inspection planning, defining the characteristics to be inspected, method of inspection, drawing acceptance and rejection criteria and requirements for recording of inspection results are documented or referenced as a part of the Work Order Record as described in Section 5.0 of this appendix. The WOR is reviewed by QA prior to issue to assure that all mandatory hold points are identified (e.g., in-house, customer, AI, etc.). For ASME code items, the WOR is reviewed with the Authorized Inspector for his designation of mandatory hold and check points. All inspection operations are signed and dated as verification of completion. Inspection and NDE reports of the results are referenced on the WOR along with the Nonconforming Item Record number when applicable. The inspection planning contains reference to procedures, drawings and specifications, by revision, when needed to perform the inspection.

Personnel who perform nondestructive examinations are qualified and certified as described in Section 9.0 of this appendix.

Whenever direct measurement is not possible, process surveillance is utilized as specified on the WOR.

Modification, repair, rework and replacement operations are specified on Work Order Records, and such operations are completed and inspected the same as the original item.

Inspection results are reviewed by Quality Assurance personnel prior to release of a product for shipment to provide assurance that inspection requirements have been satisfied and that proper records have been prepared.

Inspection of purchased items is described in Section 7.0 of this Appendix.

Inspection and test records contain the following where applicable:

- a. A description of the type of observation.
- b. The date and results of the inspection or test.
- c. Information related to conditions adverse to quality.
- d. Inspector or data recorder identification.
- e. Evidence as to the acceptability of the results.
- f. Action taken to resolve any discrepancies noted.

The inspection planning includes designation of the necessary measuring and test equipment including accuracy requirements.

## 11.0 TEST CONTROL

Test programs are identified and documented in accordance with established procedures. The test programs cover all required tests, including, as appropriate, prototype/qualification tests, hydrostatic tests of pressure boundary components, in-process tests of manufactured items, and proof and acceptance tests prior to installation.

Technical documentation in the form of specifications and drawings define the requirements for in-process tests, acceptance tests, and verification tests of performance characteristics.

Operating and Test Procedures are prepared by Engineering and issued as specifications to define the operational requirements and test procedures for conduct of prototype/qualification, proof and acceptance testing. These procedures: (a) define the test objectives, (b) describe the test item and interfaces with the test facility, (c) describe unique handling requirements and equipment, (d) describe the test details, including acceptance and rejection criteria contained in applicable design documents, and environmental limitations, (e) itemize the parameters to be measured, accuracy requirements, instrumentation response characteristics, range of variables to be measured, error analysis requirements, (f) provide instructions for data collection, reduction, analysis, and retention, (g) describe facility and facility equipment requirements, and (h) Quality Assurance inspection and check points. Test items failing to meet specified performance requirements are documented on a Nonconforming Item Record and dispositioned by a Material Review Board consisting of representatives from Engineering and Quality Assurance, and for rework and repair dispositions a manufacturing engineer.

The Material Review Board is responsible for determining that items repaired and replaced are tested in accordance with the original or acceptable alternative design and test requirements.

Responsibility for acceptance of prototype/qualification test results is assigned to the responsible engineering manager.

Tests required to be performed during the manufacturing process are identified on the Work Order Record, the prime controlling document for all manufacturing operations, including testing. Quality Control Instructions (QCIs) or Manufacturing Process Instructions (MPIs) are referenced on the Work Order Record and provide detailed instructions for in-process and final acceptance testing of items, including (a) instructions for test method, equipment and instrumentation, and (b) test prerequisites, such as calibrated instrumentation, equipment, personnel qualification, condition and status of item to be tested, environmental conditions, acceptance criteria, and documentation requirements, for acceptable and nonconforming items.

The Work Order Record contains provisions for designating and sign-off of HOLD and CHECK POINTS by the Authorized Inspector or customer representative.

The "Test Authorization and Record" (TAR) is used to identify the requirements of tests which are not performed during the manufacturing process. The TAR serves the same purpose as the "Work Order Record" and has provisions for identifying hold, witness, inspection, etc. points during the test sequence.

Responsibility for review and acceptance of in-process and final acceptance test results is assigned to the delegated Product Assurance Manager. The TAR is reviewed by the Quality Assurance organization prior to issuance.

## 12.0 CONTROL OF MEASURING AND TEST EQUIPMENT

Tools, gauges and instruments used in measurement, inspection, and monitoring for product acceptance are calibrated and recalibrated at specified intervals based on the required accuracy, purpose, degree of usage, stability characteristics, and other conditions affecting the measurement and they are controlled in accordance with established procedures. Procedures require that calibration standards have an uncertainty (error) requirement of no more than 1/10 to 1/4 of the allowable tolerance of the equipment being calibrated. When this is not possible, procedures require the equipment being calibrated to be within required tolerance and the basis of acceptance is documented and authorized by the Manager Development Tests and Plant Materials Operation. Measurement and test equipment is calibrated utilizing standards whose calibration is traceable to the U. S. National Bureau of Standards, accepted values of natural physical constants, or standards derived by rational self-calibration techniques.

Responsibility for calibration of test instruments is assigned to the GE-ARSD Development Test and Plant Materials Operations which reports to Manager - Product Assurance and Services. Responsibility for calibration of tools and gauges is subcontracted. Included within this responsibility is performance of initial and periodic calibration, establishment of calibration frequency, calibration standards, calibration procedures, records and notification of Product Assurance when equipment is found to be out of calibration, and identification of calibration status.

The assurance that tools, gauges, and instruments used for product acceptance are of the proper range, types and accuracy to verify conformance to design requirements is the responsibility of Quality Assurance. Surveillance is maintained of tools, gauges, and instruments being utilized by inspection and manufacturing to assure that they are within current calibration. If a tool, gauge or instrument is found to be beyond its calibration due date, it is removed from use by the Quality Control Inspector affixing a Quality Hold Tag. When a tool, gauge, or instrument is found to be out-of-calibration during periodic recalibration, Quality Control is immediately notified by the source performing the calibration and informed of the nature and extent of the error. An investigation is conducted to determine the materials, parts or components affected by the error reported. Based upon the investigation results, re-inspections are made to verify the validity of the previous readings obtained. Unacceptable materials, parts, and components are submitted to the Material Review Board on a Nonconforming Item Record for disposition as described in Section 15.0 of this Appendix.

GE-ARSD utilizes procedures for control of measuring and test equipment which conform with the requirements of RDT F3-2T, Calibration Program Requirements, and the Measuring and Test Equipment Calibration and Control Requirements of RDT F2-2. These procedures require the use of identification labels to indicate next calibration due date.

GE-ARSD's major subcontractors and suppliers which have RDT Standard F2-2 imposed, are required to meet the applicable requirements of RDT Standard F3-2T, Calibration Program Requirements, and the Measuring and Test Equipment Calibration and Control Requirements of RDT Standard F2-2. All other suppliers are required to meet other calibration standards established by government or industry. Vendor surveys and audits verify that these requirements are being complied with.

### 13.0 HANDLING, STORAGE, AND SHIPPING

Procedures and instructions are established to provide control of handling, storage, cleaning, packaging, preserving, shipping release and shipping of material and equipment as necessary to prevent damage, deterioration or loss during manufacture and shipment. When necessary for a particular item, special coverings, special equipment, or special environmental conditions, such as, inert gas atmosphere, specific moisture content levels, and temperature levels are specified by Engineering and verified by Product Assurance. As required, special markings or instructions are used to identify, maintain and preserve a shipment, including indication of the presence of special environments or the need for special control.

Technical documents, such as specifications, specify the requirements applicable to special handling, preservation, storage, cleaning, packing and shipping. The shop traveler is prepared by Manufacturing Engineering to provide instructions for performing these activities.

For both GE-ARSD manufactured items and for direct-to-site procured equipment, Product Assurance verifies that identified quality requirements have been completed prior to product shipment release. These verification activities are discussed in Sections 7.0 and 10.0 of this appendix.

Necessary instructions or guidance for Site inspection, handling, preservation, storage and special controls are prepared and are delivered to the Site prior to or at the time of component shipment.

GE-ARSD engineering personnel establish the requirements for special handling, preservation, storage, cleaning, packaging and shipping. Personnel accomplishing these activities are hired to fill job descriptions which include job qualification requirements. Performing personnel utilize documented procedures to accomplish these activities. For any unique task of this type for which a procedure does not exist, an instruction or procedure is prepared and proper training is accomplished prior to use.

#### 14.0 INSPECTION, TEST AND OPERATING STATUS

The Work Order Record is the prime controlling document for all in-process manufacturing inspection and test operations at GE-ARSD. The Work Order Record delineates the sequence of operations to be performed and is used to document completion of machining, assembly, welding, inspection, examination, testing, preparation for shipment, and other operations. The Work Order Record accompanies the item throughout the manufacturing process. It identifies the item at all stages of manufacturing and provides the status of manufacturing inspection, examination and testing status. As each sequential step is accomplished, verification of completion is made by the performer, affixing his signature, date and pay number to the Work Order Record. Application of welding stamp is made directly on the part or on weld maps, referenced on the Work Order Record.

By-passing of inspection, test, and other critical operations can only be accomplished by revision of the Work Order Record and approval of the Quality Control Engineer.

At completion of the manufacturing cycle, the Quality Control Engineer verifies that all sign-offs required on the Work Order Record are completed.

During the manufacturing process, any item found to be nonconforming is segregated from conforming items and identified with a Quality Hold tag. The control of nonconforming items is discussed in Section 15.0 of this appendix.

GE-ARSD imposes requirements on subcontractors and suppliers for identification of witness and hold points in design, fabrication and test cycles for GE-ARSD participation and specifies that audits will be conducted by GE-ARSD. Suppliers are required to submit for approval a program schedule including manufacturing and test activities. GE-ARSD then identifies witness and hold points within the schedule.

## 15.0 NONCONFORMING MATERIALS, PARTS OR COMPONENTS

GE-ARSD controls materials, parts, components, and services (including computer codes) which do not conform to specified requirements in accordance with documented procedures in order to prevent their inadvertent use, further processing, or shipment. Procedures provide for identification, documentation, notification, segregation, evaluation, and disposition of nonconforming items.

Nonconformances are identified during inspection operations performed by GE-ARSD or by supplier notification. Nonconformances are documented by GE-ARSD Quality Control personnel on a Nonconforming Item Record (NIR) or by the supplier on a Vendor Case Record (VCR). These documents describe the item identification, reference the applicable drawing, specification, or standard, and describe the details of the nonconformance.

GE-ARSD fabricated items found to be nonconforming during manufacturing inspection operations are removed from the production flow, segregated in a quarantine area (size permitting), identified by attachment of a Quality Hold Tag prepared by the QC Inspector and recorded on a Nonconformance Record (reverse side of the Work Order Record). Nonconformances which cannot be reworked to the drawing or specification using Standard Shop Practices and Procedures are further documented on an NIR for disposition by the M.R.B.

Purchased items found to be nonconforming at Receiving Inspection are identified with a Quality Hold Tag prepared by the QC Inspector. The NIR serial number is recorded on the Quality Hold Tag and Receiving Inspection Plan to provide cross reference identification to the document submitted for MRB disposition.

A Material Review Board is established to evaluate and determine disposition of NIRs for items that cannot be reworked and for VCRs. The Board consists of authorized members representing Engineering and Product Assurance. The Material Review Board's disposition and directions are recorded on the NIR or VCR. When the nonconformance is associated with an ARSD manufactured item and the item disposition involves rework or repair operations, the concurrence of a Manufacturing Engineer is also required. Material Review Board dispositions of "Repair" or "Accept as is" for end items are submitted to the LRM for approval, as required by contract, and on ASME Code materials, parts or components are also submitted to the Authorized Inspector for his review and concurrence.

Items dispositioned as rework or repair are reprocessed and re-inspected using the Work Order Record to assure that the reworked items conform to drawing or specification requirements and repair items conform to the repair procedure requirements.

Items dispositioned as reject are quarantined and ultimately disposed of either by scrapping or returning to the supplier. Manufactured items, when scrapped, are marked or deformed to preclude their use. To provide assurance that all actions are complete, including C/A as described in Section 16.0, on each Nonconforming Item Record processed, a final review and close-out of the document is performed by signature of the Quality Assurance MRB Representative.

Copies of NIRs and VCRs are made part of the inspection records which support the quality of the material, part or component. Copies of NIRs and VCRs are also forwarded to the customer as part of the records package as required to fulfill code, specification or contractual requirements.

NIRs and VCRs are analyzed by Quality Assurance personnel to determine quality trends and categorized by responsible function, fault code and fault category. As adverse trends are identified, corrective action is initiated. Quality Trend Reports are generated and forwarded to affected management for information and action.

## 16.0 CORRECTIVE ACTION

Conditions that are adverse to quality (such as nonconformance, failures, malfunctions, deficiencies, deviations, defective material, defective equipment and other anomalies) identified both internally and externally are processed for corrective action in accordance with established GE requirements.

Corrective actions are initiated following the determination of a condition that is adverse to quality to preclude its recurrence. GE identifies, documents and implements these corrective actions in accordance with documented procedures that are reviewed and issued as described in Section 2.0. Corrective action requirements result from evaluations of purchased and fabricated item nonconformances as described in Section 15.0, design errors and deficiencies as described in Section 3.0, and audit results as described in Section 18.0 of this Appendix. Proposed corrective action related to nonconformances, failures, unsatisfactory conditions and audit findings are reviewed for adequacy by Product Assurance with subsequent followup for timely closeout.

The Unsatisfactory Condition Record (UCR), Corrective Action Request (CAR) and suppliers Corrective Action Request (SCAR) are used to document requirements for corrective action and follow-up. UCRs are initiated by GE-ARSD personnel who become aware of a problem outside of any formal audit activity. CARs can be initiated by Quality Assurance personnel and others acting in an audit capacity as a result of internal audit activities. Deviations identified from external audits require that corrective action by the Supplier be identified and submitted to GE. Request for corrective action for deficiencies discovered by source and receiving inspection on supplier products are made using the SCAR, when appropriate.

UCRs and CARs are directed to responsible organizations describing the adverse conditions and requesting corrective action to alleviate the problem. Responsible managers at Suppliers are required to respond to the request within a predetermined time period. The recipient completes and returns the document to the issuing organization for review and acceptance with follow-up reviews performed to assure that actions committed are implemented and effective. Upon determination that the action taken has been implemented and is effective to preclude recurrence, the CAR or UCR is closed out. All CARs issued by Product Assurance Audits which have overdue response or action dates are listed on a Monthly Status Report, distributed to Management, and reported at appropriate Management Review Meetings.

CARs and UCRs may identify problems that require reporting by other reporting documents; such as, Failure and Unusual Occurrences Reports. These reports assure that appropriate GE-ARSD Management and customers receive notification of unusual occurrences requiring technical evaluation or corrective action or that impact safety.

## 17.0 QUALITY RECORDS

GE-ARSD collects, stores, and maintains records necessary to provide documentary evidence of the quality of items and services in accordance with Procedures and Practice.

The scope of the Quality Records Program includes results of reviews, inspections, tests, audits, and material analyses; monitoring of work performance; qualification of personnel, procedures, and equipment; and other documentation such as drawings, specifications, procurement documents, calibration procedures and reports; nonconformance reports; and corrective action reports.

The records are accumulated and processed for shipment to the customer to be permanently stored. The processing of the records is performed in a controlled access area and they are available for review upon request. The controlled access area has fire, flooding, and environmental controls that comply with the requirements and regulations covering office space provided for employees.

The Manager, CRP is responsible for establishing a Quality Records Management System and its implementation through the Department's procedural system. The Quality Records Management System is responsive to applicable requirements and regulations and provides:

- A. for the identification, declaration and indexing of records to be preserved as Quality Records for the CRBRP Project.
- B. a method of positive identification and correlation of each record with the item or activity to which it applies.
- C. a method of timely transfer of Quality Records to the Owner.

The Manager, Technical Operations Support is responsible for establishing a Records Management Organization. Activities to support the implementation of the Quality Records Management System include:

- A. Coordination of a Record Identification System.
- B. Coordination of record files/storage as maintained by the responsible organizations and establishment and operation of working and reference files within a controlled access area.
- C. Maintenance of a listing, as furnished by the CRP Section, of all indices and/or logs of quality records.
- D. Coordination of the transfer of records to the customer (owner) as required. Assure preservation and safekeeping of the records.
- E. Accepted Quality Records will be held pending authorization for transfer to the Owner.

GE-ARSD records include inspections, test, audits, and material analyses; monitoring of work performance; qualification of personnel, procedures, and equipment; and other documentation; such as, drawings, specifications, procurement documents, calibration procedures and reports; non-conformance reports; and corrective action reports.

GE-ARSD Inspection and test records for acceptance and delivery for CRBRP contain:

- A. A description of the type of observation.
- B. Evidence of completing and verifying a manufacturing, inspection, or test operation.
- C. The date and results of the inspection or test.
- D. Information related to non-conformance.
- E. Inspector or data recorder identification.
- F. A statement as to the acceptability of the results.

The requirements and responsibilities for record transmittals, retention, and maintenance subsequent to completion of work, are consistent with procurement documents and applicable codes and standards.

## 18.0 AUDITS

GE-ARSD conducts a comprehensive audit program to verify that the QA Program requirements have been developed, documented, and effectively implemented and complied with. The audit program is applicable in those quality program activities conducted directly by GE-ARSD as well as those delegated to suppliers. Responsibility for conducting the audit program is established in Section 1.0 of this Appendix.

Internal and external audit plans are issued annually and updated on a quarterly basis. The audit plans delineate the activities, organizations, processes or products to be audited; the work scope to be audited, i.e., project management, planning, design, procurement, manufacturing, records, training, etc.; and the planned schedules for conducting the audits.

GE-ARSD internal and external audits, as well as vendor surveys include an objective evaluation of:

- a. Work areas, activities, processes, and items, and the review of documents and records.
- b. Quality-related practices, procedures, and instructions and the effectiveness of implementation.

In developing the audit plans, the frequency, scope and activities to be audited are based on importance and status of the activity. All applicable Quality Assurance Program criteria are audited at least once during the contract. The audit team leader is selected on the basis of his experience, training, demonstrated capability to perform audits and familiarity with the methods, procedures and codes and standards applicable to the audit scope. The members of the audit team are selected on the basis of their familiarity with the methods, procedures, and codes and standards applicable to the audit scope. No member of the audit team can have any direct responsibility for the activity being audited.

Prior to conducting audits, the lead auditor prepares a specific audit plan identifying the subject of the audit, purpose and scope of audit, audit dates, audit team and audit criteria; and an audit checklist which identifies the functional areas to be audited, the audit contact, the reference documents, and characteristics to be evaluated. The specific audit plan is approved by the Manager, Product Assurance Audits. The audit checklist is utilized by the audit team to record their findings and observations.

At the conclusion of the audit, an exit review is held with the management to review the findings and corrective action requirements. Corrective Action Requests (CARs) are prepared to document each significant discrepancy found and are directed to appropriate management as discussed in Section 16.0 of this Appendix. An audit report is prepared to document the audit results. Internal audit reports are distributed to the audited Managers; Manager, Product Assurance and Services Section; Manager, Product Assurance Clinch River Project; Manager, Clinch River Project Section; and other responsible Section and Subsection Managers.

External audit reports with all findings are distributed to the appropriate internal management and are submitted to the purchasing organization for distribution to the supplier along with a request for corrective action. Information concerning audit results is provided to the LRM.

When results from a number of audits or other surveillance activities indicate that a generic adverse trend is developing, a Quality Trend Report is prepared and distributed to appropriate management. Follow-up audits are conducted as appropriate to verify the effectiveness of corrective action performed.

Audits confirm compliance with established procedures for interface control, computer codes, calibration, and nonconforming item control. These audits cover interfaces with the LRM, other RMs and with subcontractors and suppliers. Activity audits, both internal and external, verify the implementation and effectiveness of indoctrination and training programs.

A complete file of records to support each audit conducted is maintained.

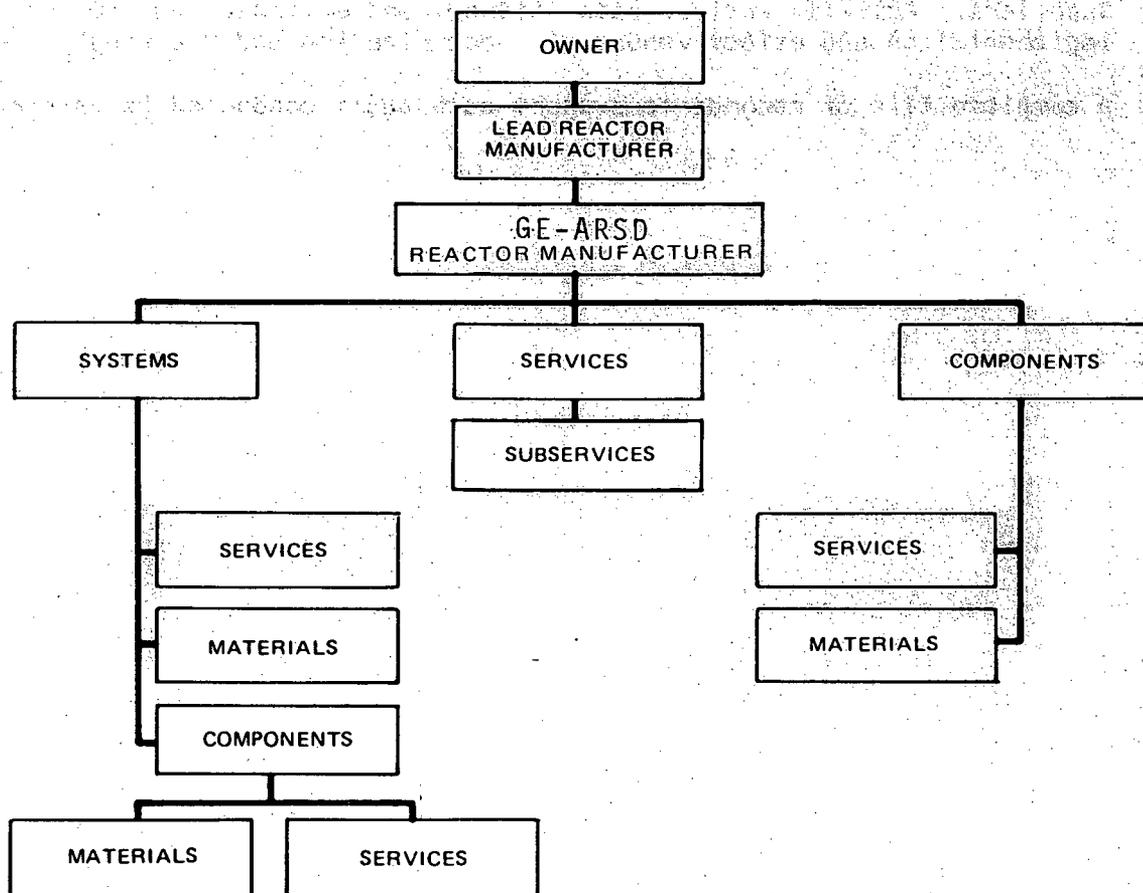
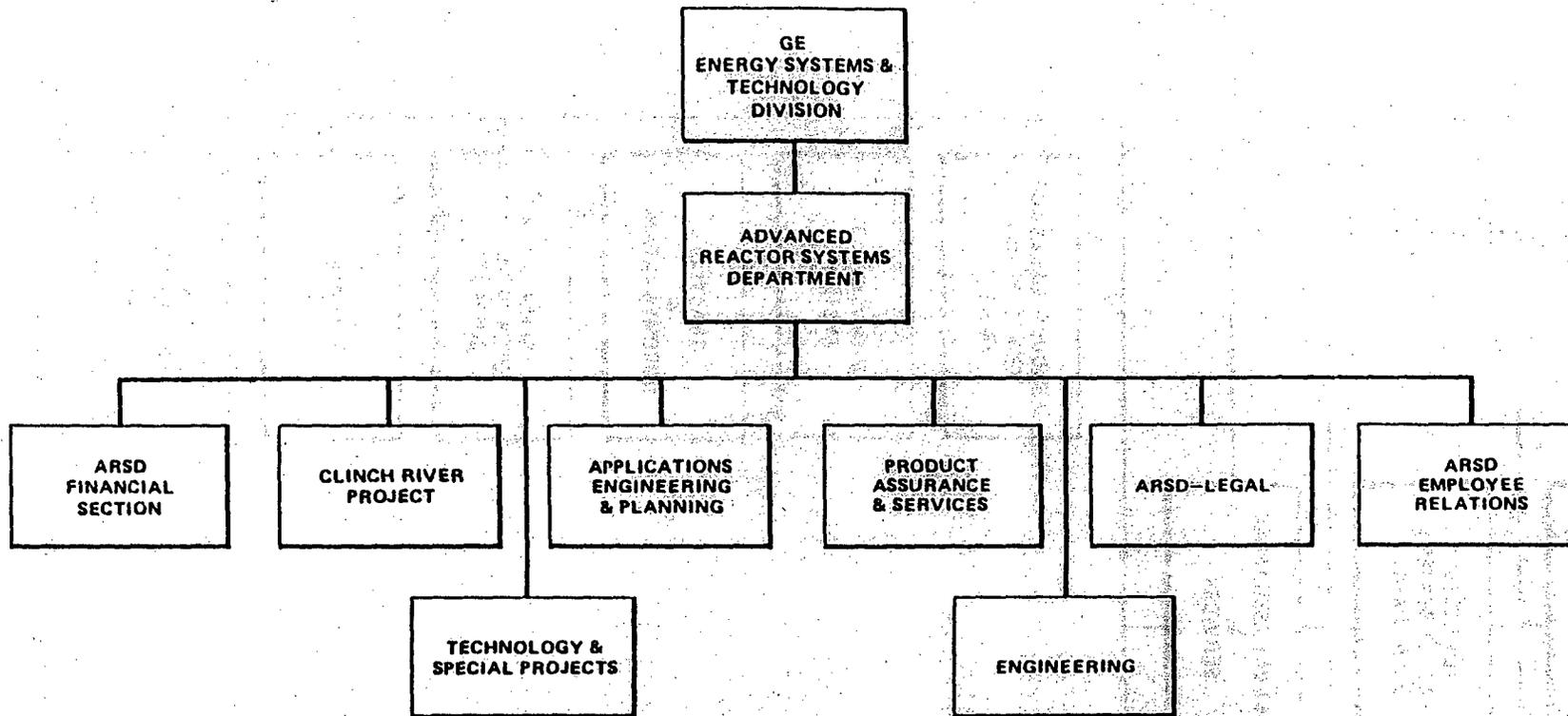


Figure 17I-1. Organization of Quality Assurance Program Participation

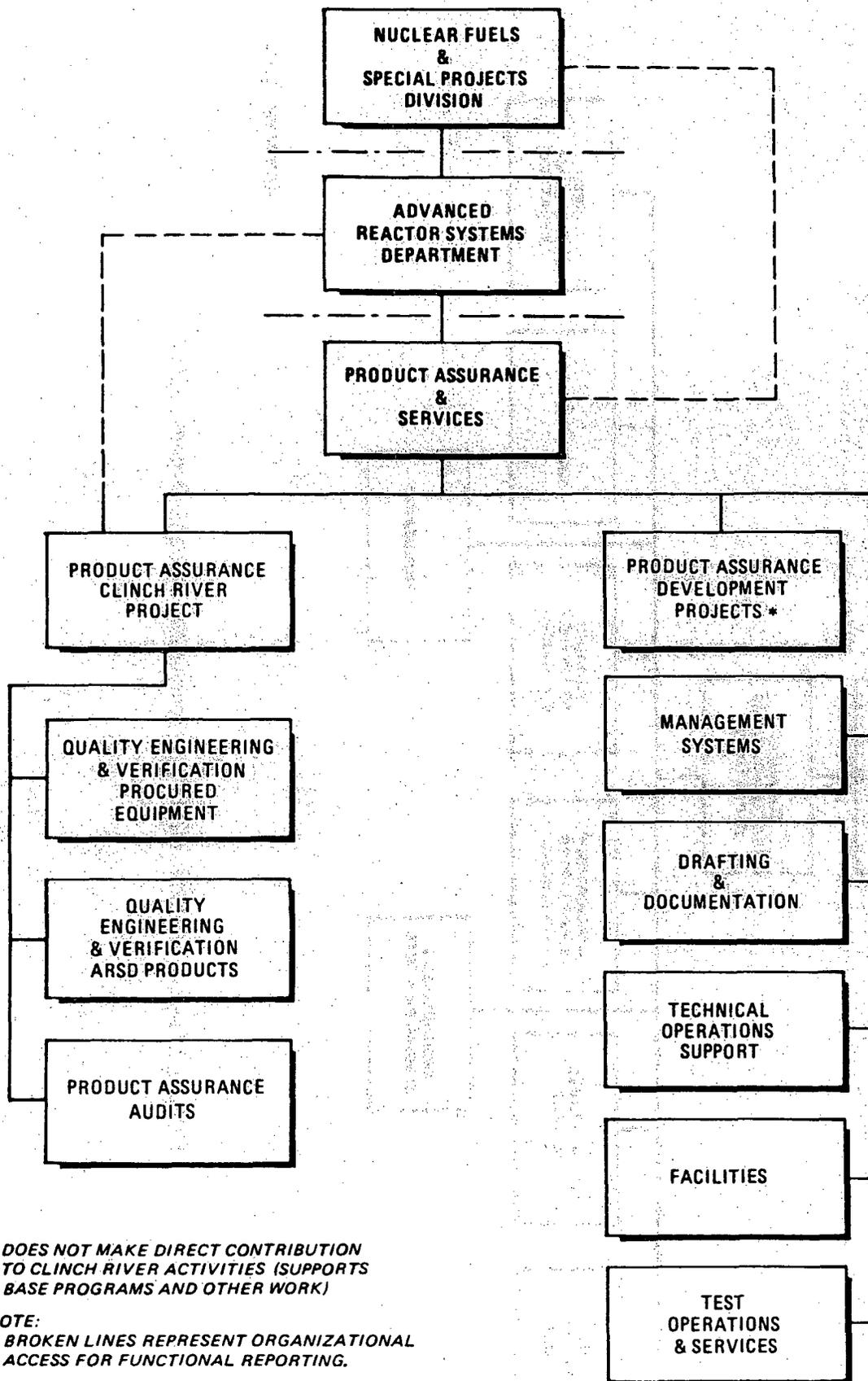
171-41



January 1982

Figure 171-2. GE-ARSD Quality Program Management Organization

Amend. 71  
Sept. 1982



\* DOES NOT MAKE DIRECT CONTRIBUTION TO CLINCH RIVER ACTIVITIES (SUPPORTS BASE PROGRAMS AND OTHER WORK)

NOTE:  
BROKEN LINES REPRESENT ORGANIZATIONAL ACCESS FOR FUNCTIONAL REPORTING.

Figure 17I-3 GE-ARSD PRODUCT ASSURANCE ORGANIZATION

83-188-01

PROGRAM MANAGEMENT

<b>QUALITY ASSURANCE PROGRAM</b> 1. Planning 2. Quality Assurance Program Index	<b>ORGANIZATION</b> 1. Responsibility and Authority 2. Training and Indoctrination 3. Personnel Qualification	<b>DOCUMENTATION</b> 1. Policies and Procedures 2. Quality Records 3. Quality Status Reports	<b>AUDITS AND REVIEWS</b> 1. Quality Audits 2. Management Reviews	<b>CORRECTIVE ACTION</b> UNUSUAL OCCURRENCE REPORTING	<b>ENGINEERING HOLDS</b>
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DESIGN AND DEVELOPMENT

- Design Planning
- Design Definition and Control
  1. Design Criteria
  2. Codes, Standards and Practices
  3. Engineering Studies
  4. Parts, Materials and Processes
  5. Design Descriptions
  6. Specifications, Drawings and Instructions
  7. Identification
  8. Acceptance Criteria
  9. Interface Control
- Document Review and Control
  1. Document Reviews
  2. Document Control
  3. Engineering Drawing Lists
- Design Reviews
- Development
- Failure Reporting and Corrective Action

PROCUREMENT

- Procurement Planning
- Procurement Requirements
- Procurement Document Reviews
- Evaluation and Selection of Procurement Sources
  1. General Requirements
  2. Acceptable Source List
  3. Pre-Award Evaluation
  4. Interchange of Source Capability Information
- Control of Configuration
  1. Contract Change Control
  2. As-Built Verification
- Equipment Calibration and Standards
- Source Surveillance and Inspection
- Receiving Inspection
  1. Planning and Inspection
  2. Documentation
  3. Dispositioning of Received Items
- Control of Nonconforming Items
- Control of Received Items

MANUFACTURING, FABRICATION AND ASSEMBLY

- Planning
- Inspection and Test Plan
- Material Identification and Control
- Control of Processes
  1. Fabrication and Assembly Processes
  2. Process Qualification
  3. Nondestructive Examination
  4. Cleaning
- Inspection and Tests
  1. General Requirements
  2. Procedures
  3. Completed Item Inspection and Test
  4. Inspection Status Indication
  5. Certification
- Document Control
- Equipment Calibration and Standards
  1. Equipment Evaluation
  2. Control of Inspection Measuring and Test Equipment
  3. Calibration Standards
  4. Discrepancy Equipment
- Statistical Quality Control and Analysis
- Control of Nonconforming Items
- Corrective Action
- Handling, Preservation, Packaging, Storage and Shipping
  1. Handling
  2. Preservation, Packaging and Storage
  3. Shipping

171-43

Amend. 52  
Oct. 1979

Figure 171-4. Major Elements of the GE-ARSD-RM QA Program

TABLE 171-1

GE-ARSD Quality Assurance Procedures Index versus  
Requirements of 10 CFR 50, Appendix "B"

Sheet 1 of 7

10CFR50 App B Criteria	Title	Implementing Document*
I	Organization	Organization List - ARSD Product Quality Quality Assurance Program Index 03-002 (Section 1.2 "Organization and Responsibilities")
II	Quality Assurance Program	Quality Assurance Program Index 03-002
III	Design Control	Project Baseline Definition and Documentation Project Baseline Definition and Documentation - CRBRP Project CRBRP Quality Verification Planning Quality Verification Planning - CRBRP Project CRBRP Working Level Design Data CRBRP Safety Categories Functional Classification Design Criteria Configuration Management Design Definition Documentation Structure Engineering Work Records Design Data Hold Design Data Hold - CRBRP Project Engineering Change Notice Engineering Change Notice - CRBRP Project CRBRP Configuration Management System CRBRP Configuration Control Board CRBRP Engineering Change Proposal CRBRP Waiver Requests Supplier Documentation Design Reviews Drawings and Specifications Drawings and Specifications - CRBRP Project Receiving, In-Process, and Final Inspection Receiving, In-Process, and Final Inspection - CRBRP Project

\*See Attachment 171-1 for description of Implementing Documents.

171-44

Amend. 71  
Sept. 1982

TABLE 17I-1

GE-ARSD Quality Assurance Procedures Index versus  
Requirements of 10CFR50, Appendix "B"

Sheet 2 of 7

10CFR50 App B Criteria	Title	Implementing Document*
III (Cont.)		Standard Distribution RDT Standards Review, Approval and Issue - Drawings, Specifications and Standards Engineering Changes Preliminary Engineering Change (PEC) Preliminary Engineering Change (PEC) - CRBRP Project Engineering Configuration Definition System (ECDS)
IV	Procurement Document Control	Configuration Management Engineering Release Instruction Engineering Release Instruction - CRBRP Project Material Request Material Request - CRBRP Project Supplier Documentation Interdivisional Work Orders Request for Proposal or Quotation Purchase Order Approval Letter Order Purchase Orders, Revisions and Change Orders
V	Instructions, Procedures and Drawings	Receiving, In-Process and Final Inspection - CRBRP Project Receiving, In-Process and Final Inspection Fabrication Engineering Manufacturing System: Noncoded Items QA Manual for Compliance with ASME Boiler and Pressure Vessel Code, Section III Division 1, Sections 4.0 and 11.0

\*See Attachment 17I-1 for description of Implementing Documents.

17I-45

Amend. 74  
Dec. 1982

TABLE 17I-1

GE-ARSD Quality Assurance Procedures Index versus  
Requirements of 10 CFR 50, Appendix "B"

Sheet 3 of 7

10CFR50 App B Criteria	Title	Implementing Document*
V (Cont.)		Drawings and Specifications Drawings and Specifications - CRBRP Project Work Order Record
VI	Document Control	Reports Configuration Management Engineering Computer Codes Engineering Work Records Engineering Change Notice Engineering Change Notice - CRBRP Project Engineering Release Instruction Engineering Release Instruction - CRBRP Project CRBRP Working Level Design Data CRBRP Configuration Management System CRBRP Configuration Control Board CRBRP Engineering Change Proposal CRBRP Waiver Requests Supplier Documentation Drawings and Specifications Drawings and Specifications - CRBRP Project Standard Distribution Review, Approval and Issue - Drawings, Specifications and Standards Engineering Changes Engineering Configuration Definition System (ECDS) CRBRP Design Data and Baseline

\*See Attachment 17I-1 for description of Implementing Documents.

17I-46

Amend. 71  
Sept. 1982

TABLE 171-1

GE-ARSD Quality Assurance Procedures Index versus Requirements of 10CFR50, Appendix "B"

Sheet 4 of 7

10CFR50 App B Criteria	Title	Implementing Document*
VII	Control of Purchased Materials, Equipment and Services	Procurement Supplier Qualification Business Managed Procurement Business Managed Procurement - CRBRP Project Competitive Procurement Proposal Evaluation Plan Proposal Evaluation Cost/Price Analysis Supplier Negotiations Cost or Pricing Data Purchase Order Approval Contract Award Design Verification Design Verification - CRBRP Project Letter Order Source Inspection Configuration Management Receiving, In-Process and Final Inspection Receiving, In-Process and Final Inspection - CRBRP Project Supplier Contract Administration Material Request Material Request - CRBRP Project Supplier Shipment Supplier Shipment - CRBRP Project Receiving Purchased Material Receiving Inspection Deficiency
VIII	Identification and Control of Materials	Configuration Management Receiving, In-Process and Final Inspection Receiving, In-Process and Final Inspection - CRBRP Project Fabrication Engineering Manufacturing System: Noncoded Items QA Manual for Compliance with ASME Boiler and Pressure Vessel Code, Section III, Division 1, Sections 3.5, 4.4, 4.5 and 5.3 Handling, Preservation, Packaging, Storage and Shipping

\*See Attachment 171-1 for description of Implementing Documents.

171-47

Amend. 74  
Dec. 1982

TABLE 17I-1

GE-ARSD Quality Assurance Procedures Index versus  
Requirements of 10 CFR 50, Appendix "B"

Sheet 5 of 7

10CFR50 App B Criteria	Title	Implementing Document*
VIII (Cont.)		Materials Control Drawings and Specifications Drawings and Specifications - CRBRP Project Receiving Purchased Material Supplier Contract Administration
IX	Control of Special Processes	Fabrication Engineering Manufacturing System: Noncoded Items QA Manual for Compliance with ASME Boiler and Pressure Vessel Code, Section III, Division 1, Sections 4.5 and 4.6 Material Request Material Request - CRBRP Personnel Training, Indoctrination, and Qualification
X	Inspection	Fabrication Engineering Manufacturing System: Noncoded Items QA Manual for Compliance with ASME Boiler and Pressure Vessel Code, Section III, Division 1, Sections 3.4, 3.5 and 4.5 Work Order Record
XI	Test Control	Design Verification Design Verification - CRBRP Project Test Procedures and Plans Test Procedures and Plans - CRBRP Project Development Review Engineering Work Records QA Manual for Compliance with ASME Boiler and Pressure Vessel Code, Section III, Division 1, Section 4.8

\*See Attachment 17I-1 for description of Implementing Documents.

17I-48

Amend. 71  
Sept. 1982

TABLE 17I-1

GE-ARSD Quality Assurance Procedures Index versus  
Requirements of 10 CFR 50, Appendix "B"

Sheet 6 of 7

10CFR50 App B Criteria	Title	Implementing Document*
XI (Cont.)		Drawings and Specifications Drawings and Specifications - CRBRP Project Test Authorization Work Order Record
XII	Control of Measuring and Test Equipment	Measuring and Test Equipment Calibration and Control QA Manual for Compliance with ASME Boiler and Pressure Vessel Code, Section III, Division 1, Section 7
XIII	Handling, Storage and Shipping	Personnel Training, Indoctrination, and Qualification QA Manual for Compliance with ASME Boiler and Pressure Vessel Code, Section III, Division 1, Sections 4.6 and 4.7 Handling, Preservation, Packaging, Storage and Shipping Shipping Shipping - CRBRP Project Supplier Shipment Supplier Shipment - CRBRP Project Quality Audits Quality Audits - CRBRP Project CRBRP Field Deviation and Disposition Report Work Order Record
XIV	Inspection, Test and Operating Status	Receiving, In-Process and Final Inspection Receiving, In-Process and Final Inspection - CRBRP Project QA Manual for Compliance with ASME Boiler and Pressure Vessel Code, Section III, Division 1, Sections 4.5 and 11.2 Work Order Record
XV	Non-Conforming Materials, Parts or Components	Receiving, In-Process and Final Inspection Receiving, In-Process and Final Inspection - CRBRP Project QA Manual for Compliance with ASME Boiler and Pressure Vessel Code, Section III, Division 1, Section 11.0

\*See Attachment 17I-1 for description of Implementing Documents.

17I-49

Amend. 71  
Sept. 1982

TABLE 17I-1

GE-ARSD Quality Assurance Procedures Index versus  
Requirements of 10 CFR 50, Appendix "B"

Sheet 7 of 7

10CFR50 App B  
Criteria

Title

Implementing Document\*

XV (Cont.)

Testing Anomalies  
Supplier Identified Anomaly  
Supplier Identified Anomaly - CRBRP Project  
Anomaly System  
Source Inspection  
Receiving Purchased Materials  
Receiving Inspection Deficiency

XVI

Corrective Action

Supplier Identified Anomaly  
Supplier Identified Anomaly - CRBRP Project  
Unusual Occurrence Reporting and Management  
Unusual Occurrence Reporting and Management - CRBRP Project  
Quality Audits  
Quality Audits - CRBRP Project  
Anomaly System  
Testing Anomalies  
Unsatisfactory Condition Anomalies  
Unsatisfactory Condition Anomalies - CRBRP Project  
Source Inspection  
Receiving, In-Process and Final Inspection  
Receiving, In-Process and Final Inspection - CRBRP Project  
QA Manual for Compliance with ASME Boiler and Pressure Vessel  
Code, Section III, Division 1, Section 11.0

XVII

Quality Assurance  
Records

Record Control  
Record Control - CRBRP Project  
Shipping  
Shipping - CRBRP Project  
QA Manual for Compliance with ASME Boiler and Pressure Vessel  
Code, Section III, Division 1, Section 9.0

XVIII

Audits

Quality Audits  
Quality Audits - CRBRP Project

\*See Attachment 17I-1 for description of Implementing Documents.

(Next Page Is 17I-54)

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Amend. 71  
Sept. 1982

ATTACHMENT 171-1  
GE-ARSD QUALITY ASSURANCE DOCUMENT DESCRIPTIONS

1. Anomaly System

This instruction provides a summary of the departments system for documenting, controlling, reporting and discharging corrective actions for those conditions adverse to the quality of a department product.

2. Business Managed Procurement

This instruction defines the objectives, application, individual responsibilities and general approach to operation of a procurement team.

3. Business Managed Procurement - CRBRP Project

This addendum states instructions for procurements on the Clinch River Breeder Reactor Plant Project.

4. Competitive Procurement

This instruction defines adequate price competition, single source, sole source, and requires pursuit of competition.

5. Configuration Management

This policy establishes the guidelines for configuration management as a discipline that provides a system to certify that the product conforms exactly and on a continuing basis to its related documentation package through each of its revisions and changes.

6. Contract Award

This instruction defines the requirements for executing the contractual document.

7. Cost or Pricing Data

This instruction provides the means for compliance with Truth in Negotiations Act, and its principals as stated in federal regulations.

8. Cost or Price Analysis

This instruction provides for the performance of effective cost/price analysis.

9. CRBRP Configuration Control Board

This instruction describes the procedure and responsibilities in establishing a Configuration Control Board for the Clinch River Breeder Reactor Plant Project, defines membership and scope of activities.

10. CRBRP Configuration Management System

This instruction establishes the requirements and organizational responsibilities to develop and implement a Configuration Management System for the Clinch River Breeder Reactor Plant Project. It implements the CRBRP Project Configuration Management Plan. The objective of Configuration Management is to assure the customer that the products delivered under the Department's responsibility are physically and functionally what they are required to be.

11. CRBRP Design Data and Baseline

This instruction contains the approval process and the required approval authority for a baselined design document to be released for Clinch River Breeder Reactor Plant Project use.

12. CRBRP Engineering Change Proposal

This instruction provides the requirements for preparing, formatting, reviewing and approving an Engineering Change Proposal for the Clinch River Breeder Reactor Plant Project.

13. CRBRP Field Deviation and Disposition Report

This instruction establishes the method for processing a Field Deviation and Disposition Report (FDDR) within the Department for the Clinch River Breeder Reactor Plant (CRBRP) Project. The Plant Constructor initiates a FDDR and, where appropriate, submits it to the Department for the determination of a disposition of the observed field deviation.

14. CRBRP Safety Categories

This instruction defines the system of classification of equipment for the Clinch River Breeder Reactor Plant Project according to its risk potential during the various phases of plant operation.

15. CRBRP Waiver Requests

This instruction establishes a method for waiving a requirement on a specified component(s) when unusual circumstances are encountered on the Clinch River Breeder Reactor Plant Project.

16. CRBRP Working Level Design Data

This instruction establishes a method for preparing, controlling and releasing the transfer of nonbaselined, working level design data that does not impact cost or schedule within the Clinch River Breeder Reactor Plant Project.

17. Design Criteria

This document describes the requirements and responsibilities for initiating the use of design criteria documents within the department.

18. Design Data Hold

This document provides instructions for identifying and monitoring Design Data Holds on Department drawings, specifications and standards.

19. Design Data Hold - CRBRP Project

This addendum states additional or modified instructions for identification and monitoring of Design Data Holds for the Clinch River Breeder Reactor Plant Project.

20. Design Definition Documentation Structure

This instruction defines the hierarchical series of documents that provides control of and direction to a design as it evolves from the initial general contract requirements to the specific characteristics and requirements necessary for fabrication and use.

21. Design Reviews

This document provides guidelines and responsibilities for formally reviewing designs at component and systems level.

22. Design Verification

This document defines the requirements and responsibilities for preparation of design verification plans and the formal verification of design requirements.

23. Design Verification - CRBRP Project

This document states the additional or modified requirements and responsibilities for preparation of CRBRP design verification plans.

24. Development Review

This document defines the guidelines and responsibilities for the conduct of development reviews.

25. Drawings and Specifications

This instruction establishes the responsibility and methods for documenting specific design definitions.

26. Drawings and Specifications - CRBRP Project

This instruction states additional or modified responsibility and methods concerning design definition for the Clinch River Breeder Reactor Plant Project.

27. Engineering Changes

This instruction describes the requirements and responsibilities for initiating and approving engineering changes to all Department drawings, specifications and standards.

28. Engineering Change Notice

This instruction establishes the Engineering Change Notice as the vehicle which defines and authorizes changes to all issued Department engineering documents, i.e., drawings, specifications and standards.

29. Engineering Change Notice (ECN) CRBRP Project

This addendum details the Clinch River Breeder Reactor Plant Project procedures and organizational responsibilities for the preparation, review, approval and processing of ECN's.

30. Engineering Computer Codes

This instruction provides for the identification, control and verification of engineering computer codes used in engineering development work or in (a) design analysis, (b) safety analysis and (c) evaluation and verification of design calculations for reactor systems and components, test facilities, and other equipment critical to the performance and safety of reactors or other Department products.

31. Engineering Configuration Definition System

This document establishes the Engineering Configuration Definition System as the vehicle which defines the listing of all design related documents applicable to each project or program.

32. Engineering Release Instruction

This document establishes the use of the Engineering Release Instruction as the vehicle by which Engineering releases engineering documents for use in manufacturing and procurement.

33. Engineering Release Instruction - CRBRP Project

This document clarifies instructions for the use of Engineering Release Instruction for the Clinch River Breeder Plant Project.

34. Engineering Work Records

This instruction defines the guidelines and responsibilities for the generation and retention of Engineering Work Records.

35. Fabrication Engineering Manufacturing System-Non-Coded Items

This document authorizes the ASME Code Quality Assurance Manual for non-coded-items and provides modification instructions for use on non-coded items.

36. Functional Classification

This procedure provides for a gradation of quality requirements, criteria for the proper selection of quality requirements and communicates the selection within the department classification.

37. Handling, Preservation, Packaging, Storage and Shipping

This document establishes the requirements for the handling, preserving, packaging, storing and shipping of raw, in-process and completed parts and assemblies.

38. Interdivisional Work Orders

This instruction establishes the requirements for conducting procurement activity with other General Electric Divisions or Departments.

39. Letter Order

This instruction defines policy and procedures to govern issuance and definitization of letter orders which are to be documented on appropriate forms.

40. Material Control

This document establishes the methods and control utilized in the manufacturing area to ensure suitable material identification throughout processing.

41. Material Request

This instruction provides requirements for the preparation and processing of a purchase order or a change.

42. Material Request - CRBRP Project

This addendum describes additional instructions applicable to Material Requests under Clinch River Breeder Reactor Plant Project's contracts.

43. Measuring and Test Equipment Calibration and Control

This document establishes the requirements for the calibration, adjustment, maintenance and control of all measuring and test equipment used to accept department products.

44. Organization List GE-ARSD

This instruction defines the function, title and name of Management personnel for GE-ARSD.

45. Preliminary Engineering Change (PEC)

This document establishes the use of PECs for expediting the immediate implementation of on-the-spot-changes to developmental hardware and test facilities.

46. Preliminary Engineering Change - CRBRP Project

This instruction states additional or modified use of a PEC on the Clinch River Breeder Reactor Plant Project.

47. Procurement

This document defines the requirements for performing procurement activities such as the purchase of material, equipment, and services required by the department.

48. Product Quality

This document establishes a quality policy for the department. It defines the broad structure of the quality system to be used in implementing the policy; identifies prime and contributing responsibilities, relationships, and checkpoints for managerial reviews and actions; identifies relationships with customers, vendors and government agency representatives and identifies supporting document systems for measuring product quality.

49. Project Baseline Definition and Documentation

This instruction establishes a Project Baseline, including the Work Breakdown Structure, the Project Master Plan, Project Budget Baseline and Project Schedule Baseline.

50. Project Baseline Definition and Documentation - CRBRP Project

This instruction adds or modifies information for baseline definition and documentation on the Clinch River Breeder Reactor Plant Project.

51. Proposal Evaluation

This instruction defines the requirements for opening proposals, safeguarding proposal information and evaluation of proposal information.

52. Proposal Evaluation Plan

This instruction defines the requirement for preparing and establishing a proposal evaluation.

53. Purchase Order Approval

This instruction concerns obtaining review and approval of a proposed purchase order or revision.

54. Purchase Orders, Revisions and Change Orders

This instruction provides guidelines for preparing and issuing purchase orders, revision to purchase orders, and change orders.

55. Quality Assurance Manual for Compliance with ASME Boiler and Pressure Vessel Code - Section III Division 1

This manual describes the QA Program and documents the controlled manufacturing system utilized by GE-ARSD to comply with the ASME B&PV Code, Section III Division 1 requirements.

56. Quality Assurance Program Index - CRBRP Project

This documents describes the Quality Assurance Program and identifies procedures which the department shall implement to assure conformance to contractual requirements for the assigned scope of work on Clinch River Breeder Reactor Plant Project.

57. Quality Audits

This instruction defines the procedure and responsibility for establishing and implementing internal and external audit requirements.

58. Quality Audits - CRBRP Project

This addendum describes requirements for establishing and implementing internal and external audits for the Clinch River Breeder Reactor Plant Project.

59. Quality Verification Planning

This instruction establishes the criteria and responsibility for Quality Verification Plans, including test, inspection, surveillance, and audit plans.

60. Quality Verification Planning - CRBRP Project

This addendum describes instructions pertinent to Quality Verification planning for the Clinch River Breeder Reactor Plant Project.

61. RDT Standards

This instruction provides the requirements and responsibilities for the use, development, and preparation of RDT standards and changes thereto.

62. Receiving Purchased Material

This document establishes the requirements associated with the flow of purchased materials from the time of department receipt to its in-plant destination or return.

63. Receiving, In-Process and Final Inspection

This instruction states the requirements for the inspection of purchased items received at a Department site, items during the fabrication process and items prior to their ultimate use.

64. Receiving, In-Process and Final Inspection - CRBRP Project

This addendum describes instructions pertinent to the inspection of items for the Clinch River Breeder Reactor Plant Project.

65. Receiving Inspection Deficiency

This instruction provides a method for review and disposition of a Receiving Inspection Deficiency.

66. Record Control

This document establishes the departments records system and identifies the required quality assurance records, the record custodian, the record location, and retention period.

67. Record Control - CRBRP Project

This addendum specifies instructions for implementing the department's Quality Record Management Plan for the Clinch River Breeder Reactor Plant Project.

68. Reports

This instruction provides requirements for the preparation, production review, approval, and release of reports and release of information contained in these reports.

69. Request for Proposal or Quotation

This instruction establishes methods for obtaining proposals and quotations from suppliers.

70. Review, Approval and Issue, Drawings, Specifications and Standards

This document establishes the requirements for conducting reviews of technical documentation prior to initial issue. Additionally, it specifies the requirements for resolving comments made by technical personnel representing various disciplines (i.e. safety and licensing, QA, etc.) and the approval level required for issuance. The requirements for documenting the above sequence are also identified.

71. Shipping

This document establishes the requirements which must be met prior to shipping an item including Product Assurance sign-off.

72. Shipping - CRBRP Project

This instruction provides direction for preparation of shipping plan and related activity to Clinch River Breeder Reactor Plant Project.

73. Source Inspection

This instruction provides the instructions necessary to perform in-process quality hold points and/or final inspections at supplier's facility.

74. Standard Distribution

This procedure establishes the use of pre-established listing for the identification of distribution for issued drawings, specifications or reports, and other documents.

75. Supplier Contract Administration

This instruction provides uniform routines for administering purchase contracts from point of execution until beginning of termination or closeout.

76. Supplier Documentation

This instruction provides the requirements for establishing supplier document submittals and the processing, controlling and reviewing and/or approving of supplier document transmittal packages.

77. Supplier Identified Anomaly

This document establishes the system to be followed for the documentation and processing of unplanned events which occur at a supplier's facility during the fulfillment of a contract with GE-ARSD. The Vendor Case Record is the form utilized.

78. Supplier Identified Anomaly - CRBRP Project

This addendum states pertinent instruction for processing VCRs for the Clinch River Breeder Reactor Plant Project.

79. Supplier Negotiations

This instruction describes methods to be used in negotiating contractual documents and changes and defines documents which do not need to be negotiated.

80. Supplier Evaluation

This instruction provides system for evaluating and approving potential suppliers of materials, components and services to be purchased.

81. Supplier Shipment

This instruction establishes requirements for effecting shipment from a supplier.

82. Supplier Shipment - CRBRP Project

This addendum provides pertinent requirements for effecting shipment from supplier directly to the customer or designated representative for the Clinch River Breeder Reactor Plant Project.

83. Testing Anomalies

This instruction defines responsibilities and describes the activities for documenting, controlling, reporting and resolving any anomaly detected during testing.

84. Test Authorization

This procedure describes the preparation and use of the Test Authorization and Record (TAR). An approved TAR authorizes initiation of a test, documents a test article's functional classification, and forms a business record of the test.

85. Test Procedures and Plans

This instruction defines requirements and responsibilities for the conduct and planning of development and qualification testing necessary to demonstrate, evaluate, or substantiate the fulfillment of design objectives.

86. Test Procedures and Plans - CRBRP Project

This addendum states the additional or modified instructions for the preparation and content of documents that support tests of hardware items for the Clinch River Breeder Reactor Plant Project.

87. Unsatisfactory Condition Anomalies

This instruction states the requirements for reporting and processing any unsatisfactory condition.

88. Unsatisfactory Condition Anomalies - CRBRP Project

This addendum states pertinent requirements for reporting and processing any unsatisfactory condition for the Clinch River Breeder Reactor Plant Project.

| 89. Unusual Occurrence Reporting and Management

This document, in response to RDT Standard F1-3T, establishes the requirements for reporting, documenting and correcting the type of unplanned events known as "Unusual Occurrences". These events have by definition an impact on safety and/or a significant programmatic effect.

| 90. Unusual Occurrence Reporting and Management - CRBRP Project

This addendum describes additional instruction pertinent to reporting certain events to Nuclear Regulatory Commission for the Clinch River Breeder Reactor Plant Project.

| 91. Work Order Record

This document establishes the requirements for preparation, review and approval of the Work Order Record that defines in-process operations.

Attachment 171-2

Schedule for Issuing

Unreleased Procedures

<u>Item</u>	<u>Title</u>	<u>Schedule</u>
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THE CLINCH RIVER BREEDER REACTOR PLANT

PRELIMINARY SAFETY ANALYSIS REPORT

CHAPTER 17.0 - QUALITY ASSURANCE

APPENDIX J

A DESCRIPTION OF THE ESG - RM

QUALITY ASSURANCE PROGRAM

ENERGY SYSTEMS GROUP

A DIVISION OF ROCKWELL INTERNATIONAL CORPORATION

Amend. 73  
Nov. 1982

CLINCH RIVER BREEDER REACTOR PLANT  
A DESCRIPTION OF THE ENERGY SYSTEMS GROUP  
MANUFACTURER QUALITY ASSURANCE PROGRAM

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## 0.0 INTRODUCTION

### 0.1 SCOPE

This appendix provides a description of the Quality Assurance Program conducted by Rockwell International Energy Systems Group (ESG) as a Reactor Manufacturer (RM) for portions of the Nuclear Steam Supply System. Through the practices described herein, ESG discharges its responsibilities to assure the quality of systems, components, and structures provided by ESG and ESG's subcontractors.

ESG provides an annual review of the Quality Assurance Program description contained in this appendix, and modification as necessary to keep it current. Changes in the Quality Assurance organization are provided to the Lead Reactor Manufacturer within 30 days of issuance of the approved organization chart.

### 0.2 BASIS

The program defined herein is based on ESG having been assigned execution responsibility for the Quality Assurance Program applied to design, procurement, and manufacture of systems, components, and structures as shown by Figure 17J-1. ESG is not assigned responsibilities for site construction and installation.

### 0.3 APPLICATION

The practices described herein will be applied to the planning, design, procurement, and manufacture of those systems, components, and structures defined in Sections 3.2, 7.1, and 9.13 of the PSAR that are assigned to the ESG scope of work.

## 1.0 ORGANIZATION

Energy Systems Group, a division of Rockwell International, has been assigned RM responsibilities for the systems, components, and structures defined in Section 0.3 of this appendix. The organization of individuals and groups performing quality-related activities is shown and defined in Section 1.4 of the PSAR. Figure 17J-2 depicts the organizational structure of the ESG Quality Assurance Department. This organization chart shows only lines of administrative control (salary review, hire-fire, position assignments). The separation of the organizational elements of Engineering, Procurement, Manufacturing, and Quality Assurance (which includes all inspection functions), with separate lines of administrative control from the Energy Systems Group President, provides the authority, independence, and freedom for each effectively to perform quality-related activities.

Quality Assurance responsibilities for CRBRP are assigned and executed by the following first line organizations of ESG:

Atomics International Division  
Engineering and Test  
Operations  
Quality Assurance

The Atomic International Division contains the CRBRP Program Office and associated financial and program planning and control functions. The Operations organization contains the Purchasing and Manufacturing Departments which are responsible for CRBRP procurement and internal fabrication activities. Engineering and Test contains the ESG design as well as development and design verification testing functions. Quality Assurance has the responsibility for developing a quality assurance program meeting CRBRP project requirements and assuring its effective execution. Quality Assurance also provides resources for inspection, examination, and test of supplier and ESG fabricated items.

1.1 The responsibility and authority of key managers involved in quality-related activities is as follows:

1.1.1 Atomic International Division Vice President and General Manager

The Atomic International Division Vice President and General Manager has overall responsibility for the management of the LMFBR programs and the Nuclear Products Facilities and Services. LMFBR programs include the CRBRP RM activities as well as Large Breeder Reactor, Sodium Technology, LMFBR Component Development, and Safety programs. Therefore, the responsibility for ESG's overall performance on the CRBRP is vested in the General Manager.

1.1.2 LMFBR Programs Director

The LMFBR Programs Director has overall responsibility for the LMFBR business segment, including CRBRP Program activities, large plant design projects, and LMFBR Base Technology.

1.1.3 CRBRP Program Manager

The CRBRP Program Manager is responsible for the management of the CRBRP Program at ESG. In this capacity, he is responsible for managing the CRBRP Program work in accordance with the contract requirements and providing direction to the functional organizations within ESG for CRBRP development, design, and procurement.

1.1.4 Engineering and Test Vice President

The Engineering and Test Vice President is responsible for the management of ESG's centralized engineering activities. On the CRBRP program, engineering work in support of conceptual design, preliminary design, and final design is assigned to the Engineering Department. Engineering and design work conducted by the Engineering Department includes: Mechanical Design, Drafting and Checking, Electrical and Control Engineering, Materials and Process, Piping and Structural Design, Thermal and Process Systems Pressure Components Stress Analysis, Structural Systems Stress Analysis, Specifications and Manuals, Engineering Assurance and Data Management, and the verification of design through developmental and acceptance testing.

### 1.1.5 Operations Director

The Director of Operations is responsible for the product manufacturing, material purchasing and warehousing in support of the CRBRP in accordance with the controlling programmatic documents. The material purchasing function is responsible for selecting sources, procurement, subcontract administration, assuring adherence to work statements, prices and delivery schedules, receiving, inspection, storage, issuance, payment of invoices, and observing the performance quality of the articles purchased. The manufacturing manager is responsible for reviewing engineering and design work performed by ESG to assure manufacturability. On the CRBRP program, as with other programs, the Manager of Manufacturing Engineering is responsible for conducting on-the-board reviews, participating in design reviews, reviewing vendor design information, and assuring component designs can be fabricated and assembled expeditiously and at minimum cost.

### 1.1.6 Finance and Administration Vice President and Controller

The CRBRP administration is under the cognizance of the Finance and Administration Vice President. The Finance Controller reports administratively to the Finance and Administration Vice President and organizationally to the AI Division Vice President and General Manager. Within the Finance and Administration Organization, the Program Business Management function is responsible to the individual projects for assistance in the budgeting and planning of manpower and dollar expenditure rate; for maintaining and reporting project costs and remaining balances; for monitoring and satisfying contractual requirements; for maintaining contract data control systems; and for providing assistance in preparation of project schedules. On the CRBRP program, Program Administration provides the CRBRP project management with detailed weekly summaries of manpower expenditures, monthly cost information, projection of figure costs at various subaccount levels, commitment control system reports, and various other reports required by the project and the customer.

### 1.1.7 Quality Assurance Director

The Quality Assurance Director is responsible for the Quality Assurance activities within ESG, which include the Quality Assurance functions for the CRBRP project. He is responsible for establishing and maintaining a quality system that meets the requirements of all contracts received by ESG, including meeting the requirements of RDT F2-2 for the CRBRP project. The authority for achieving these responsibilities is through the issuance of Standard Operating Policies and Procedures from the President of ESG.

The Quality Assurance Director has the authority to prevent issuance of drawings and specifications, and to terminate work where quality requirements are not being met. He interfaces directly with the Atomic International Division Vice President and General Manager to assure that quality program requirements are being met by ESG personnel working on the CRBRP project.

The Quality Assurance Director manages a number of organizations and functions within the Quality Assurance Department to provide assurance that the ESG and CRBRP Quality programs are effectively implemented. A description of the responsibilities of the managers of these organizations and functions is given in the following sections.

The Quality Assurance Director reports directly to the President of ESG.

#### 1.1.8 CRBRP Quality Assurance Program Manager

The CRBRP Quality Assurance Program Manager is responsible to the Quality Assurance Engineering LMFBR Programs Manager for defining and assuring that the Quality Assurance Program for CRBRP Reactor Manufacturer activities assigned to the Energy Systems Group is effectively executed within ESG. This responsibility also extends to assuring that subcontractors define and implement contractually applied quality assurance programs. He is also responsible for cost, schedule, and technical performance of the Quality Assurance cost accounts of the Energy Systems Group Performance Measurement System.

#### 1.1.9 Quality Assurance Audits and Controls Manager

The Energy Systems Group Audit Program responsibilities of the Quality Assurance Director are implemented through the Manager, Quality Assurance Audits and Controls. The Manager, Quality Assurance Audits and Controls, is responsible for:

- 1) Maintaining and administering the Quality Program Audit System by preparing and maintaining audit schedules.
- 2) Arranging for checklists and conducting or arranging for audit teams to conduct audits.
- 3) Insuring preparation of audit reports.
- 4) Followup to verify corrective action implementation.
- 5) Maintenance of audit case history files.
- 6) Development, issuance, control, and revision of Quality Assurance Manuals and procedures.
- 7) Review of operating procedures, and revisions thereto, prepared by other quality-affecting organizations, to assure compatibility with overall ESG Quality Assurance Program requirements.
- 8) Performing supplier quality surveys of procurement sources for materials and fabrication services and maintenance of the approved list of such suppliers.
- 9) Administering a Material Review system for nonconforming items.

- 10) Administering a Corrective Action system to assure prompt and effective correction of conditions causing nonconformance to technical requirements/procedures.
- 11) Chemical, physical, and mechanical property testing services to support other Quality Assurance Department units.
- 12) Qualification programs for welders and welding procedures.
- 13) Performing surveillance of warehouse areas and manufacturing control stations to assure that only accepted items, properly identified and protected from damage and deterioration, remain in storage. Assure corrective action for any unsatisfactory conditions observed.

#### 1.1.10 Quality Assurance Engineering LMFBR Programs Manager

The Quality Assurance Engineering LMFBR Programs Manager is responsible to the Quality Assurance Director and provides quality assurance engineers to support the CRBRP Quality Assurance Program Manager. Quality Assurance Engineering personnel perform the following activities:

- 1) Quality Assurance Program administration for specific portions of the CRBRP activities, to monitor and assure effective implementation of quality requirements from design through procurement and fabrication.
- 2) Quality Assurance engineering support for change control boards, design reviews, and design document review and approval.
- 3) Nonconforming Item review board coordination.
- 4) Developing and implementing statistical test programs and analyses as required.
- 5) Evaluating inspection and test data and report quality trends.
- 6) Reviewing and evaluating bid invitations and returns for quality impact.
- 7) Participation on capability evaluation teams for prospective suppliers of major items.
- 8) Procurement document review and supplier quality surveys for materials and fabrication services and maintenance of the approved list of such suppliers.
- 9) Receiving inspection planning.
- 10) ESG fabrication inspection planning.
- 11) A quality data and records collection and storage system for procured and ESG-fabricated items.
- 12) Data packages for ESG-fabricated items.

- 13) Source inspection and surveillance of suppliers.
- 14) Qualification and certification programs for nondestructive examination (NDE) personnel and procedures.
- 15) Nondestructive examination technical support and consultation to ESG organizations and suppliers.
- 16) Quality Assurance instructions for complex inspection, tests, and process control operations.
- 17) Development of nondestructive examination methods for the Inspection and Test Unit.

#### 1.1.11 Quality Assurance Engineering Utility and Energy Programs Manager

The Quality Assurance Engineering Utility and Energy Programs Manager is responsible to the Quality Assurance Director. This organization has no involvement in the CRBRP program.

#### 1.1.12 Inspection and Test Unit Manager

The Inspection and Test Unit Manager is responsible to the Quality Assurance Director and, along with his assistant managers, is responsible for:

- 1) Performing receiving inspection of procured items and services, identifying and documenting nonconforming conditions of these items and services, and assuring conformance to the established nonconformance dispositions.
- 2) Performing inspections and tests of ESG fabrication and subassembly operations, final inspections, and performing or witnessing performance of acceptance and qualification tests of ESG-fabricated items.
- 3) Performing nondestructive examination and acceptance of ESG-fabricated items.
- 4) Making inspection acceptance and release acceptable ESG-fabricated items for delivery to the next operation. Reject and withhold nonconforming items. Document nonconforming conditions for Material Review evaluation and assure prompt conformance to Material Review disposition.
- 5) Performing inspection of purchased or ESG-manufactured tooling.
- 6) Performing inspection of packaging, preservation, and identification of items prior to shipment.
- 7) Maintaining a system for calibration of measurement instruments used for product inspection and test, including applicable procedures and records. Performing periodic calibration of measuring instruments, in accordance with established requirements.

1.2 Quality assurance policy originates with the President of Rockwell International, through the issuance of a Corporate Policy statement covering Product Integrity. The Quality Policy is issued to each division of Rockwell International in a Corporate Directive, prepared and authorized by the Senior Vice President, Corporate Staffs, which directs each division to take action to implement the Corporate Quality Policy. The President of the Energy Systems Group implements the Corporate Quality Policy Directive through Standard Operating Policies, which provide quality assurance direction consistent with Corporate Policy, as well as the Quality Assurance Program requirements applicable to ESG business objectives and contract requirements. The overall Quality Program is implemented in the operating manuals of the quality-affecting organizational units by the managers of these units. The Quality Assurance Director reports directly to the Energy Systems Group President and verifies compliance of the quality-affecting organizations to the Quality Program, under the authority granted in the Standard Operating Policies.

1.3 The Quality Assurance Director, by virtue of being at the same level of management as the highest level manager of other major Energy Systems Group functions, has the necessary unimpeded communication path to bring quality matters to the attention of the president and executive level management. Differences of opinion on quality matters that cannot be resolved at lower management levels are referred to the Energy Systems Group President by the Quality Assurance Director for final resolution. Quality Assurance Department Managers or Quality Engineers attend scheduled and ad hoc status meetings to assist in resolving problems, report quality results, interpret quality requirements, and provide a basis for providing adequate staffing.

1.4 Quality Assurance functions implemented within ESG are defined in Standard Operating Procedures. All functional organizations (Program Offices, Engineering, Purchasing, Quality Assurance and Manufacturing) are assigned responsibility for:

- 1) The preparation and issuance, in the operating manuals, of written instructions and procedures which establish the methods and responsibilities for performing quality-related activities, and for verifying satisfactory performance of such activities.
- 2) The indoctrination and training of their personnel in these procedures, as applicable to their work assignments.

1.5 In addition, the Quality Assurance Director is assigned the following specific quality assurance functions:

- 1) Identifying those procedures which cover the performance and verification of quality-related activities.
- 2) Conducting audits of the implementation of such procedures.
- 3) Identifying quality deficiencies and problems in the Program and reporting them, with any recommendations, to the responsible ESG executive, functional and program managers.

- 4) Verifying that solutions to reported quality problems or deficiencies are achieved.
- 5) Stopping nonconforming work and controlling further processing, fabrication, and delivery of nonconforming items.
- 6) Submit overall status reports on the ESG Quality Assurance Programs to the ESG President, as well as concerned program and functional managers.

1.6 Communications flow directly between the ESG Quality Assurance Department and the Quality Assurance organization of subcontractors, and are documented, as appropriate, by the Purchasing organization buyer assigned for each subcontractor. The lines of communication are defined in internal procedures, and in procurement and quality assurance administrative specifications contractually applied to each subcontractor. The ESG Contract Data Management organization tracks and provides management reports of all communications requiring action, on either the part of ESG or subcontractor, to provide a means of insuring timely resolution of problems.

1.7 Verification of conformance to established quality requirements is the responsibility of the Quality Assurance Department, through the actions of review and approval of design documents (specifications and drawings), procurement documents (purchase requisitions and purchase orders, along with their referenced documents and attachments), and manufacturing documents (travelers and processing procedures). Additionally, the Quality Assurance Department is responsible for verification of conformance to quality requirements of hardware items during source inspection/surveillance, receiving, in-process, and final inspections and process surveillance. As shown by the organizational structure and the functional descriptions of the ESG organization in Section 1.4 of the PSAR, the Quality Assurance Department is divorced from the quality-affecting organizational units performing the design, procurement, and manufacturing activities, with the Quality Assurance Department having a hierarchical position at the same or higher level than the performing organizations.

The authority and responsibility for stopping unsatisfactory work, or the control of further processing, delivery, or installation of nonconforming material, is an explicit function of the Quality Assurance Director in the Standard Operating Policy covering the ESG Quality Assurance Program and issued by the ESG President.

The ESG Quality Assurance Department reporting level, and the Standard Operating Policy covering the ESG Quality Assurance Program, are structured and explicitly provide for the Quality Assurance Director to:

- 1) Identify quality problems
- 2) Initiate, recommend, or provide solutions to quality problems
- 3) Verify implementation of solutions

1.8 The qualification requirements for the Quality Assurance Department management positions are as follows:

- 1) Minimum qualification requirements for the Quality Assurance Director are (a) a Bachelor of Science degree in Engineering, Science, or Technology from an accredited college or university, (b) 15 years experience in quality assurance or engineering in an advanced technology industry, of which at least 5 years will be in quality assurance; and, of this 5 years, at least 2 years will be in the nuclear area, (c) experienced in the direction of personnel, and the planning and management of resources needed to conduct a Quality Assurance Program, and (d) possess a knowledge of industry and government codes, standards, and regulations defining quality assurance requirements and practices; quality assurance administrative methods and technology and their application; and be experienced in planning, defining, and performing quality assurance practices and application of procedures.
- 2) Minimum qualification requirements for the Quality Assurance Engineering LMFBR Programs Manager, Quality Audits and Controls Manager, and Quality Assurance Engineering Utility and Energy Programs Manager are (a) a Bachelor of Science degree in Engineering, Science, or Technology from an accredited college or university, (b) 5 years experience in or related to the field of his educational major, of which at least 2 years will have been in quality engineering or technology; and (c) possesses a knowledge of at least two of the following areas of specialty: statistics/reliability, nondestructive examination, physical/mechanical properties measurement, metal fabrication, measurement technology, instrument and control fabrication and testing, chemical processing and analysis, failure analysis, and quality program development and implementation.
- 3) Minimum qualification requirements for the Inspection and Test Unit Manager are (a) 10 years experience in a manufacturing industry of which 5 years will have been in quality control/assurance; and (b) have a general knowledge of manufacturing and inspection methods and techniques including dimension and electrical measurements, nondestructive examination, quality planning, and fabrication and assembly methods.
- 4) Minimum qualification requirements for the CRBRP Quality Assurance Program Manager are (a) a Bachelor of Science degree in Engineering, Science, or Technology from an accredited college or university, (b) 5 years experience in quality assurance or engineering in an advanced technology industry, of which at least 3 years will be in quality assurance in the nuclear area, (c) experienced in the direction of personnel, and the planning and management of resources needed to conduct a Quality Assurance Program, and (d) possess a knowledge of industry and government codes, standards, and regulations defining quality assurance requirements and practices; quality assurance administrative methods and technology and their application; and be experienced in planning, defining, and performing quality assurance practices and application of procedures.

1.9 Adequate staffing of the QA Department is the responsibility of the QA Director and managers reporting to the Director. Basically, staff size is a function of business level. For each project or program, the QA Director provides an estimate of quality engineering, inspection, and supervision funding needs to the project or program manager. These estimates are prepared by members of the QA Department staff and negotiated when necessary by the QA Director with the project or program manager. Issuance of the funding to the QA Department is then through normal accounting channels to Quality Assurance Department Managers who then staff appropriately. Certain overhead functions, such as calibration, procedure development or audit are staffed to an adequate size based on negotiations between the QA Director and the Controller.

Quality Assurance personnel are involved in day-to-day plant activities to assure adequate QA coverage. For ESG fabrication, both the assigned Quality Engineer and Inspection Manager attend scheduled meetings with Manufacturing and Purchasing management on status of work in progress. These meetings are normally scheduled weekly and may be held daily during periods of intense activity. Floor level inspection and manufacturing managers also interact daily to ensure adequate inspector availability to meet current work schedules. Quality Engineers are assigned to specific portions of the CRBRP activities at ESG, e.g., systems and/or components, and these engineers interact daily with their counterparts in Program Office, Engineering and Purchasing. The quality engineers also attend scheduled and ad hoc meetings and are on distribution for appropriate correspondence, reports, drawings, and specifications.

## 2.0 QUALITY ASSURANCE PROGRAM

The Quality Assurance Program described herein complies with the requirements of Title 10, Code of Federal Regulations, Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants," for the ESG scope of work as a CRBRP Reactor Manufacturer. The elements of the CRBRP Quality Assurance Program to be executed by ESG are shown in Figure 17J-3. The Quality Assurance Program is applied to individual structures, systems, and components in a defined, graded approach, according to their importance to safety. This program is issued and made mandatory by direction of the President of Energy Systems Group by Standard Operating Policies that require the issuance of operating procedures, and provides for verification of their enforcement through a system of quality program audits. ESG delegates execution responsibility of appropriate Quality Assurance Program elements to suppliers of material, equipment, and services, but retains responsibility for their implementation by these suppliers. Such delegation is controlled as described in paragraphs 8.1, 9.1, 10.1, 11.1, 12.1, 13.1, 14.1, 15.1, 16.1, and 18.1 of this appendix.

2.1 Management assessment of the scope and effectiveness of the Quality Assurance Program is accomplished by two independent audits. One of these is performed at yearly intervals, and specifically addresses the 10 CFR 50, Appendix B, requirements as they are implemented through that portion of the Quality Assurance Program that addresses Section NCA-4000 of Section III of the ASME Boiler and Pressure Vessel Code. The second audit occurs at 18-month intervals and is conducted by senior officials from other divisions of Rockwell International. This latter audit is to assure compliance with contractual and statutory quality assurance requirements.

Continuing involvement of the ESG President in Quality Assurance matters is achieved by three routinely scheduled interactive associations with the Quality Assurance Director. These are: (1) periodic staff meetings, during which each member of the President's staff, which includes the Quality Assurance Director, must report on significant problems, accomplishments, and status of activities, (2) periodic Program Review Meetings, in which formal and in-depth reports are presented by Program Managers, and during which time the Quality Assurance Director addresses significant quality problems, with recommendations for corrective action, and (3) submission of a monthly quality status report to Executive Management that covers quality progress accomplishments, problems, and audit results, and to the customer as required by contract.

2.3 Quality policy originated at Rockwell International, with the issuance of a "Product Integrity" policy statement, in which the President of the Corporation states... "It is the policy of the Corporation that its product will meet or exceed applicable standards and requirements for quality, reliability, and safety." The Senior Vice President, Corporate Staffs, issues a directive applicable to all Division Presidents of the Corporation, which requires actions to be taken to implement this Corporate Policy, including:

- 1) Providing engineering activities for defining safe and reliable products.
- 2) Providing verification or qualification testing of new products and any subsequent significant design changes prior to introduction into the market.
- 3) Providing purchasing activities that are responsible for procuring materials, components, and end items that comply with specified requirements.
- 4) Providing manufacturing activities that are responsible for the manufacture of products that comply with specified requirements.
- 5) Providing quality assurance activities at each manufacturing location to ensure compliance with specified requirements.
- 6) Preparing and maintaining clear and correct descriptions of products to be used in advertising and sales literature, proposals, contracts, customer literature, service manuals, labeling, and other necessary documents.
- 7) Providing prompt feedback of field data regarding failures, complaints, and accidents to the appropriate functional organizations.
- 8) Developing procedures to ensure that appropriate government agencies and customers are promptly notified of product conditions that could be hazardous and timely resolutions of such conditions.
- 9) Notifying the Office of the Vice President - Communications, Corporate Offices, relative to all product conditions which could be hazardous.

- 10) Establishing measurement techniques to provide management visibility of the adequacy of product integrity activities.
- 11) Preparing and maintaining appropriate written operating procedures to implement the requirements of this Directive.
- 12) Maintaining a record retention program in compliance with the appropriate Corporate Finance Policy which will support the integrity of company products.
- 13) Conducting periodic audits throughout all activities having a direct impact on product integrity to measure compliance with established operating procedures.

2.4 The Corporate Quality Policy is implemented at Energy Systems Group through Standard Operating Policies issued by the President, Energy Systems Group. This Group Policy states: "The managers of Engineering, Material (Purchasing), Manufacturing, Quality Assurance, and Program Offices will be responsible for:

- 1) The preparation and issuance, in their operating manuals, of written instructions and procedures which establish the methods and responsibilities for performing quality-related activities and for verifying satisfactory performance of such activities;
- 2) The indoctrination and training of their personnel in these procedures, as applicable to their work assignments;
- 3) Assurance that the instructions and procedures covering quality-related activities meet the Quality Assurance Program requirements of the applicable government regulations and/or contract provisions;
- 4) Requiring that each individual be responsible for performing quality-related activities in accordance with the applicable instructions and procedures."

Based on the previously described quality policy, the department managers provide procedural coverage in their department manuals for quality-affecting activities.

2.5 The Quality Assurance Director has overall responsibility for assuring conformance to the procedures of the Quality Assurance Program Manual. He has the further responsibility, authority, and organizational freedom to stop non-conforming work, and control further processing, fabrication, and delivery of nonconforming items. If the differences of opinion occur that cannot be resolved, these are referred to the President of Energy Systems Group for final resolution. Changes to department manuals may be proposed by any individual or organization, but final review and approval rests with the department manager. Changes to ESG ASME Code Section III Manual and the basic Quality Assurance Department Manual receive final review and approval by the Quality Assurance Director. Additionally, Standard Operating Policies and Procedures, CRBRP Program Directives, Engineering Management Procedures are reviewed for concurrence by QA Department personnel. All procedures declared as quality-affecting are submitted to the lead reactor manufacturer and owner.

2.6 Provisions for controlling the distribution of Department and Quality Assurance Manuals are addressed in each manual. These provisions provide for serialization of each manual in use and maintenance of a record of the recipients of each manual. Revisions of procedures in the manuals are distributed to each manual holder of record, along with an updated table of contents.

2.7 The CRBRP Quality Assurance Project Manager identifies the procedures from Department and Quality Assurance Manuals that constitute the Quality Assurance Program for the ESG CRBRP Project Reactor Manufacturer scope of work. These procedures are documented in a Quality Assurance Program Index that is approved by the ESG Quality Assurance Director and CRBRP Program Manager. The Index is issued for use by managers and key personnel in organizations performing activities that affect quality. Changes to this Index must be approved by the ESG Quality Assurance Director and the CRBRP Program Manager. A brief synopsis of each procedure contained in the CRBRP Quality Assurance Program Manual is given in Attachment 17J-1 of this appendix.

The safety-related structures, systems, and components tasks controlled by the ESG Quality Program during engineering, design, and procurement are defined in Section 0.3 of this appendix.

2.8 Contractors of component designs and/or fabricated items are required to submit their quality assurance program descriptions for these items for review and approval. This review is made against contractually applied quality assurance program requirements. Additionally, audits of these program activities are conducted by ESG. The requirements for quality assurance program description submittal, and notification of the right of audit, are contained in administrative specifications, which are made part of each component contract.

2.9 Personnel performing quality-related activities for CRBRP receive a training and indoctrination course covering the CRBRP QA program including quality assurance for nuclear facility projects in the United States, the overall Clinch River Breeder Reactor Plant project, and the implementation of this QA program at ESG. This training includes quality concepts; CRBRP design familiarization, major participant responsibilities, and organization interrelationships; and procedure requirements for each ESG organization. Additionally, personnel involved in ASME Code Section III activities receive training courses as to the specific procedures applicable to their function, and their content, scope and purpose. Contents of the courses, attendees, and dates of attendance are documented.

2.10 Specific categories of personnel responsible for verifying activities affecting quality require formal training in the principles, techniques, and requirements of the activity being performed. Certification as written testimony of qualification is provided in accordance with the appropriate code, standard or procedure, and course content, attendees and dates of attendance documented. Proficiency tests are given to obtain evidence of proper training and qualification. Certifications of qualification are issued that delineates the specific functions personnel are qualified to perform. The criteria for qualification are provided in applicable procedures, and results for each individual are maintained in Training Department files.

Proficiency of personnel is maintained by retraining, reexamination, or continued satisfactory performance in accordance with specified procedural requirements, and recertification is documented along with the basis for recertification. Quality verification personnel involved in the certification program are as follows:

- Personnel performing nondestructive examinations, and establishing NDE techniques (SNT-TC-1A)
- Personnel performing welding operations (ASME S-IX and AWS)
- Personnel leading quality audit items (ANSI N45.2.23)
- Personnel performing visual examination (ASME S-III, Subsection NF)
- Personnel performing dimension inspection
- Personnel certifying Design Specifications, Design Reports, Overpressure Protection Reports, and Load Capacity Data Sheets (ANSI/ASME N626.3)

2.11 Procedures that provide instructions for quality-related activities such as cleaning, welding, nondestructive examination, inspection, and test, specify equipment and facilities to be used as well as any appropriate environmental conditions to be maintained during these activities, e.g., temperature, humidity, and cleanliness. The sequence of events to be followed is specified in the work instruction documents (Test Procedures and Manufacturing Travelers), and verification of conformance to this sequence is performed to assure prerequisites have been met prior to successive operation.

2.12 The Quality Assurance Program described herein is reviewed and revised annually as appropriate. Changes in the QA Department organization are transmitted to the lead reactor manufacturer and owner within 30 days of issuance of the organization chart. The overall ESG organization given in Section 1.4 of the PSAR is reviewed and revised annually. Also, the lead reactor manufacturer is notified of key personnel changes before the changes are announced.

2.13 Development, control, and use of computer programs for design and design verification are covered by a procedure under the control of the Engineering Department and which is included as part of the CRBRP QA program. Adherence to this procedure is audited by Quality Assurance using knowledgeable and independent auditors.

2.14 The docket date of the CRBRP PSAR was April 11, 1975. Regulatory guides to be addressed prior to that date and other factors to be considered are as follows:

- 1) Regulatory Guides in Subsection V of Section 17.1 of NUREG 0800, as described in PSAR Sections 1.1, 17.0, and 17.1.2.1 and the answers to Questions 411.1 and 411.2.
- 2) 10 CFR Part 50, 50.55a, as described in PSAR Sections 17.1.2.1, 3.1, 3.2, and 7.1.

- 3) 10 CFR Part 50, 50.55(e) in accordance with the quality assurance program, as described in PSAR Section 17A.15.1.
- 4) 10 CFR Part 50, Appendix A, General Design Criteria 1, as described in PSAR Sections 17.0.5, 17.1.2.6, and 3.1.1.
- 5) ASME B&PV Code Section III, as described in PSAR Sections 17.1.2.6 and 3.2.2.

### 3.0 DESIGN CONTROL

3.1 ESG utilizes a Cognizant Engineer concept to assign engineering responsibility for the various systems and subsystems for which ESG is the Reactor Manufacturer. Each Cognizant Engineer, under the direction of his manager, has the responsibility for planning, directing, and controlling all effort in conformance with the contract work scope for the system, subsystem, or component under his jurisdiction. This responsibility includes the coordination and integration of all activities related to systems requirements definition, system engineering, component design, interface control, and change control. The Cognizant Engineer is supported in this effort by the functional engineering groups, such as the structural, electrical, and design groups. Written procedures describe the methods to be used in carrying out these activities.

3.2 Applicable regulatory requirements and design bases are defined in principal design documents. The top level design requirement document is the Overall Plant Design Description (OPDD-10). This document describes the overall CRBRP technical, functional, and quality parameters. OPDD-10 is written, released, and controlled by the Lead Reactor Manufacturer.

System Design Descriptions (SDDs) provide the principal means of design definition and control for each CRBRP system for which ESG has system responsibility. The SDDs reflect the OPDD-10 requirements and are used to define the various technical, operational, and safety considerations involved, identify interfaces, and serve as the basic technical document for the system.

Specifications and procedures are prepared to define the requirements for the design, fabrication, quality assurance, testing, handling, shipping, installation (where applicable), construction testing, and preoperational testing of components and structures in compliance with the SDD and all approved baseline documents.

Engineering drawings are developed to meet the requirements of the SDD, approved baseline documents, and component specifications, and further to define and establish engineering parameters, characteristics, and design functions.

Design drawings and specifications are reviewed prior to release by Quality Assurance engineers. This review is performed in accordance with a procedure that provides approval requirements established by senior management of the Engineering, Operations, Quality Assurance and Program Management organizations. The Quality Assurance engineering review is conducted to assure compliance to Engineering and program procedures which specify that drawings and specifications contain quality assurance requirements such as inspection and test requirements, acceptance requirements and inspection and test results documentation. Deviations or changes from these drawing and specification requirements are processed as specified in Sections 15.0 and 16.0 of this appendix.

3.3 The Technical Services Manager, through a system of engineering management procedures is responsible to assure that suitable design controls are applied to such disciplines as seismic, stress, thermal, hydraulic, radiation, and material compatibility. Design reviews are held at various design milestones to verify design adequacy, and to insure that:

- 1) Design characteristics can be controlled, inspected, and tested.
- 2) Inspection and test (including any design verification testing) criteria are identified.

3.4 Identification and control of design interfaces is accomplished by the Cognizant Engineer and documented by means of System Design Descriptions (SDDs), Component Specifications, and Interface Control Documents (ICDs). The fundamental control document for functional interface data is the SDD, which identifies the system interfaces including referencing supporting control documents (e.g., ICDs) and together with the ICDs, completely defines requirements for every interface within a system.

ICDs are drawings or documents that identify the physical interface characteristics necessary to ensure compatibility between mating pieces of equipment. ICDs are distributed to, and used by, project participants for assuring compatibility of system and/or components. Interface requirements are transmitted to interfacing organizations, and concurrence obtained prior to issue. Proposed changes are coordinated with interfacing organizations prior to implementation.

3.5 The preparation of design documents (SDDs, ICDs, specifications, and drawings) involves input from appropriate technical disciplines including system, safety, stress, thermal, fluid flow, mechanical, materials and process, electrical, control, manufacturing, and quality engineering. Qualified representatives of these disciplines review and approve design documents before issue. Additionally, drawings are checked for dimension accuracy by an independent checking function before issue.

SDD drawing and specification changes are reviewed and approved by the same disciplines as the original issue. A method is used by the releasing function to check the approvers and the functions they represent to assure all the same disciplines review and approve revisions.

3.6 Verification of designs is performed by formal and independent design reviews at various stages of the design to insure that all significant factors affecting performance, reliability, safety, operability, and maintainability of a component or system are properly considered. The Design Review Board is established on an ad hoc basis to provide an expert evaluation and is comprised of a Chairman and specialists in Design, Materials, Safety, Quality Assurance, and other disciplines. Members of the board are selected from any organization on the basis of their knowledge of the subject but are not responsible for the work. Action items are assigned during the meeting, and the followup is provided by the Design Review Board Administrator to assure that the action is taken and the action items closed out. Analyses and calculations having significant effect on the design are subject to verification. The completeness, adequacy, and appropriateness of assumptions, input data, and analytical or calculation method used are evaluated. Certain aspects of designs are verified by test to supplement independent design reviews. In those cases where the adequacy of a design is verified by a qualification test, testing is identified and documented. Testing is conducted using a prototype unit under the most adverse design conditions for which an item is required to perform its safety function. The results of design verification are clearly documented, with the verifier identified. Documentation of the results is auditable against the verification methods identified.

The design engineer, assisted by the materials process, and quality engineering, is responsible for determining the applicability of materials, parts, and equipment used in the design. This selection of hardware is reviewed during the design review.

One of the basic purposes of the design review system is to find and correct errors and deficiencies, prior to the release of the engineering document for procurements, manufacture, construction, or to another organization for use in other design activities. In all cases, the design verification is completed prior to relying upon the components system, or structure to perform its function. Documentation of the deficiency, and the resulting corrective action, are included in the records of the design review.

3.7 The methods for the collection, storage and maintenance of design documents, review records, and related engineering data are described in Section 17.0 of this appendix.

#### 4.0 PROCUREMENT DOCUMENT CONTROL

4.1 ESG uses a system of procedures which describe the sequence of actions to be taken in preparing, reviewing, approving, and controlling procurement documents. The basis for all procurement actions is the Purchase Requisition, which is prepared by the organization requiring the material, service, or component being purchased. Each Purchase Requisition is reviewed and approved by qualified Quality Assurance Department personnel to assure that correct and complete quality requirements are stated or referenced. This review is documented. Drawings, specifications, design reports, and other documents which are referenced in the Purchase Requisition are reviewed and approved as described in Section 6.0 of this appendix. The requirements of the Purchase Requisition are transferred to a Purchase Order, which is offered to the supplier. Purchase Orders are reviewed by Quality Assurance Department personnel to assure no changes of requirements from the Purchase Requisition.

4.2 Purchase Orders for structures, systems, and components identify appropriate requirements, which must be addressed in the supplier's quality assurance program description. The supplier's program is reviewed against contract requirements and approved by qualified Quality Assurance Department personnel prior to start of activities affected by the Quality Assurance Program.

The Purchase Order and its referenced documentation contain all necessary design basis technical information. They additionally identify all documentation to be prepared, maintained, and submitted to ESG for review and approval. The Purchase Order also identifies those records which must be retained, controlled, maintained, or delivered to ESG. Provision is made in the Purchase Order to ensure ESG's right of access to the supplier's facilities and records for source surveillance and audits.

4.3 The Purchase Requisition - Purchase Order cycle described here is also used to process changes and revisions to the contract. The same review and approval is required of changes as is required of the original Purchase Requisition and Purchase Order. Procurement documents pertaining to spare or replacement parts are treated in the same manner as that used for initial production parts.

4.4 Applicable elements of 10 CFR 50, Appendix B, are applied to suppliers by invoking government or industry Quality Assurance standards in whole or in part, or by inserting specific quality requirements in the Procurement Specifications.

Procurement specifications contain the design basis technical requirements; identification requirements of components, subcomponents, and materials; applicable codes, standards and specifications; test and inspection requirements; and appropriate special process requirements covering critical processes such as welding, brazing, heat treatment, electroplating and thermal surface coating, cleaning, and nondestructive examinations. Applicable regulatory technical requirements are included in the procurement specifications rather than specifying these by reference to regulatory documents.

#### 5.0 INSTRUCTIONS, PROCEDURES, AND DRAWINGS

5.1 Policy, procedures, and instruction documents are prepared to cover activities affecting quality. These quality-affecting activities include management, design and engineering, procurement, quality assurance, and manufacturing. Policies, procedures and instructions are collected and issued in operating department and quality assurance manuals. The manuals contain provisions for preparation, review, control, and revision of procedures and instructions comprising the manual.

The manuals containing procedures and instructions for quality-affecting activities at Energy Systems Group are:

- Standard Operating Policies Manual
- CRBRP Program Management Directives Manual
- Engineering Management Procedures Manual
- Corporate Material (Purchasing) Procedures Manual
- ASME Code Section III Manual
- Quality Assurance Operating Procedures Manual
- Manufacturing Manual

Methods for complying with quality assurance criteria applicable to the ESG scope of work are defined in the preceding manuals. A correlation of procedures, policies, and instructions from these manuals with the criteria of 10 CFR 50, Appendix B, is given in Figure 17J-4, and a summary description of the contents of each document referenced in this figure is given in Attachment 17J-1 to this appendix.

Acceptance criteria for important activities defined by the aforementioned procedures and instructions are a part of each procedure, as applicable. For example, document formats and content are specified, as are release, approval, and distribution control requirements.

5.2 The requirements for activities affecting quality, as well as appropriate quantitative and qualitative criteria for determining that important activities have been satisfactorily accomplished, are specified in instructions, procedures, and drawings, including the following types of documents:  
(1) Design Specifications, (2) SDDs, (3) Procurement Documents, and (4) Test Procedures.

5.3 Provisions for preparation, content, quantitative and qualitative requirements review, revision, and control of drawings are contained in Sections 3.0 and 6.0 of this appendix. These provisions for manufacturing and inspection instructions and procedures are contained in Sections 6.0, 9.0, 10.0, and 13.0 of this appendix.

#### 6.0 DOCUMENT CONTROL

6.1 Documents, such as design specifications, design drawings, computer programs, manufacturing drawings, equipment specifications, construction and preoperational test specifications, material processing specifications, and nondestructive examination procedures, are prepared, reviewed, approved, and issued in accordance with written procedures. Review methods may vary from a series of formalized reviews by a Design Review Board to individual reviews by personnel from involved organizations and the Quality Assurance Department. Organizations responsible for review and approval functions for a specific type of document are identified in a written procedure. Originals, prints, and/or reproducible copies of these documents are controlled by the Engineering organization, which releases, distributes, stores, and maintains files and records of these documents. Document changes are prepared, reviewed, and approved in accordance with applicable procedures, only under the authority of the organization or function that prepared, reviewed, and approved the original. Drawings and drawing changes distributed to Manufacturing and Quality Assurance for items being fabricated by the Energy Systems Group require return of a document receipt to Engineering, as evidence that the documents were received by those organizations. Drawings for manufacturing and inspection purposes are further controlled through the Manufacturing Production Control Station. The personnel of this organization insure that correct drawings and revisions thereto are available for manufacturing and inspection planning, as well as for the subsequent manufacturing and inspection operations. Periodic audits are conducted to verify that active documents are in use and obsolete issues have been removed from use. The Engineering data base, containing the latest issues of drawings, specifications, and design basis documents, is updated daily. Terminals are available to all functions for assuring that obsolete issues are not used.

6.2 Procurement documents are controlled as described in Section 4.0 of this appendix. Source and receiving inspection documents are controlled as described in Section 7.0 of this appendix.

ESG Quality Assurance Manuals and department operating procedure are distributed and controlled in accordance with a procedure contained within each manual.

6.3 Manufacturing, inspection and testing instructions, and testing procedures are designated in Manufacturing Production Orders (MPOs) by instruction or procedure number and by applicable revision letter or revision number. The instructions and procedures either accompany the MPO or are maintained available at the location where the work is performed. Changes to MPOs, necessitated for any reason, require the prior review and approval of Quality Assurance, as do changes in manufacturing inspection and test instructions, and test procedures.

6.4 A listing is periodically issued of design documents and their revisions which includes system design descriptions, drawings, specifications, engineering reports, engineering orders, nonconformance reports, manufacturing process procedures, test procedures, and nondestructive examination procedures. The administrative policies and procedures listed in Figure 17J-4 are contained in the CRBRP Quality Assurance Program Index. These listings are used to assure that obsolete issues of the aforementioned documents are not used.

6.5 Assurance that receiving and source inspection is performed to the latest purchase order change is achieved through a system that routes purchase requisitions and orders and changes thereto to the Quality Assurance Engineering Department function. At the time that a change is received by this organization, it is reviewed for quality requirements, and the source or receiving inspection instructions are revised as necessary. Copies of revised inspection instructions and the change orders are sent to the Receiving and Source Inspection functions.

6.6 Assurance that approved changes are included in specifications, drawings, and procedures prior to their implementation is achieved through review and approval of the implementing documents (purchase requisitions and manufacturing travelers) by Quality Assurance Engineering Department personnel and enforcement actions of the QA Department inspection functions. Quality Assurance Engineering Department personnel review and approve purchase requisitions and manufacturing travelers prior to their release to insure that the correct revisions of specifications, drawings, and procedures are given therein. After issuance, purchase orders are reviewed to assure that there are no unauthorized changes from the purchase requisition. Source, Receiving, and In-Process Inspection inspects to the requirements document revision given in the purchase orders and travelers.

6.7 As-built drawings and documentation are a requirement of contracts for components and are required to be delivered with the item. Quality Assurance source surveillance and document review prior to authorizing shipment to the CRBRP site assures that as-built documentation is received in a timely manner.

#### 7.0 CONTROL OF PURCHASED MATERIAL, EQUIPMENT, AND SERVICES

7.1 Each supplier of materials, structures, systems, and components is evaluated to assess his capability to provide acceptable services and products. Evaluation of major item suppliers for which there is no recent capability information is performed by a team, consisting of representatives of Purchasing, the Program Office, Quality Assurance, and Manufacturing Departments as appropriate. Representatives of Design Engineering, Materials and Processes Engineering, and other units of the Engineering Department participate in the evaluation as necessary.

The details of the evaluation include reviews of past performance, evaluation of procedures and capability descriptions provided by the supplier, surveys of the supplier's facility and Quality Assurance Program in operation, and/or experience of other CRBRP participants with the supplier. The evaluation considers the supplier's capability to supply a product which satisfies all requirements. Results of this evaluation are documented and retained on file at ESG.

7.2 ESG Quality Assurance Department personnel perform surveillance of suppliers during fabrication, processing, inspection, testing, and shipment of products. These surveillance activities are planned and performed in accordance with written procedures. The plans provide instructions which specify the characteristics or processes to be witnessed or verified, the documentation required, and the acceptance criteria which must be met. Sufficient surveillance is performed to verify that quality is achieved in items which cannot be inspected upon receipt. This surveillance ends with written approval to ship the item to ESG or the construction site, given by appropriate Quality Assurance Department personnel.

7.3 Receiving inspection is performed on products delivered to ESG to assure their acceptability prior to use. This inspection is carried out in accordance with written inspection plans. The product is evaluated to determine that it is properly identified, that it meets inspection criteria, that necessary inspection and testing records are included with the product, and that the accepted product is identified as to its acceptability before being released for use or storage. Nonconforming items are segregated, controlled, and clearly identified pending proper disposition. ESG Quality Assurance Department personnel provide written instructions for receiving inspection of items purchased by ESG and delivered directly to the construction site from the supplier.

7.4 ESG requires that the supplier furnish, as a minimum, certifications that identify (e.g., by the purchase order number) the product and the specific requirements (codes, standards, specifications) met by the item. The supplier is further required to submit a report, identifying any requirements which have not been met, and indicating his disposition of such nonconformances. Certifications and test reports are reviewed and approved by appropriate Quality Assurance Department personnel. Acceptable certificates of compliance, and data reports as required, are provided to the plant site with equipment delivery.

7.5 Procurement of spare or replacement spare parts will be conducted under the quality assurance program that is in effect at the time of order placement. Technical requirements, if not the same as for the initial plant item, will be evaluated to insure that they are equal to or better than those for the initial plant item.

7.6 "Off-the-shelf" items are subjected to special receiving or source inspections for critical characteristics. Specific inspection instructions are prepared on a case-by-case basis to accommodate the unique characteristics and use of each item.

7.7 Suppliers' certificates of compliance are validated by an established program of audits, independent inspections, and surveillance and overchecks. This is accomplished using itinerant or resident Quality Assurance site representatives or source inspectors, hold point release, and supplier audits. Additionally, procurement specifications require supporting technical data for certificates of compliance, and these data are reviewed for completeness before use of any item.

## 8.0 IDENTIFICATION AND CONTROL OF MATERIALS, PARTS, AND COMPONENTS

8.1 For purchased items, ESG delegates execution responsibility for activities of identification and control of materials, parts, and components to suppliers and assesses the effectiveness of these supplier activities, as described in Section 7.0 of this appendix.

8.2 For items fabricated by ESG, procedures and instructions establish identification and control requirements of materials (including consumables), parts, and components, from design through final assembly.

Identification requirements begin with specifications and drawings. Drafting procedures require that notes and location indicators appear on drawings that specify identification information and exact location. Specifications describe how the identification is to be accomplished (e.g., name plates, impression stencil, electrochemical etching). Identification requirements from drawings and specifications are referred to on the Manufacturing Production Order (MPO).

8.3 Traceability of parts, assemblies, components, and structures to drawings and specifications is achieved through the practice of the drawing number becoming the part number. Completed component and structure name plates reference the design or component specification number. In manufacturing and assembly, the MPO, which references drawings and specifications and directs the identification to be applied to the items, provides data for traceability to nonconformance reports, special process procedures, inspection procedures, purchase orders, and mill test reports.

8.4 Any adverse effect of the location or method of identification on quality or function of items identified is prevented by specifying these requirements in engineering drawings and specifications. These documents are reviewed and approved by specialists in stress, materials, processing, manufacturing, and quality assurance, to assure identification markings do not affect quality and function.

8.5 Verification of the correct identification of materials, parts, and components is performed by the inspection function of the Quality Assurance Department for ESG fabricated items. Quality Assurance Engineering Department personnel are responsible for issuing instructions to inspection for this verification to appear on the MPO. Upon completion of fabrication and assembly, Quality Assurance Engineering Department personnel review the MPO to assure the steps specifying identification and its verification are initiated and stamped to show completion of these operations. For supplier fabricated items, identification verification is accomplished by ESG itinerant or resident QA representatives.

## 9.0 CONTROL OF SPECIAL PROCESSES

9.1 For purchased items, ESG delegates execution responsibility for special process control activities to suppliers and assesses the effectiveness of supplier special process control activities, as described in Section 7.0 of this appendix.

9.2 For items fabricated by ESG, special processes, including but not limited to welding, brazing, heat-treating, cleaning, bonding, coating, soldering, plating, hard surfacing, forming, clean room operations, and nondestructive testing are controlled to the degree required by applicable codes, standards, specifications, and regulations. This control is accomplished by several means:

- 1) Fabrication Procedures are written by Manufacturing Engineering, and reviewed and approved by Design Engineering and Quality Assurance. Nondestructive examination procedures are reviewed and approved by certified NDE Level III Examiners.
- 2) Detail instructions in the Manufacturing Production Order (MPO), which serves as ESG's shop traveler, are written by Manufacturing Planning and reviewed and approved by Quality Assurance.

When Processing Procedures are used, they are made part of the MPO by reference.

9.3 Procedures, equipment, and personnel performing special processes are qualified and certified by Quality Assurance Department personnel. Qualification is accomplished in accordance with applicable codes, standards, specifications, or internal requirements. Qualifications are reviewed and approved by Quality Assurance.

Special processes are performed by trained, qualified personnel working to written qualified instructions using qualified equipment. Evidence of performance or verification is recorded on the MPO which accompanies each structure, system, or component during manufacture. Evidence of performance is either recorded or verified by qualified Quality Assurance personnel.

9.4 Qualification records of procedures, equipment, and personnel for performing special processes are established, filed, and maintained current in compliance with written ESG procedures. Periodic audits of these records are performed by Quality Assurance to ensure their adequacy.

## 10.0 INSPECTION

10.1 For purchased items, ESG delegates execution responsibility for inspection activities to suppliers and assesses the effectiveness of these inspection activities, as described in Section 7.0 of this appendix.

10.2 For items fabricated at ESG, inspections, examinations, and quality verification testing of systems, structures, and components are performed by Inspection and Test Unit personnel of the Quality Assurance Department. The manager of this function reports directly to the Quality Assurance Director, who reports directly to the President of Energy Systems Group, thus providing the inspection function freedom effectively to perform its responsibilities.

10.3 The shop traveler for the control of manufacturing and inspection activities is the Manufacturing Production Order (MPO). The MPO is a single document that authorizes and directs both manufacturing and inspection activities. For inspection, the MPO serves as the test and inspection checklist.

The MPO specifies the characteristics to be inspected and the specific point in the manufacturing process where the inspection must be accomplished. It also specifies, by line entry, the specific department and group responsible for performing the operations, including inspections and tests. Inspection points are selected by Quality Assurance Department staff.

Acceptance and rejection criteria and the description of the method of inspection, including any special requirements such as use of particular equipment, are specified on the MPO or are contained in documents specifically referenced by the MPO. These are entered on the MPO by Quality Assurance Department staff.

The inspector who performs the inspection operation stamps the MPO entry when he completes an inspection activity. When the manufacturing and inspection effort on the MPO is completed, the MPO is reviewed by the Quality Assurance Engineering personnel of the Quality Assurance Department to verify and certify acceptable completion of all specified manufacturing, inspection, and test operations.

Each system, structure, component, or subtler detail is fabricated against an individual MPO. Established procedures require that a copy of each drawing and procedure referenced on the MPO be at the manufacturing and inspection work station for use by personnel during the work operation.

10.4 Inspectors are trained and indoctrinated, as required, to assure proficiency in their assignments. In addition, nondestructive examination personnel are formally trained, qualified, and certified to SNT-TC-1A as supplemented by Section III of the ASME Boiler and Pressure Vessel Code (see paragraph 2.10).

10.5 Modifications, repairs, and replacements are fabricated under the same Manufacturing-Inspection control system as new items, and receive the same reviews and approvals as original item fabrication.

10.6 Hold points for witness by the authorized Code Inspector and/or customer representatives are provided for and established, as required by these agencies, on the MPO by Quality Assurance Engineering personnel, prior to release for fabrication.

10.7 Procedures require Quality Assurance Department personnel monitoring of special processes, where direct inspection is not possible. Process procedures are used which specify control measures and acceptability requirements.

#### 11.0 TEST CONTROL

11.1 For purchased items, Energy Systems Group delegates execution responsibility for test programs to suppliers, and assesses the effectiveness of these programs through surveillance actions, as described in Section 7.0 of this appendix.

11.2 For items produced by Energy Systems Group, test programs are identified by Design Engineering, as appropriate, to demonstrate that items will perform satisfactorily in service. Testing is accomplished in accordance with written and controlled procedures. These procedures are prepared by Engineering or Quality Assurance Department personnel from the group or unit responsible for conducting the test. They are reviewed and approved by the cognizant Quality Assurance Department personnel having responsibility that quality and quality assurance requirements are met and by Program Office cognizant engineers having responsibility that technical requirements are met.

11.3 Test procedures include appropriate requirements for test article identification, test purpose and objectives, test prerequisites, test condition limits, instruments and calibration, equipment, environmental warnings and cautions, authority for test restart after interruptions, accept/reject criteria, data type, method of documentation, and records collection, and storage requirements, Quality Assurance Department, authorized inspection, or customer witness requirements, personnel qualification requirements, and step-by-step procedure requirements with provision for performer signoff and Quality Assurance Department witness verification signoff or stamp.

11.4 Test data are analyzed by qualified personnel and a written report prepared in which results are documented, evaluated, and the acceptability of the item for performing its function satisfactorily in service stated.

11.5 Tested items that have subsequently been modified, repaired, or have been replaced in whole or in part are retested to the original test requirements. If the repair, modification, or replacement involves a design change and modified testing requirements, all design and test documents are revised prior to this work in accordance with the procedures and control described in Sections 3.0, 5.0, and 6.0 of Appendix J.

## 12.0 CONTROL OF MEASURING AND TEST EQUIPMENT

12.1 For purchased items, Energy Systems Group delegates execution responsibility for control of measuring and test equipment to suppliers and assesses the effectiveness of these activities, as defined in Section 7.0 of this appendix.

12.2 For items produced or tested by Energy Systems Group, procedures define the requirements and responsibilities for calibration, calibration standards, and control of measuring and test equipment used for fabrication, testing, and inspection. The Quality Assurance Department has the responsibility for implementing and maintaining the program for calibration and control of measuring and test equipment. Calibration operations are conducted by the Quality Assurance Department, Engineering Department, other Rockwell International Divisions, and qualified suppliers.

12.3 Each item of measuring and test equipment is given a unique serial number, and the records containing calibration and test data are identified and filed by that serial number.

The calibration system procedures require that measuring and test equipment be calibrated at specified intervals and that these intervals be based on usage, stability, accuracy, and history. Calibration procedures are prepared by the calibrating function and are reviewed and approved by cognizant Quality Assurance management.

The complete calibration status of measurement and test equipment is maintained, using a computerized calibration inventory and recall system, which provides the basic calibration system control, by forcing a listing of equipment requiring calibration and the periodic recall notification to the instrument user and calibration function.

Measuring and test tools and instruments are labeled to show calibration status, i.e., out of use, indication only, and next calibration due date for in-use equipment. Out-of-use tools and instruments are labeled "Calibrate Before Using."

12.4 Calibration procedures specifically state that the calibration standards against which the measuring and test equipment is calibrated have an error no more than one-fourth of tolerance of the equipment (including standards) being calibrated, unless prohibited by the state-of-the-art. A greater error may be permitted after discussion between management of the using organization and the Manager of Inspection and Test.

Energy Systems Group maintains working standards against which measuring and test equipment are calibrated. Working standards are calibrated for traceability to the National Bureau of Standards. This is accomplished by procuring standards or calibration services directly from the NBS or from suppliers which, in turn, can demonstrate NBS traceability. Where NBS standards do not exist, calibration of standards is accomplished by such methods as inter-laboratory comparisons or internal development of a standard.

12.5 When discrepancies from accepted tolerance are found for measuring and test instruments during calibration, this finding is reported to the Manager of the using organization who initiates an investigation of items inspected since the previous calibration. The validity of previous inspection performed with the suspect instrument is evaluated, and the results, along with appropriate actions, documented for the record and follow-up.

### 13.0 HANDLING, STORAGE, AND SHIPPING

13.1 For purchased items, Energy Systems Group delegates execution responsibility for cleaning, handling, storage, and shipping activities to the suppliers and assesses the effectiveness of these activities, as defined in Section 7.0 of this appendix.

13.2 For items produced by Energy Systems Group, special handling, preservation, storage, packaging, and shipping requirements are specified by packaging engineering specialists. Any special cleaning requirements are specified by manufacturing planning. Operations involving these activities are accomplished by qualified individuals, in accordance with written work and inspection instructions. Handling and cleaning instructions are detailed in procedures referenced in the Manufacturing Production Order (MPO).

All specifications and instructions covering cleaning, handling, preservation, storage, packaging, and shipping reflect design and specification requirements of the material, components, or system being processed. Special attention is given to prevention of loss, damage, or deterioration due to adverse environmental conditions, such as temperature or humidity.

By the time of shipment to the construction site, instructions for handling and storage are transmitted to the Constructor.

#### 14.0 INSPECTION, TEST, AND OPERATING STATUS

14.1 For purchased items, Energy Systems Group delegates execution responsibility for identifying and maintaining inspection, test, and operating status. Assessment of the effectiveness of inspection, test, and operating status is obtained from surveillance activities described in Section 7.0 of this appendix.

14.2 For items produced by Energy Systems Group, the inspection and test status of structures, systems, and components, throughout manufacturing, is identified by the utilization of a shop traveler, known as a Manufacturing Production Order (MPO). The MPO is a comprehensive manufacturing, inspection, and testing planning document written by the Manufacturing Planning Unit of the Manufacturing Department. It is reviewed and approved by Quality Assurance Department personnel to assure that adequate inspection and test controls are included. Inspections and tests are performed or witnessed by qualified Quality Assurance Department inspection personnel, and the status of the inspection or test is indicated on the MPO with the inspector's stamp. Finished items also receive the Quality Assurance Department inspector's stamp; or, if too small to be stamped, are bagged and tagged with the status indicator applied to the tag.

Quality Assurance Department personnel perform periodic and final reviews of the MPO, to assure that all inspections and tests have been performed and their status properly indicated. Thus, bypassing of inspections, tests, and other critical operations is precluded. Application and removal of inspection status indicators, such as tags, markings, labels, and stamps are performed or witnessed by Quality Assurance Department personnel. Welding stamp indications are applied by the welder, as required by the MPO and are verified by Quality Assurance Department personnel.

14.3 The status of nonconforming, inoperative, or malfunctioning structures, systems, or components is identified by Quality Assurance Department personnel to prevent inadvertent use. Details of the control system are described in Section 15.0 of this appendix.

#### 15.0 NONCONFORMING MATERIALS, PARTS, OR COMPONENTS

15.1 For purchased items, Energy Systems Group delegates execution responsibility for nonconforming materials, parts, or components control measures to suppliers. Assessment of the effectiveness of these measures is obtained from surveillance activities described in Section 7.0 of this appendix. Nonconformances that affect safety-related functions or utility that are proposed

for "accept as is" or "repair" dispositions are submitted to Energy Systems Group for approval; and if ESG approval is granted, then to the customer for approval.

15.2 For Energy Systems Group fabricated items, procedures are implemented whereby nonconforming item identification, documentation, segregation, review, and disposition are performed. The administrative system for nonconformance control routinely provides for notification of appropriate affected organizations (Manufacturing, Purchasing, Engineering, Quality Assurance Engineering LMFR Programs) of the existence of nonconforming conditions.

The shop traveler, or Manufacturing Production Order (MPO), described in Section 10.0 of this appendix initiates identification of a nonconformance of inprocess items, with the Quality Assurance Department inspector affixing his discrepancy stamp to the line items on the MPO for the inspection operation. This identification of the item, the nonconformance, and the acceptance criteria involved are transferred to a nonconformance report form by Quality Assurance Department personnel, and the serial number of this report is transcribed onto the MPO. The nonconformance report form and the procedure controlling its use provide for documentation of the disposition of the nonconformance, signature approval of individuals authorized to determine dispositions, and distribution of the report. A similar approach is used for supplier nonconformances detected at receiving or source inspection.

Nonconformance procedures define the individuals and groups responsible for the disposition of nonconforming items.

15.3 Nonconforming items are physically segregated from acceptable items in controlled access hold rooms. The hold rooms are controlled by the Quality Assurance Department Inspection Unit. Items too large to be placed in the rooms are prominently tagged to identify their hold status. Release from hold areas or removal of hold status tags can only be performed by appropriate Quality Assurance Department personnel, after receipt of an approved nonconformance report.

Nonconformances in services will normally be written against affected hardware. Where that is not practical (e.g., defective computer codes), the Corrective Action Request (see Section 16.0) is used to control further operations and/or hardware as appropriate, and to track resolution.

15.4 Repair and rework operations of materials, parts, components, systems, and structures is accomplished by a revision to the original MPO. This revision of the MPO is prepared, reviewed, and approved in the same manner as the initial issuance, which is described in Section 10.0 of this appendix. This revision specifies the repair, rework, and inspection procedures to be used. The inspection methods used are, as a minimum, those used for the original inspection.

15.5 Nonconformances that affect safety-related functions or utility of the items that are proposed for "accept as is" or "repair" dispositions are submitted to the customer for approval. Approved nonconformance reports, with the dispositions, "accept as is" or "repair", are maintained by Quality Assurance, and are submitted with the item at the time of shipment, in accordance with contract requirements.

15.6 Nonconformance reports are summarized and analyzed for trends at least monthly by QA Audits and Controls and Quality Assurance Engineering and the summary is distributed to managers of Quality Assurance, Manufacturing, and Purchasing. Nonconformance reports are submitted to the customer as required by contract.

#### 16.0 CORRECTIVE ACTION

16.1 For procured items, Energy Systems Group delegates execution responsibility to suppliers for establishing and maintaining corrective action measures. Assessment of the effectiveness of these measures is obtained from the supplier surveillance activities provided for in Section 7.0 of this appendix.

16.2 For activities within Energy Systems Group, a documented corrective action system, under the control of the Quality Assurance Department, is established in accordance with procedures for handling nonconformance to technical requirements and technical procedures. Technical requirements are those contained in design drawings, specifications, fabrication procedures, and inspection and test procedures. Technical requirement nonconformances, therefore, are reflected by hardware nonconformance. Technical procedure requirements are those that guide the general processes of documenting and disseminating design, performance, configuration, procurement, manufacturing, and inspection requirements. These technical procedures are those in the Quality Assurance Manuals and functional manuals of quality-affecting organizations.

16.3 Corrective actions for technical requirement violations are an integral part of the nonconforming item system described in Section 15.0 of this appendix. Corrective action for technical procedure nonconformance are defined in procedures covering audits and the basic corrective action system.

Corrective action is initiated during (a) nonconformance evaluation and resolution and (b) following the determination of a condition adverse to quality, to preclude reoccurrence. Appropriate completion periods are assigned as parts of the corrective action commitments. To assure timely resolution, corrective action completion dates are monitored by the Quality Assurance Audits and Controls function; and, in the event of a delinquency, these facts are brought to the attention of the management of Quality Assurance and the affected organizations.

Implementation of corrective action is verified by Quality Assurance, and this is the basis for close-out of corrective actions.

All corrective actions are based on conditions that do or may adversely affect quality. These conditions and their causes are summarized in monthly reports to management, along with status of the corrective action implementation (i.e., complete, on schedule, or delinquent).

## 17.0 QUALITY ASSURANCE RECORDS

17.1 Policies, plans, and procedures have been implemented by Energy Systems Group to obtain applicable quality assurance records in ANSI N45.2.9 (1974). These policies, plans, and procedures also provide for storage and preservation of the quality assurance records while at ESG. Generic quality record categories have been identified and organizational retention responsibility assigned for these. At the time of contract award for equipment items, a specific list of quality records to be obtained is prepared based on the generic listing. Quality records include system design descriptions, specifications, drawings, design reports, design verification test procedures and reports, purchase orders, design review reports, manufacturing process procedures and instructions, material test reports, personnel and process qualification results, nonconformance reports, audits, inspection results, acceptance test reports, calibration procedures and records, and quality surveillance reports. The records program procedures also provide for responsibilities for its management and operation, records collection, definition of terms unique to the records program, verification of such characteristics as legibility, completeness, inventory control, and transfer to the Owner.

17.2 The organizations involved in the quality records program are Quality Assurance, Engineering, Purchasing, and Manufacturing. Responsibilities of these organizations for specifying, generating, collection, verification, filing, storage, and preservation are given in appropriate procedures.

17.3 Inspection and test records for items examined contain the following information:

- 1) The inspection or test performed
- 2) The date and results (acceptable/unacceptable) of the inspection or test
- 3) A notation of the acceptability of parts, assemblies, or operations
- 4) A signature or stamp of the individual performing or verifying inspections and tests
- 5) Notification that nonconformances exist, information relating to nonconformances, and disposition of the nonconforming item, and specific repair or rework actions.

17.4 Record storage facilities and files minimize the possibility of destruction by fire, flooding, theft, biodegradation, and deterioration by environmental conditions such as temperature, humidity, and corrosive fumes.

## 18.0 AUDITS

### 18.1 EXTERNAL AUDITS

Energy Systems Group has an audit program for auditing suppliers of structures, systems, and components. Quality Assurance Department personnel perform audit planning, scheduling, audit team selection, audit coordination and contact, report issuance, and follow-up to verify implementation of effective corrective action. Audits are planned on an annual basis. Unscheduled audits may be performed when deemed necessary. Audits are scheduled, based on supplier activity status, to evaluate the effectiveness of supplier Quality Assurance Programs. Checklists are prepared to guide the conduct of audits. Personnel experienced in the conduct of audits are selected as audit team leaders.

The responsibility for the execution of audits within their own and sub-tier suppliers' is delegated to suppliers in procurement documents.

### 18.2 INTERNAL AUDITS

18.2.1 Internal quality assurance audits are conducted in accordance with pre-established procedures and checklists. Personnel experienced in the conduct of audits perform the audits, or are team leaders when the team approach is used. Audit personnel are selected to prevent their having direct responsibilities in the areas being audited.

Auditors document their findings, and these findings are reviewed with managers having responsibility for the area audited. At the time of this review, the affected manager accepts a commitment to implement corrective action for deficiencies, and a specified date when implementation will be complete. Upon notification of completion of a corrective action commitment, that area is re-audited to assure the corrections have been accomplished.

18.2.2 Audits are conducted of systems and procedures, processes, and products. The procedures audited are first evaluated against code, standard, and contract requirements, and then the effectiveness of their implementation to on-going work effort is established during audits. A review of documents and records is an integral part of all audits.

Quality audits are performed by personnel from the Quality Assurance Department, or, in the instance of team audits, personnel from other functions under the direction of a Quality Assurance Department lead auditor certified to the requirements of ANSI N45.2.23.

Audits are scheduled yearly, in advance, to cover all elements where there is on-going activity. The audit activity is initiated concurrent with initiation of conceptual design and is conducted throughout the life of the program, so that discrepancies noted can be corrected early enough that end products will not be affected.

18.2.3 Audit results and status are reported monthly to program and functional managers. A summary report of problems affecting timely corrective action is sent to the ESG President and executive level functional managers monthly.

Yearly summarization and analysis of CRBRP Audit Results are conducted and reported to management for review and assessment and as required by contract requirements.

### 18.3 ACTIVITIES AUDITED

Activities audited are those Quality Assurance program elements indicated in Figure 17J-3.

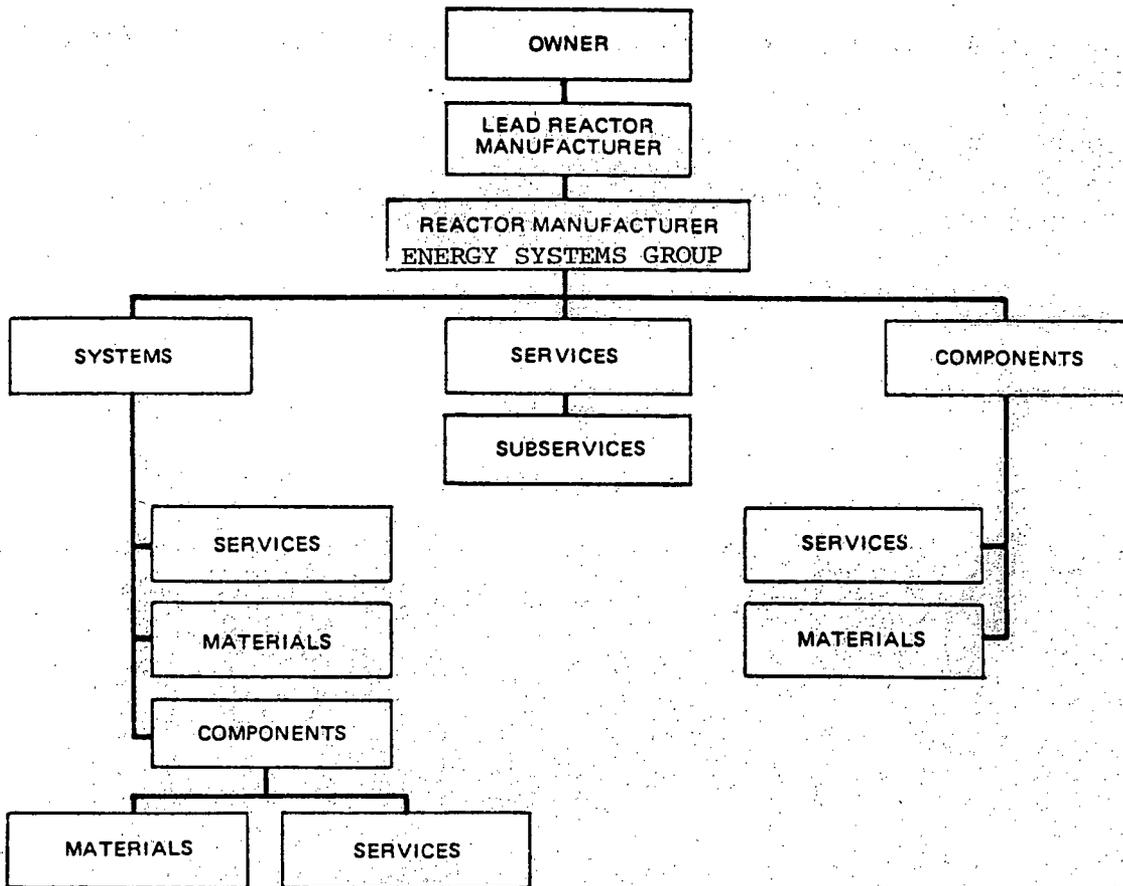
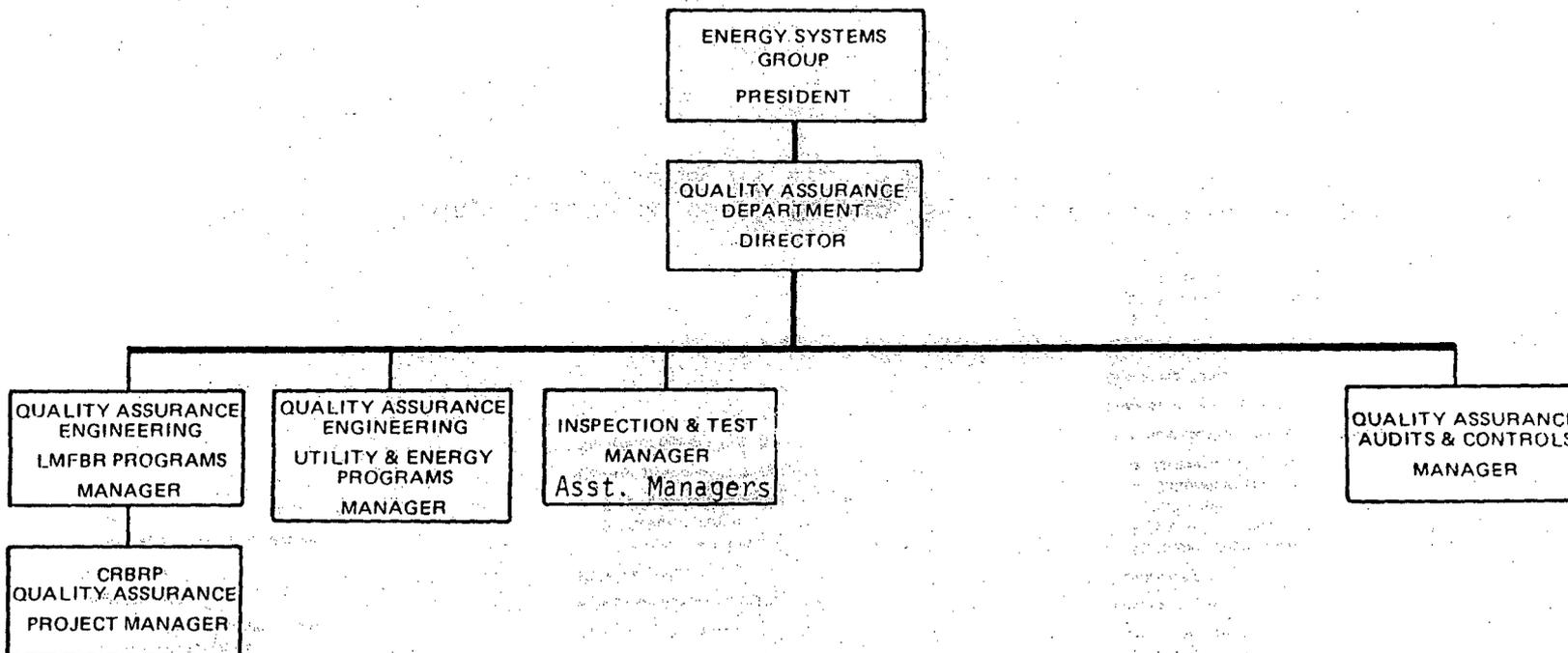


Figure 17J-1. Overall Energy Systems Group Reactor Manufacturer Quality Assurance Program Functional Organization of Program Participation

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FIGURE 17J-2. ENERGY SYSTEMS GROUP QUALITY ASSURANCE DEPARTMENT ORGANIZATION

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PROGRAM MANAGEMENT

<b>QUALITY ASSURANCE PROGRAM</b> 1. Planning 2. Quality Assurance Program Index	<b>ORGANIZATION</b> 1. Responsibility and Authority 2. Training and Indoctrination 3. Personnel Qualification	<b>DOCUMENTATION</b> 1. Policies and Procedures 2. Quality Records 3. Quality Status Reports	<b>AUDITS AND REVIEWS</b> 1. Quality Audits 2. Management Reviews	<b>CORRECTIVE ACTION</b> UNUSUAL OCCURRENCE REPORTING	<b>ENGINEERING HOLDS</b>
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DESIGN AND DEVELOPMENT

- Design Planning
- Design Definition and Control
  - 1. Design Criteria
  - 2. Codes, Standards and Practices
  - 3. Engineering Studies
  - 4. Parts, Materials and Processes
  - 5. Design Descriptions
  - 6. Specifications, Drawings and Instructions
  - 7. Identification
  - 8. Acceptance Criteria
  - 9. Interface Control
- Document Review and Control
  - 1. Document Reviews
  - 2. Document Control
  - 3. Engineering Drawing Lists
- Design Reviews
- Development
- Failure Reporting and Corrective Action

PROCUREMENT

- Procurement Planning
- Procurement Requirements
- Procurement Document Reviews
- Evaluation and Selection of Procurement Sources
  - 1. General Requirements
  - 2. Acceptable Source List
  - 3. Pre-Award Evaluation
  - 4. Interchange of Source Capability Information
- Control of Configuration
  - 1. Contract Change Control
  - 2. As-Built Verification
- Equipment Calibration and Standards
- Source Surveillance and Inspection
- Receiving Inspection
  - 1. Planning and Inspection
  - 2. Documentation
  - 3. Dispositioning of Received Items
- Control of Nonconforming Items
- Control of Received Items

MANUFACTURING, FABRICATION AND ASSEMBLY

- Planning
- Inspection and Test Plan
- Material Identification and Control
- Control of Processes
  - 1. Fabrication and Assembly Processes
  - 2. Process Qualification
  - 3. Nondestructive Examination
  - 4. Cleaning
- Inspection and Tests
  - 1. General Requirements
  - 2. Procedures
  - 3. Completed Item Inspection and Test
  - 4. Inspection Status Indication
  - 5. Certification
- Document Control
- Equipment Calibration and Standards
  - 1. Equipment Evaluation
  - 2. Control of Inspection Measuring and Test Equipment
  - 3. Calibration Standards
  - 4. Discrepancy Equipment
- Statistical Quality Control and Analysis
- Control of Nonconforming Items
- Corrective Action
- Handling, Preservation, Packaging, Storage and Shipping
  - 1. Handling
  - 2. Preservation, Packaging and Storage
  - 3. Shipping

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Figure 17J-3. Major Elements of the Energy Systems Group Reactor Manufacturer Quality Assurance Program

Appendix B Criterion	Number	ESG Implementing Document or Procedure Title
I. Organization	SOP M-10	Program Management
	SOP Q-10	ESG Quality Assurance Program
	QAOP N1.21	Quality Assurance Plans
II. Quality Assurance	SOP A-01	ESG Policies and Procedures
	SOP M-10	Program Management
	SOP Q-10	ESG Quality Assurance Program
	SOP Q-16	Quality Assurance (QA) - Program Support Functions
	SOP Q-12	Quality Assurance Program Audits
	SOP Q-18	ESG Quality Records
	SOP Q-26	Product Integrity
	FMD No. 16	Quality Assurance Management Reviews
	FMD No. 11	CFBRP Document Hold Status System
	FMD No. 20	CFBRP Training and Indoctrination
	FMD No. 27	CFBRP Document Status System
	EMP 3-1	Engineering Documentation Process
	OMP 2.35	Case File Documentation
	QAOP N1.00	Preface to Quality Assurance Manual
	QAOP N1.01	Quality Assurance Department Functions
	QAOP N1.03	Vision Requirements for Quality Assurance Personnel
	QAOP N1.21	Quality Assurance Plans
	QAOP N1.23	Quality Status Reports
	QAOP N6.02	Qualification and Certification of Nondestructive Examination Personnel
	CS3M2.4	Qualification and Certification of Visual and Dimensional Inspection Personnel
	QAOP N8.00	Statistical Quality Control Program
	QAOP N13.02	Quality Assurance Data Packages
	CS3M2.3	Training and Indoctrination

Figure 17J-4. Quality Assurance Procedure Index vs Requirements of 10 CFR 50, Appendix B  
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Appendix B		ESG Implementing Document or Procedure	
Criterion	Number	Title	
II. Quality Assurance Program (cont'd)	CS3M17	Quality Assurance Records	
	FMD-i3	CRBRP Licensing Administrator	
III. Design Control	SOP M-10	Program Management	
	SOP N-16	Configuration Management	
	FMD No. 1	CRBRP Correspondence Control	
	FMD No. 11	CRBRP Document Hold Status System	
	FMD No. 15	Schedule Development and Control	
	FMD No. 19	CRBRP SDD Preparation and Revision	
	FMD No. 21	CRBRP Development Activities	
	FMD No. 25	CRBRP Parts Standardization	
	FMD No. 26	Use of Controlled Information Data Transmittal (CINDT)	
	FMD No. 27	CRBRP Document Status System	
	FMD No. 30	CRBRP Specifications	
	FMD No. 32	CRBRP Design Reviews and Release	
	FMD No. 34	Application of Additions to ASME Code Requirements	
	FMD No. 36	Engineering Drawings	
	FMD No. 40	Materials and Processes for CRBRP	
	FMD No. 41	Baselining of Documents	
	FMD No. 54	SHRS Reliability Program	
	FMD No. 56	Acceptance Test Requirements and Specifications	
	EMP 1-0	Preface to Engineering Management Procedures Manual	
	EMP 2-8	Engineering Studies	
	EMP 2-9	Design and Acceptance Criteria	
	EMP 3-5	Engineering Release System	
	EMP 3-42	Engineering Management System for Specifications	

Figure 17J-4. Quality Assurance Procedure Index vs Requirements of 10 CFR 50, Appendix B (Sheet 2 of 12)

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Appendix B		ESG Implementing Document or Procedure	
Criterion	Number	Title	
III. Design Control (continued)	EMP 3-21	Engineering Change Control	
	EMP 3-22	Interface Control	
	EMP 3-24	Control of Engineering Drawings	
	EMP 3-25	Engineering Orders - Preparation Instructions	
	EMP 3-26	Preparation and Control of Supporting Documents	
	EMP 3-28	Component Traceability	
	EMP 3-29	Engineering Requirements for Serialization	
	EMP 3-51	Weldment Checklist	
	EMP 3-52	Engineering Release Plan of Action	
	EMP 3-63	Documentation Release and Control of Scientific and Technical Computer Programs	
	EMP 5-3	Design Reviews	
	EMP 5-17	Checking of Engineering Drawings	
	EMP 5-21	Materials and Processes Control System	
	EMP 5-24	Application of Standards	
	CS3M 3, 6	Design and Document Control	
	M-3-13	Numbering and Control of Manufacturing Material Processing Procedures (MPP)	
	IV. Procurement Document Control	SOP J-12	Preparation and Processing of the Purchase Requisition
		SOP M-10	Program Management
		PMD No. 22	Use of CBRP Administrative Specification in Procurements
PMD No. 23		Subcontract Preprocurement Planning	
PMD No. 24		Preparation, Review, Approval, and Processing of Purchase Requisitions	
AIMP 1.1.1		Procurement Policy	
AIMP 3.109.1	Procurement from Approved Supplier		

Figure 17J-4. Quality Assurance Procedure Index vs  
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Appendix B Criterion	Number	ESG Implementing Document or Procedure Title
IV. Procurement Document Control (continued)	CMP 2.14	Changes to Purchase Orders and Other Direction to Suppliers
	CMP 2.35	Case File Documentation
	QAOP N4.00	Procurement Documents
	QAI N4.00A	CRBRP Procurement Document Review
	CS3M 4	Subcontractor Fabricated Items
	CS3M, Appendix A	Contracting for the Fabrication of a Code Item as an N-Certificate Holder Retaining Overall Responsibility for Certification and Stamping
V. Instructions, Procedures, and Drawings	SOP A-01	ESG Policies and Procedures
	SOP Q-10	ESG Quality Assurance Program
	SOP Q-28	Unusual Occurrence Reports - RDT Programs
	SOP Q-18	ESG Quality Records
	SOP Q-20	Reports to the Nuclear Regulatory Commission (NRC) Concerning Defects and Noncompliances
	PMD No. 35	Change Control
	PMD No. 36	Engineering Drawings
	PMD No. 48	Unusual Occurrence Reporting
	EMP 2-9	Design and Acceptance Criteria
	EMP 3-1	Engineering Documentation Process
	EMP 3-4	Numbering of Engineering Documents
	EMP 3-5	Engineering Release System
	EMP 3-42	Engineering Management Systems for Specifications
	EMP 3-29	Engineering Requirements for Serialization
	SOP L-12	Laboratory and Engineering Notebooks
	EMP 4-4	Test Procedures
	EMP 4-5	Test Reports

Figure 17J-4. Quality Assurance Procedure Index vs Requirements of 10 CFR 50, Appendix B (Sheet 4 of 12)

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Appendix B		ESG Implementing Document or Procedure
Criterion	Number	Title
V. Instructions, Procedures, and Drawings (continued)	QMP 2.35	Case File Documentation
	QAOP N1.21	Quality Assurance Plans
	QAOP N1.22	Quality Assurance Acceptance Procedures
	QAOP N1.23	Quality Status Reports
	CS3M 5.11	Cleaning Procedures
	CS3M 9	Control of Fabrication Processes
	QAOP N6.01	Qualification of Welding Procedures and Welding Personnel
	QAOP N6.02	Qualification and Certification of Nondestructive Examination Personnel
	CS3M 2.4	Qualification and Certification of Nondestructive Examination Personnel
	QAOP N6.05	Qualification of Special Processes
	CS3M 5.4	Welding Procedures
	CS3M 9.3	Control of Welding Operations
	CS3M 5.5	Heat-Treating Procedures
	CS3M 5.9	Nondestructive Examination Procedures
	CS3M 7.10	Subcontracted Nondestructive Examination Services
	CS3M 10, 11, 5.10	In-Process and Final Examination and Tests
	CS3M 2.6	Authorized Inspector
	CS3M 17	Quality Assurance Records
	MM M-3-15	Qualification of Welders, Welding Operators, and Welding Procedures
	CS3M 3, 6	Design and Document Control
VI. Document Control	SOP J-12	Preparation and Processing of the Purchase Requisition
	PMD No. 1	CRBP Correspondence Control
	PMD No. 36	Engineering Drawings
	PMD No. 12	Quality Assurance Review and Approval of Engineering Requirements Documents
	PMD No. 35	Change Control
	PMD No. 56	Acceptance Test Requirements and Specifications

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Appendix B		ESG Implementing Document or Procedure	
Criterion	Number	Title	
VI. Document Control (continued)	EMP 3-42	Engineering Management System for Specifications	
	EMP 3-21	Engineering Change Control	
	EMP 3-24	Control of Engineering Drawings	
	EMP 3-25	Engineering Orders - Preparation Instructions	
	EMP 3-26	Preparation and Control of Supporting Documents	
	EMP 3-36	Request for Document Change	
	EMP 3-52	Engineering Release Plan of Action	
	EMP 3-63	Documentation, Release, and Control of Scientific and Technical Computer Programs	
	OMP 2.14	Changes to Purchase Order and Other Directions to Suppliers	
	QAOP N2.03	Document Control	
	CS3M 3, 6	Design and Document Control	
	M-3-13	Numbering and Control of Manufacturing Material Processing Procedures (MPP)	
	VII. Control of Purchased Material, Equipment and Service	SOP J-12	Preparation and Processing of the Purchase Requisition
SOP K-90		Receiving and Inspection of Incoming Material and Equipment	
SOP K-84		Warehousing of Direct-Charged Purchased Materials by Traffic and Warehousing	
SOP P-46		Handling and Storage of Project Critical Hardware	
SOP K-78		Procurement and Control of Supplier Data	
PMD No. 23		Subcontract Preprocurement Planning	
PMD No. 43		Review of Supplier Data	
PMD No. 55		Instructions for Required Documentation and Procedures for Shipment of Components to CRBRP Site or Other Designated Areas	
OMP 3.121		Source Selection	
QAOP N4.01		Supplier Evaluation and Approval	
QAOP N4.02		Procurement Quality Verification Instructions	

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Appendix B Criterion	ESG Implementing Document or Procedure	
	Number	Title
VII. Control of Purchased Material, Equipment and Service (cont'd)	QAOP N4.03	Procurement Quality Assurance - Source Inspection/Surveillance
	QAOP N4.04	Procurement Quality Assurance - Receiving Inspection
	QAOP N4.04C	CRBRP Receiving Inspection Overcheck Requirements
	CS3M 7.2	Approved Procurement Sources
	CS3M 4	Procurement Document Control
	CS3M 5.3	Procurement Quality Verification Instructions
	CS3M 7.3, 7.4	Procurement Verification (Source and Receiving Verification)
	CS3M 8	Identification and Control of Materials and Items
VIII. Identification and Control of Materials, Parts and Components	SOP K-90	Receiving and Inspection of Incoming Material and Equipment
	SOP K-84	Warehousing of Direct-Charged Purchased Materials by Traffic and Warehousing
	SOP P-46	Handling and Storage of Project Critical Hardware
	EMP 3-28	Component Traceability
	EMP 3-29	Engineering Requirements for Serialization
	QAOP N4.02	Procurement Quality Verification Instructions
	QAOP N4.04	Procurement Quality Assurance - Receiving Inspection
	QAOP N5.01	Manufacturing Production Order (Shop Travelers)
	QAOP N6.04	Weld Material Control
	QAOP N9.00	Stamp Control
	CS3M 14.2	Issuance, Use, and Control of Stamps
	QAOP N9.02	Serialization of Hardware
	QAOP N10.0	Nonconforming Materials and Items
	CS3M 4	Procurement Document Control
	CS3M 5.3	Procurement Quality Verification Instructions
CS3M 7.3, 7.4	Procurement Verification (Source and Receiving Verification)	
CS3M 8	Identification and Control of Materials and Items	

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Appendix B		ESG Implementing Document or Procedure	
Criterion	Number	Title	
9 VIII. Identification and Control of Materials, Parts and Components (continued)	CS3M 9	Control of Construction Processes	
	CS3M 15	Nonconforming Materials and Items	
	MM M-2-4	Control Stations	
	MM M-3-6	Material Control	
IX. Control of Special Processes	EMP 5-21	Materials and Processes Control System	
	QAOP N3.02	ESG Special Tooling	
	QAOP N5.01	Manufacturing Production Order (Shop Travelers)	
	CS3M 9	Control of Construction Processes	
	QAOP N6.01	Qualification of Welding Procedures and Welding Personnel	
	QAOP N6.02	Qualification and Certification of Nondestructive Examination Personnel	
	CS3M 2.4	Qualification and Certification of Nondestructive Examination Personnel	
	CS3M 5.11	Cleaning Procedures	
	QAOP N6.03	Nondestructive Examination Procedures	
	CS3M 5.9	Nondestructive Examination Procedures	
	QAOP N6.05	Qualification of Special Processes	
	CS3M 5.4	Welding Procedures, Specifications, and Personnel	
	CS3M 9.3	Control of Welding Operations	
	CS3M 5.5	Heat-Treating Procedures	
	CS3M 7.10	Subcontracted Nondestructive Examination Services	
MM M-3-15	Qualification of Welders, Welding Operators, and Welding Procedures		
X. Inspection	SOP K-90	Receiving and Inspection of Incoming Material and Equipment	
	QAOP N1.21	Quality Assurance Plans	
	QAOP N1.22	Quality Assurance Acceptance Procedures	
	QAOP N4.02	Procurement Quality Verification Instructions	

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Appendix B		ESG Implementing Document or Procedure	
Criterion	Number	Title	
X. Inspection (continued)	QAOP N4.04	Receiving Inspection	
	QAOP N4.03	Procurement Quality Assurance - Source Inspection/Surveillance	
	QAOP N4.04	Procurement Quality Assurance - Receiving Inspection	
	QAOP N4.04C	CBRP Receiving Inspection Overcheck Requirements	
	QAOP N5.01	Manufacturing Production Order (Shop Travelers)	
	QAOP N6.03	Nondestructive Examination Procedures	
	CS3M 5.9	Nondestructive Examination Procedures	
	QAOP N6.05	Qualification of Special Processes	
	QAOP N7.00	Product Acceptance Tests	
	QAOP N7.01	Pressure Testing	
	CS3M 5.3	Procurement Quality Verification	
	CS3M 7.3, 7.4	Procurement Inspection (Source and Receiving Inspection)	
	CS3M 9	Control of Construction Processes	
	CS3M 10	Examination, Tests, and Inspections	
CS3M 2.6	Authorized Inspector		
XI. Test Control	SOP L-12	Laboratory and Engineering Notebooks	
	EMP 4-4	Test Procedures	
	EMP 4-5	Test Reports	
XII. Control of Measuring and Test Equipment	SOP Q-24	Calibration of Measuring Instruments and Equipment	
	QAOP N3.00	Control of Measuring and Test Equipment (M&TE)	
	QAOP N3.02	ESG Special Tooling	
	CS3M 12	Control of Measurement and Test Equipment	
XIII. Handling, Storage and Shipping	SOP P-46	Handling and Storage of Project Critical Hardware	
	SOP K-44	Shipping	
	SOP P-48	Material Handling Equipment (MHE)	
	CS3M 5.11	Cleaning Procedures	
	PMD 55	Instructions For Required Documentation and Procedures for Shipment of Components to CBRP Site or Other Designated Area	
	PMD 57	Storage, Maintenance, and Inspection of Material, Parts, and Components	

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Appendix B		ESG Implementing Document or Procedure	
Criterion	Number	Title	
XIII. Handling, Storage and Shipping (continued)	QAOP N12.00	Packaging and Shipping Inspection	
	CS3M 13	Handling, Preservation, Storage, and Shipping	
	MM M-2-4	Control Stations	
	MM M-3-10	Packaging and Shipping	
XIV. Inspection, Test and Operating Status	SOP K-90	Receiving and Inspection of Incoming Material and Equipment	
	SOP K-84	Warehousing of Direct-Charged Purchased Materials by Traffic and Warehousing	
	SOP P-46	Handling and Storage of Project Critical Hardware	
	SOP Q-18	ESG Quality Records	
	QAOP N1.21	Quality Assurance Plans	
	QAOP N3.02	ESG Special Tooling	
	QAOP N4.04	Procurement Quality Assurance - Receiving Inspection	
	QAOP N5.01	Manufacturing Production Order (Shop Travelers)	
	CS3M 9	Control of Construction Processes	
	QAOP N6.04	Weld Material Control	
	QAOP N7.00	Product Acceptance Tests	
	QAOP N7.01	Pressure Testing	
	QAOP N9.00	Stamp Control	
	CS3M 14.2	Issuance and Control of Stamps	
	QAOP N9.02	Serialization of Hardware	
	QAOP N10.00	Nonconforming Materials and Items	
	CS3M 7.3, 7.4	Source Quality Verification and Receiving Inspection	
	CS3M 8.0	Identification and Control of Materials and Items	
	CS3M 9.3	Control of Welding Operations	
	CS3M 5.5	Heat Treating Procedures	
	CS3M 10, 11	Examination, Tests, and Inspections, Test Control	
	CS3M 15	Nonconforming Materials and Items	
	CS3M 2.6	Authorized Inspector	
MM M-2-4	Control Stations		
MM M-3-6	Material Control		

Figure 17J-4. Quality Assurance Procedure Index vs Requirements of 10 CFR 50, Appendix B (Sheet 10 of 12)

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Appendix B		ESG Implementing Document or Procedure	
Criterion	Number	Title	
XV. Nonconforming Materials, Parts, or Components	SOP K-90	Receiving and Inspection of Incoming Material and Equipment	
	SOP Q-18	ESG Quality Records	
	QAOP N5.01	Manufacturing Production Order (Shop Travelers)	
	QAOP N10.00	Nonconforming Materials and Items	
	QAI N10.00D	CRBRP Hardware Nonconformance Processing	
	QAOP N13.02	Quality Assurance Data Packages	
	CS3M 9	Control of Construction Processes	
	CS3M 15	Nonconforming Materials and Items	
CS3M 17	Quality Assurance Records		
XVI. Corrective Action	SOP K-90	Receiving and Inspection of Incoming Material and Equipment	
	SOP Q-14	Corrective Action System	
	SOP Q-28	Unusual Occurrence Reports - RDT Programs	
	PMD No. 48	Unusual Occurrence Reporting	
	EMP 5-19	Failure Reports	
	EMP 5-20	Incident Reports	
	QAOP N4.03	Procurement Quality Assurance - Source Inspection/Surveillance	
	QAOP N4.04	Procurement Quality Assurance - Receiving Inspection	
	QAOP N10.00	Nonconforming Materials and Items	
	QAOP N14.00	Corrective Action	
	CS3M 16	Corrective Action	
SOP Q-20	Reports to the Nuclear Regulatory Commission (NRC) Concerning Defects and Noncompliances		
XVII. Quality Assurance Records	SOP Q-18	ESG Quality Records	
	SOP K-78	Procurement and Control of Supplier Data	
	CS3M	Quality Assurance Records	
	PMD 18	CRBRP Quality Records Management System	
	N099QRP000001	Quality Records Management Plan for CRBRP	
	N099DWP410001	Quality Records Management Procedures	

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Appendix B Criterion	ESG Implementing Document or Procedure	
	Number	Title
XVIII. Audits	SOP Q-12 QAOP N1.04 CS3M 18	Quality Assurance Program Audits Quality Assurance Audits Audits

Figure 17J-4. Quality Assurance Procedure Index vs  
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QUALITY ASSURANCE MANUAL  
PROCEDURE DESCRIPTIONS

STANDARD OPERATING POLICIES (SOP's)

SOP A-01 - ESG Policy and Procedures

This SOP defines the types of ESG administrative policies and procedures authorized, and establishes minimum format and distribution requirements for such policies and procedures.

It identifies the highest level of management, corporate or otherwise, responsible for establishing quality policies, goals, and objectives. A clear path of communication between Quality Assurance organization and corporate management is defined.

Positions and groups responsible for defining both content and changes to the Quality Assurance Program and manuals are identified, in addition to the management level responsible for the approval of the Quality Assurance Program and manuals. Provisions are established for controlling and distribution of Quality Assurance manuals and revisions.

SOP J-12 - Preparation and Processing of the Purchase Requisition

This SOP establishes methods and policies applicable to the preparation and processing of the Purchase Requisitions (Form N25-R-2). The requisition is used for authorizing procurement, through Purchasing, of materials, equipment, and services from suppliers.

Procedures are established that delineate the sequence of actions to be accomplished in preparation, review, approval, and control of the Purchase Requisition.

SOP K-90 - Receiving of Incoming Material and Equipment

Receiving inspection of supplier-furnished material and equipment is performed in accordance with the following. The material is properly identified and corresponds with receiving documentation. Inspection is performed and judged acceptable, in accordance with predetermined instructions, prior to use. Items accepted and released are identified as to their inspection status, prior to release. Nonconforming items are segregated, controlled, and identified until proper disposition is made.

SOP K-84 - Warehousing of Direct-Charged Purchased Materials by Traffic and Warehousing

Methods are specified to identify and control materials. Verification of correct identification of material, prior to release, is required. Material shall be protected against loss, damage, and deterioration from environmental conditions.

#### SOP P-46 - Handling and Storage of Project Critical Hardware

Special handling, preservation, storage, packaging, and shipping requirements are specified and performed by qualified personnel under predetermined instructions.

#### SOP K-44 - Shipping

Special packaging and shipping requirements are specified and accomplished by qualified individuals, in accordance with predetermined instructions. Procedures are prepared in accordance with design and specification requirements which control the packaging and shipping of materials, components, and systems to preclude damage, loss, and deterioration.

#### SOP P-48 - Material Handling Equipment

Special handling requirements are specified and accomplished by qualified individuals, in accordance with predetermined instructions. Procedures are prepared in accordance with design and specification requirements which control the handling of materials, components, and systems, to prevent damage.

#### SOP Q-24 - Calibration of Measuring Instruments and Equipment

Procedures describe the calibration technique and frequency, maintenance, and control for all measuring instruments and test equipment which are used for obtaining data, where traceable calibrations are required, measuring and test equipment is identified, and the calibration test data is identified with the associated equipment. Measurement and test equipment are calibrated at specified intervals, based on the conditions affecting the measurement. When measuring and test equipment is found to be out of calibration, any items measured with this equipment are withheld until the accuracy of the results is evaluated. The complete status of all items under the calibration is recorded and maintained. Reference and transfer standards are traceable to national standards. If national standards do not exist, the basis for calibration is documented.

#### SOP Q-26 - Product Integrity

Implements Rockwell International quality policy and directive for ESG operations by establishing the Product Integrity Program. Defines 14 areas to be covered, makes ESG Quality Assurance Director Product Integrity Program Coordinator, and establishes a Product Integrity Committee consisting of ESG executive management.

#### SOP L-12 - Laboratory and Engineering Notebooks

It is the policy of the company to record all scientific and laboratory research and development activities in laboratory and engineering notebooks to be used by scientific and engineering personnel, primarily to record results of scientific studies and lab work, whether company or customer oriented. Innovations, inventions, discoveries, and improvements

will be recorded for the purpose of fulfilling contractual obligations and protecting company interests.

#### SOP K-78 - Procurement and Control of Supplier Data

Procedures are established for preparation, review, and control of instructions, procedures, drawings and changes thereto. These documents and changes thereto are procedurally controlled to assure adequacy. Provisions are established, identifying the personnel responsible for these activities. Changes are reviewed by the same organizations that performed the original review, unless delegated by the applicant to qualified responsible organizations. Approved changes are promptly included in the appropriate documents.

#### SOP M-10 - Program Management

This SOP sets forth principles and guidelines for the management of Energy Systems Group Business Programs. The Guidelines include organizational framework, program management processes, performance monitoring, and reporting systems.

#### SOP N-16 - Configuration Management

This SOP establishes the policies, methods, and responsibilities for the preparation, issuance, and use of Configuration Summary Reports.

The primary purpose of this report is to aid the Manufacturing, Quality Assurance, and Engineering functions in determining configuration and effectivity requirements for product hardware.

#### SOP Q-14 - Corrective Action System

Evaluation of nonconformances and determination of the need for corrective action follow established procedures. Prompt corrective action is initiated, following the determination of nonconformance to procedural or technical requirements. Adverse conditions significant to quality, their causes, and corrective actions, are reported to the appropriate levels of management.

#### SOP Q-10 - ESG Quality Assurance Program

This procedure defines the Quality Assurance Program to be applied to all ESG products and services, in compliance with applicable contract, federal, or state requirements. Management (above or outside of Quality Assurance and to the highest corporate level) regularly assesses the Quality Assurance Program effectiveness. The establishment of indoctrination and training progress review is specified.

#### SOP Q-28 - Unusual Occurrence Reports - RDT Programs

This SOP establishes methods and responsibilities for reporting to the customer of unusual occurrences affecting ESG programs under the requirements of RDT Standard F 1-3T.

SOP Q-20 - Reports to the Nuclear Regulatory Commission (NRC) Concerning Defects and Noncompliances

The purpose of this SOP is to comply with requirements of 10CFR21 including requirements to adopt procedures to 1) provide for: a) evaluating deviations or b) informing licensees or purchasers of deviations; and 2) assure that a responsible officer is informed of: a) failures to comply with the Atomic Energy Act of 1954, as amended, or any applicable rule, regulation order or license of NRC relating to Substantial Safety Hazard, or b) defects in the construction or operation of a facility or activity licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954, as amended.

This SOP designates the President, Energy Systems Group, as the responsible officer to be informed and provides methods for informing the President, Energy Systems Group, and provides for delegating his authority for reporting to the NRC.

SOP Q-16 - Quality Assurance Program Support Functions

This procedure establishes policy on the utilization of ESG Quality Assurance Department functions on ESG programs and describes the Quality Assurance Department functions and interfaces with other ESG departments.

It summarizes the provisions for resolving disputes arising from a difference of opinion between Quality Assurance - Quality Control and other department personnel.

The procedure outlines the safety-related structures, systems, and components controlled by the Quality Assurance Program, and the respective organization executing Quality Assurance - related functions on these items during the design, engineering, procurement, inspection, manufacturing, construction, and testing phases. Quality-related activities (inspection and test, etc.) performed with appropriate equipment and under suitable environmental conditions are described.

SOP Q-12 - Quality Assurance Program Audit

Procedures and responsibilities for assuring the adequacy and effectiveness of the ESG Quality Assurance Program through audits of procedures, standards, methods, and practices used in producing ESG hardware or software products are established by this SOP.

Audits are performed in accordance with pre-established written procedures or checklists and are conducted by trained personnel not having direct responsibilities in the areas being audited. The audits include an objective evaluation of quality-related practices, procedures, and instructions, and the effectiveness of implementation and conformance with policy directives.

Audit data are analyzed and reports indicating quality trends and the effectiveness of the Quality Assurance Program are provided to management. The audit results are documented and then reviewed with management having responsibility in the area audited. Subsequently, responsible management takes the necessary action to correct the deficiencies revealed by audit.

#### SOP Q-18 - ESG Quality Records

ESG Quality Records are defined, and responsibilities for their retention are established by this SOP. Its purpose is to establish standards for meeting ESG and customer requirements for filing, storing, and retrieving of quality history information on ESG products and services.

Quality Assurance records include: 1) operating logs, 2) results of reviews, inspections, tests, audits, and material analyses, 3) monitoring of work performance, 4) qualification of personnel, procedures, and equipment, and 5) other documentation, such as drawings, specification, procurement documents, calibration procedures and reports, and nonconforming and corrective action reports. The records are to be readily identifiable and retrievable.

Requirements and responsibilities for record transmittals, retention and maintenance subject to work completion must be consistent with applicable codes, standards, and procurement documents.

Record storage facilities are to be constructed, located, and secured to prevent loss or destruction of the records or their deterioration by environmental conditions.

## CRBRP PROGRAM MANAGEMENT DIRECTIVES (PMD's)

### PMD-1 - CRBRP Correspondence Control

This procedure delineates the method for identifying, controlling, and accounting for all incoming and outgoing correspondence, and for capturing commitments on the Commitment Status Report system.

### PMD-11 - CRBRP Document Hold Status System

This procedure applies to holds and TBD's on all released (for project use) Principal Design Data for which ESG is responsible. The current status of each Hold and TBD in these documents which impacts Level 2 or Level 3 activities is maintained in the Document Hold system as described in this directive.

### PMD-12 - Quality Assurance Review and Approval of Engineering Requirements Documents

This directive establishes the requirement and procedure for formal review and approval by Quality Assurance personnel of ESG-generated 1) drawings, 2) specifications, 3) specification amendments, 4) Engineering's Change Proposals, 5) System Design Descriptions (SDD), and 6) Engineering Orders.

### PMD-13 - CRBRP Licensing Administrator

This directive defines the responsibilities of the ESG CRBRP Licensing Administrator for implementing and controlling licensing criteria in accordance with Section 9.0 of the Management Policies and Requirements (MPR).

### PMD-15 - Schedule Development and Control

This directive delineates the method for development, processing, approval, maintenance and change control of the ESG schedule hierarchy which defines the CRBRP effort within the requirements of ESG Program Management System.

This directive defines both the vertical integration of schedules for CRBRP from the contractual interface to the detailed work package structure and the horizontal breakout over the time of the various schedular levels and documents.

### PMD-16 - Quality Assurance Management Reviews

This procedure implements a Quality Program requirement for periodic quality assurance management review meetings to assess CRBRP Project quality accomplishments, discuss program quality audits, and resolve management problems affecting quality.

PMD-18 - CRBRP Quality Records Management System

This procedure implements the quality records requirements of the CRBRP Management Policies and Requirements Document, Section 11.0, "Project Records Management", for ESGRM activities.

PMD-19 - CRBRP SDD Preparation and Revision

This procedure defines the methods for preparation and maintenance of CRBRP System Design Descriptions.

PMD-20 - CRBRP Training and Indoctrination

This procedure implements CRBRP Project requirements for training and indoctrination of personnel whose activities may have an effect on quality.

PMD-21 - CRBRP Development Activities

This directive defines the methods for initiating and controlling development activities required for the CRBRP Program and includes directions for 1) preparation, review and release of development activities, 2) revision and control of approved development activities, 3) review and control of development activities, and 4) control of development hardware.

PMD-22 - Use of CRBRP Administrative Specifications in Procurements

This procedure describes the use of administrative specifications for Quality Assurance administration of purchase orders between Energy Systems Group and the sellers of services or items.

PMD-23 - Subcontract Preprocurement Planning

This procedure provides the guidelines required to accomplish a thorough subcontract preprocurement planning function by the Purchasing Department. It outlines purchasing policies that are consistent with requirements established in the Management Policies and Requirements (MPR) for the Clinch River Breeder Reactor Plant (CRBRP), and with policies delineated in the Rockwell Corporate Material Procedures (CMP's).

PMD-24 - Preparation, Review, Approval and Processing of Purchase Requisitions

This directive describes the procedure for preparing, reviewing, approving and processing Purchase Requisitions. These instructions augment those in SOP J-12.

The directive applies to Purchase Requisitions for CRBRP items prepared by the CRBRP Program Office or the Engineering Department. It does not apply to Purchase Requisitions prepared by Manufacturing in support of hardware "make" items.

**PMD-25 - CRBRP Parts Standardization**

All CRBRP design activities performed within ESG will utilize the ESG parts standardization system as described in "Preferred Parts and Design Standards", published by the Checking and Design Standards function. Changes to that publication will be applicable to the CRBRP Program immediately upon release for general ESG use and will not require revision to this directive.

**PMD-26 - Use of Controlled Information Data Transmittal (CINDT)**

This procedure establishes a method for the controlled dissemination of CRBRP technical information and to assure that information used as a basis for design is obtained only from controlled sources.

**PMD-27 - CRBRP Document Status System**

This procedure defines the operation of the Documentation Status System (DSS) module (WARD-D-0059) and the ESG responsibilities and interface with the Westinghouse ARD computer. The DSS assures that principal design data is identified, measured and statused to provide information required to manage said CRBRP Program data.

**PMD-30 - CRBRP Specifications**

This procedure modifies the requirements of the standard ESG specification revision system to certain specific requirements of the CRBRP Project.

**PMD-32 - CRBRP Design Reviews and Release**

This procedure implements the CRBRP policy relating to design reviews of systems and components, to supplement the standard ESG design review practice.

**PMD-34 - Application of Additions to ASME Code Requirements**

This directive covers all CRBRP components including piping systems designed and constructed under ASME Section III, ASME Section VIII, and ANSI B31.1.

**PMD-35 - Change Control**

This procedure provides direction for revision of all ESG documents which have been defined to be part of the CRBRP Baseline.

**PMD-36 - CRBRP Engineering Drawings**

This procedure defines the methods to be used for release and revision of CRBRP engineering drawings.

PMD-40 - Materials and Processes for CRBRP

This directive is established to ensure that all CRBRP design work will be based upon one common set of materials data as well as on consistent extrapolations and interpretations of these data.

PMD-41 - Baselineing of Documents

This procedure gives the method for defining documentation as part of the CRBRP baseline.

PMD-43 - Review of Supplier Data

This directive establishes specific requirements for the review of supplier data and augments the general requirements of SOP K-78.

PMD-48 - Unusual Occurrence Reporting

The purpose of this procedure is to provide for DOE Unusual Occurrence Reporting and for identification of those occurrences which require special consideration as deficiencies reportable under 10CFR50.55(e) and 10CFR21.

PMD-54 - SHRS Reliability Program

This directive defines the requirements of the reliability program at ESG on CRBRP.

PMD-55 - Instructions for Required Documentation and Procedures for Shipment of Components to CRBRP Site or Other Designated Areas

This directive describes the required documentation and the submittal sequence to be followed prior to and during shipment of components and equipment to the CRBRP Constructor, Stone and Webster Engineering Company.

PMD-56 - Acceptance Test Requirements and Specifications

This directive defines the requirements for systems acceptance testing specifications which are to be prepared by AI-ESG.

PMD-57 - Storage, Maintenance, and Inspection of Material Parts and Components.

This directive describes the requirements and responsibilities for storage, maintenance, and inspection of material, parts, and components for CRBRP that are under the cognizance of ESG.

## ENGINEERING MANAGEMENT PROCEDURES (EMPs)

### EMP 1-0 - Preface to the Engineering Management Procedures Manual

This procedure describes the scope of the Engineering Management Procedures (EMP) Manual.

### EMP 2-8 - Engineering Studies

This procedure establishes the requirement for conducting studies to establish that the design meets the design criteria, is based upon proven practices or analysis, and is adequate for the intended service. It describes the method for preparing, releasing, and controlling Engineering Studies.

### EMP 2-9 - Design and Acceptance Criteria

This procedure delineates the need for design and acceptance criteria to be defined and published in the appropriate design basis documents.

### EMP 3-1 - Engineering Documentation Process

This procedure describes the scope of the procedures which control the preparation, release, and control of specifications, drawings, and reports by Engineering.

### EMP 3-5 - Engineering Release System

This procedure provides instructions for the preparation, numbering, release, and control of drawings for the Engineering Release System, and provides guidelines for application of the standard release. EMPs 3-5.1, 3-5.2 and EMP 3-5.3 provide for procedural details for the ASME Code, standard and experimental release systems.

### EMP 3-4 - Numbering of Engineering Documents

This procedure and its sub-procedures (3-4.1, 3-4.2, 3-4.3, 3-4.4, 3-4.5, 3-4.6 and 3-4.10) defines the requirements and means for uniquely numbering various types of ESG engineering documents including drawings, specifications, supporting documents, O&M manuals, subcontractor memos, and software control documents.

### EMP 3-21 - Engineering Change Control

This procedure defines the method for requesting, evaluating, approving, and executing engineering changes.

### EMP 3-22 - Interface Control

This procedure establishes the criteria for interface definition and the methods for describing and controlling the interface in appropriate documentation drawings and specifications.

EMP 3-24 - Control of Engineering Documents

This procedure describes the methods for control of drawing originals and prints, released by both the Standard or Limited Release Systems.

EMP 3-25 - Engineering Orders - Preparation Instructions

This procedure describes the preparation and use of an Engineering Order to release drawings or specifications, and defines requirements. EMP's 3-25.1 through 3-25.17 provide details for various types of Engineering Orders.

EMP 3-26 - Preparation and Control of Supporting Documents

This procedure establishes the types of supporting documents and defines the requirements for their preparation, release, and change.

EMP 3-28 - Component Traceability

This procedure describes the elements and responsibility for establishing item traceability.

EMP 3-29 - Engineering Requirements for Serialization

This procedure sets conditions under which Engineering requires serialization of components or parts for traceability purposes.

EMP 3-36 - Request for Document Change

This procedure describes the formal means for requesting a change to a released drawing or specification and the approval and processing of that request.

EMP 3-42 - Engineering Management System for Specifications

This procedure defines the method for the preparation and control of Engineering specifications.

EMP 3-51 - Weldment Checklist

This procedure provides the checklist to be completed for critical weldments, and the system for its implementation.

EMP 3-52 - Engineering Release Plan of Action

This procedure gives the format and requirements for a plan describing the means of preparation and release and approval of program documents.

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EMP 3-63 - Documentation, Release, and Control of Scientific and Technical Computer Programs

This procedure describes the documentation formats for scientific and technical (S&T) computer programs used and/or produced within the Research and Engineering Department. Those S&T programs that are developed outside of ESG shall also be documented to the same extent specified by this EMP allowing for vendor documentation formats.

EMP 4-4 - Test Procedures

This procedure gives the format for preparation of Test Procedures.

EMP 4-5 - Test Reports

This procedure gives the format for preparation of Test Reports.

EMP 5-3 - Design Reviews

This procedure establishes the requirements for independent design reviews, and the means of their scheduling, conduct, and reporting.

EMP 5-17 - Checking of Engineering Drawings

This procedure establishes the responsibilities for checking of all engineering drawings.

EMP 5-19 - Failure Reports

Failure Reports are to be used when a component or system under test has failed or deviated from expected conditions on all ESG programs as defined in Paragraph 3.1.

EMP 5-20 - Incident Reports

Incident Reports are to be used when an incident or failure occurs in a test other than on the component being tested on all ESG programs as defined in Paragraph 3.1.

EMP 5-21 - Materials and Processes Control System

This procedure establishes the policy and responsibilities for control of materials and processes.

EMP 5-24 - Application of Standards

This procedure provides guidance and direction for the application of codes and standards. It categorizes various types of standards and establishes responsibilities for their collection and application.

CORPORATE AND AI MATERIAL PROCEDURES (CMP's/AIMP's)

AIMP 1.1.1 - Procurement Policy

This procedure describes the procurement policy of Rockwell International, and supplements it to cover procurement reflecting DOE requirements.

CMP 3.121 - Source Selection

This procedure defines Rockwell International's practice concerning selection of procurement sources and making commitments.

CMP 2.14 - Changes to Purchase Orders and Other Directions to Suppliers

This procedure establishes standards for accomplishing changes to purchase orders and effecting other direction to suppliers.

CMP 2.35 - Case File Documentation

This procedure establishes the documentation required to be accumulated in procurement case files.

AIMP 3.109.1 - Procurement from Approved Suppliers

This procedure requires procurements to Code requirements, to ensure that Quality Assurance-approved suppliers are obtained.

## QUALITY ASSURANCE MANUALS\* PROCEDURES

### QAOP N1.00 - Preface to Quality Assurance Manual

The preface to each Quality Assurance Manual delineates the purpose and authority of the manual.

### QAOP N1.01 - Quality Assurance Department Functions

This document outlines the functions of the individual groups within the Quality Assurance Department.

### QAOP N1.03 - Vision Requirements for Quality Assurance Personnel

This procedure establishes vision standards for Quality Assurance Department personnel and defines responsibilities for administering an eye examination program.

### QAOP N1.04, CS3M 18 - Quality Assurance Audits

These procedures outline the Quality Assurance responsibilities for implementing and maintaining an audit program to determine the overall effectiveness of the ESG and supplier quality programs and to identify areas where corrective prevention action is required.

### QAOP N1.21 - Quality Assurance Plans

This procedure defines Quality Assurance Department responsibilities for participating in the preparation of Quality Assurance Program Plans or Quality Assurance Program Indexes and for preparing Quality Assurance Functional Plans.

### QAOP N1.22 - Quality Assurance Acceptance Procedures

This procedure defines requirements and responsibilities of the Quality Assurance Department for the preparation, release, and control of Quality Assurance Acceptance Procedures (QAP's).

### QAOP N1.23 - Quality Status Reports

This procedure establishes Quality Assurance Department requirements and responsibilities for preparation of periodic Quality Assurance Program Status Reports and for submittal of the reports to Energy Systems Group customers.

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\*Energy Systems Group Quality Assurance Department Procedures (QAOP)  
Energy Systems Group ASME Code Section III Manual (CS3M)

#### QAOP N2.03 - Document Control

This procedure provides direction for the control of engineering and shop drawings, including customer drawings applicable to products to be fabricated in the ESG Manufacturing Shops. The purpose of such control is to assure the fabrication, processing, inspection, and testing of products to the proper drawings.

#### QAOP N3.00, CS3M 12 - Control of Measuring and Test Equipment

These procedures define requirements for calibration control of tools, gauges, instruments, and test equipment used by Manufacturing and Quality Assurance to measure products (materials, parts, components, and appurtenances) or to control processes related to the product.

#### QAOP N3.02 - ESG Special Tooling

This procedure defines the requirements and responsibilities for control of tooling used by Manufacturing and Quality Assurance Departments in product fabrication.

#### QAOP N4.00, QA1 N4.00A, CS3M 4 - Procurement Document Control

These procedures define requirements and responsibilities for preparation, review, and approval of procurement documents associated with the purchase of materials, parts, and services.

#### QAOP N4.01, CS3M 7.2 - Approved Procurement Sources

These procedures define Quality Assurance Department requirements for evaluation and approval of procurement sources (suppliers) of material, parts, and services used in ESG products.

#### QAOP N4.02, CS3M 5.3 - Procurement Quality Verification Instructions

These procedures define Quality Assurance Department requirements and responsibilities for preparing inspection instructions applicable to procured items and services.

#### QAOP N4.03 - Procurement Quality Assurance - Source Inspection/Surveillance

This procedure defines Quality Assurance Department requirements and responsibilities for quality verification of procured items and services at a supplier's facility.

#### QAOP N4.04 - Procurement Quality Assurance - Receiving Inspection

These procedures define Quality Assurance Department requirements and responsibilities for inspecting and testing incoming procured items and services.

QAOP N5.01 - Manufacturing Production Order (Shop Travellers)

This procedure defines the requirements and responsibilities for the preparation and utilization of the Manufacturing Production Order (MPO).

CS3M 9 - Control of Construction Processes

These procedures define the guidelines used to authorize and control the process, fabrication, installation, inspection, examination, and testing of components, parts, and appurtenances.

QAOP N6.01, CS3M 5.4 - Welding Procedures

These procedures establish requirements and responsibilities for qualifying welding and brazing procedure specifications and welding and brazing personnel (welding, welding operators, brazers, and brazing operators) employed in fabrication of Code Items.

QAOP N6.02, CS3M 2.4 - Qualification and Certification of Nondestructive Examination Personnel

These procedures establish requirements and responsibilities for the training, examination, qualification, and certification of Energy Systems Group personnel engaged in the following nondestructive examination processes:

Radiographic	Liquid Penetrant
Magnetic Particle	Eddy Current
Ultrasonic	Leak Detection

QAOP N6.03, CS3M 5.9 - Nondestructive Examination Procedures

These procedures establish requirements and assign responsibilities for preparing and controlling nondestructive examination (NDE) procedures used for determining compliance of products to requirements of applicable codes and standards.

QAOP N6.04 - Weld Material Control

This procedure defines requirements and responsibilities for issuance and control of welding materials (electrodes, rods, spools, and flux).

QAOP N6.05 - Qualification of Special Processes

This procedure defines requirements and responsibilities for qualification of special processes used during fabrication or inspection of products at Energy Systems Group.

QAOP N7.00 - Product Acceptance Tests

This procedure defines requirements and responsibilities of Quality Assurance Department personnel in performing acceptance tests, or

witnessing acceptance tests performed by others on parts, material, subassemblies, assemblies, subsystems, and systems (Items) that require acceptance by Quality Assurance.

#### QAOP N7.01 - Pressure Testing

This procedure defines the requirements and responsibilities for performing hydrostatic or pneumatic tests of ESG-fabricated ASME Code or other products.

#### QAOP N7.02 - Qualification and Certification of Visual and Dimensional Inspection Personnel

This procedure defines requirements and responsibilities to provide a mandatory program of training, examination, and certification for personnel performing dimensional inspection. The program will provide periodic updating to accommodate changes in requirements and maintain the level of knowledge necessary to perform dimensional inspection assignments.

#### QAOP N8.00 - Statistical Quality Control Program

This procedure establishes Quality Assurance Department requirements and responsibilities for implementing and maintaining a Statistical Quality Control Program.

#### QAOP N9.00, CS3M 14.2, 14.3, 14.4 - Issuance, Use, and Control of Stamps

These procedures define the requirements and responsibilities for the issuance, application, and control of stamps used for markings that identify personnel performing examination, inspection, test, welding, and brazing operations.

#### QAOP N9.02 - Serialization of Hardware

This procedure defines Manufacturing and Quality Assurance Department requirements associated with the serialization of parts and assemblies that are fabricated or procured by Manufacturing.

#### QAOP N10.00, CS3M 15 - Nonconforming Materials and Items

These procedures define requirements and responsibilities for control and disposition of nonconforming materials and items in the product manufacturing/procurement processes.

#### QAI N10.00D - CRBRP Hardware Nonconformance Processing

This instruction supplements Procedure N10.00D by providing specific details for CRBRP nonconformance items in accordance with LRM and Owner requirements.

#### QAOP N12.00 - Packaging and Shipping Inspection

This procedure defines Quality Assurance Department responsibilities for inspecting and packaging and the preparation for shipment of ESG products. It applies to products requiring Quality Assurance acceptance that are shipped from ESG, to an ESG construction site, to an ESG customer, or to an ESG supplier.

#### QAOP N13.02 - Quality Assurance Data Packages

This procedure provides format requirements for the preparation of Quality Assurance Data Packages for transmittal to the customer. Contractual requirements take precedence over this procedure, in case of conflict.

#### QAOP N14.00, CS3M 16 - Corrective Action for Nonconformance Products

These procedures establish requirements for taking action to correct conditions causing nonconforming material, parts, and components. Its purpose is to provide increased assurance that ESG products will meet design, configuration, and performance requirements.

#### CS3M 2.3 - Training and Indoctrination

This procedure defines requirements and responsibilities for training and indoctrination of personnel performing activities affecting quality or Code compliance, as necessary, to assure that suitable proficiency is achieved and maintained.

#### CS3M 3, 6 - Design and Document Control

These procedures establish the requirements and responsibilities as an Owner's Agent, and for the control of design activities and documents associated with items being constructed in accordance with the requirements of the Code.

#### CS3M 7.3, 7.4 - Procurement Verification (Source and Receiving Verification)

These procedures define requirements for source and receiving inspection, examination, and test of procured materials, parts, and services.

#### CS3M 8 - Identification and Control of Materials and Items

These procedures define requirements and responsibilities for implementing and maintaining material checklists required by the Code.

#### CS3M and Appendix A - Contracting for the Fabrication of a Code Item as an N-Certificate Holder Retaining Overall Responsibility for Certification and Stamping

This procedure covers the situations where ESG as an N-Certificate holder retains overall responsibility for a Code item, including design, certification, and stamping can contract for fabrication of the items.

### CS3M 13, 5.7, 5.8 - Handling, Preservation, Storage, and Shipment

These procedures establish measures for handling, preservation, packaging, storage, and shipping to prevent damage to Code items.

### CS3M 8.4 - Material Checklists

This procedure defines requirements and responsibilities for implementing and maintaining material checklists required by the Code.

### CS3M 8.3 - Welding and Brazing Materials

These procedures define requirements and responsibilities for control of Code welding and brazing materials (electrodes, filler wire, fluxes, gases, and weld insert materials) used in fabrication and assembly of Code items.

### CS3M 9.3 - Control of Welding Operations

These procedures define requirements and responsibilities for controlling production welding and brazing operations on Code items.

### CS3M 5.5 - Heat-Treating Procedures

These procedures define requirements for controlling heat treating processes performed by Energy Systems Group. It is applicable to heat-treating processes other than weld preheat and interpass temperature, which are controlled in accordance with methods specified in qualified weld procedure specifications.

### CS3M 7.8 - Subcontracted Furnace Brazing Services

This procedure defines requirements and responsibilities for control of subcontracted furnace brazing services.

### CS3M 7.9 - Subcontracted Heat Treat Services

This procedure defines requirements and responsibilities for control of subcontracted heat treat services.

### CS3M 7.10 - Subcontracted Nondestructive Examination Services

This procedure defines requirements and responsibilities for control of subcontracted nondestructive examination operations performed on Code materials and items.

### CS3M 10, 11, 5.10 - In-Process and Final Examination, Tests, and Inspections

These procedures define requirements and responsibilities for examinations and tests of Code items, during fabrication and upon completion of fabrication to assure their compliance with Code requirements.

CS3M 2.6 - Authorized Nuclear Inspector

This procedure defines Energy Systems Group requirements and responsibilities for assisting the Authorized Inspector in performing his duties, in accordance with Code requirements.

CS3M 7.11 - Procurement Quality Verification Records

This procedure defines requirements and responsibilities for accumulating records generated during design and/or fabrication of Code Items at Energy Systems Group, transmitting records to the owner or customer, and retention of records by Energy Systems Group.

CS3M 5.11 - Cleaning Procedures

This procedure defines requirements and responsibilities for preparing and controlling cleaning procedures.