LOCKHEED MARTIN

ORNL/ER-336/R1

ENVIRONMENTAL RESTORATION PROGRAM

Quality Assurance Plan for the Molten Salt Reactor Experiment Remediation Project at Oak Ridge National Laboratory, Oak Ridge, Tennessee

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DEPARTMENT OF ENERGY

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Quality Assurance Plan for the Molten Salt Reactor Experiment Remediation Project at Oak Ridge National Laboratory, Oak Ridge, Tennessee

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Environmental Management Activities at
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Oak Ridge, Tennessee 37831
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the
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APPROVALS

Quality Assurance Plan
for the Molten Salt Reactor
Experiment Remediation Project
at Oak Ridge National Laboratory,
Oak Ridge, Tennessee

ORNL/ER-336/R1

February 1998

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PREFACE

The *Quality Assurance Plan for the Molten Salt Reactor Experiment Remediation Project at Oak Ridge National Laboratory* (ORNL/ER-336/R1) responds to the Martin Marietta Energy Systems, Inc., *Quality Program Description*, Y/QD-15 Rev. 2 (1995), currently used by Lockheed Martin Energy Systems, Inc. (Energy Systems). Y/QD-15 applies to Energy Systems central organizations, Defense and Manufacturing (Oak Ridge Y-12 Plant), the Environmental Management and Enrichment Facilities business unit, and Oak Ridge National Laboratory.

Y/QD-15 was developed on the premise that the rigor of application of the program should be based on a graded approach to quality commensurate with the identified risk associated with the failure of items, processes, or services as related to the safety of employees or the public, protection of the environment, and achievement of programmatic missions [see Section B of the Title 10, *Code of Federal Regulations*, Pt. 830 Sect. 120 and Section 1.3, "Graded Approach," of the accompanying U.S. Department of Energy *Implementation Guide for Use with 10 CFR Part 830.120 Quality Assurance* (U.S. Department of Energy 1994)].

This QAP originally covered Phases I and II of the Molten Salt Reactor Experiment Remediation Project; this revision (ORNL/ER-336/R1) has been expanded to include quality assurance for the entire project. This work was performed under Work Breakdown Structure 1.4.12.6.2.01.05 (Activity Data Sheet 3701, "Molten Salt Reactor Experiment Remediation Project").

CONTENTS

ABBREVIATIONS

CFR	*Code of Federal Regulations*
DOE	U.S. Department of Energy
DNFSB	Defense Nuclear Facilities Safety Board
EMEF	Environmental Management and Enrichment Facilities
Energy Systems	Lockheed Martin Energy Systems, Inc.
MSRE	Molten Salt Reactor Experiment
MTE	measuring and testing equipment
ORNL	Oak Ridge National Laboratory
PAAA	Price-Anderson Amendments Act
QA	quality assurance
QAP	Quality Assurance Plan

EXECUTIVE SUMMARY

This Quality Assurance Plan (QAP) identifies and describes the systems utilized by Molten Salt Reactor Experiment (MSRE) Remediation Project personnel to implement the requirements and associated applicable guidance contained in the *Quality Program Description*, Y/QD-15 Rev. 2 (Martin Marietta Energy Systems, Inc. 1995) and Environmental Management and Enrichment Facilities Work Smart Standards.

This QAP defines the quality assurance (QA) requirements applicable to all activities and operations in and directly pertinent to the MSRE Remediation Project. This QAP will be periodically reviewed, revised, and approved as necessary. This QAP identifies and describes the QA activities and procedures implemented by the various Oak Ridge National Laboratory support organizations and personnel to provide confidence that these activities meet the requirements of this project. Specific support organization (Division) quality requirements, including the degree of implementation of each, are contained in the appendixes of this plan.

INTRODUCTION

This Quality Assurance Plan (QAP) identifies and describes the systems utilized by Molten Salt Reactor Experiment (MSRE) Remediation Project personnel to implement the requirements and associated applicable guidance contained in the *Quality Program Description*, Y/QD-15 Rev. 2 (Martin Marietta Energy Systems, Inc. 1995) and Environmental Management and Enrichment Facilities (EMEF) Work Smart Standards.

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REQUIREMENTS

Y/QD-15 Rev. 2, *Quality Program Description*, cites mandatory requirements for this project that are recognizable by the use of the word *shall.* The use of the word *should* denotes that the element is recommended guidance for consideration by management in program implementation. **The *shall* requirements must be addressed by all project personnel and support organizations as the requirements apply to their particular activities. Any exception to these requirements must be justified and approved by the project manager.**

Appendix A displays a portion of the matrix from Section 2 of Y/QD-15, Rev. 2. The "Y/QD-15 Rev. 2 program commitments" column of the matrix identifies the commitments or requirements for the project. The "Related source requirement (10 *CFR* 830.120 or DOE Order 5700.6C)" column provides a link from the source of origin to the requirement. The source documents on which program commitments are based have been coded to indicate their origin. The number 830.120 indicates that the requirement came from the Title 10, *Code of Federal Regulations* (*CFR*), Pt. 830 Sect. 120 rule; a "G" in front of the listing indicates that the requirement came from the associated 830.120 implementation guide. Requirements that stem from U.S. Department of Energy (DOE) Order 5700.6C are similarly indicated. The requirements contained in Appendix A are essentially the same as those in Sect. 3 of QA-102PD [Lockheed Martin Energy Systems, Inc. (Energy Systems) 1997].

Enforceable requirements from 10 *CFR* 830.120 of the Price-Anderson Amendments Act (PAAA) are designated ****PAAA 120-*n*****. These requirements are enforceable for nuclear facilities as defined by DOE-STD-1027-92. The MSRE Facility is a Category 2 facility of which the PAAA requirements apply to those systems, structures, components, etc. that are identified as nuclear safety related in authorization basis documents—such as safety analysis reports, technical safety requirements, and basis-of-interim operations—or provide, or are intended to provide, protection to

the public or workers from uncontrolled releases of radioactive materials or from radiation exposures, including radiation exposures from inadvertent nuclear criticalities.

Appendixes B through G display matrices from the primary organizations involved in the project. These matrices contain the quality assurance criteria that identify the Energy Systems procedures or organization procedures that will be followed to control the quality related activities of the project. If the organization matrices contain no specific procedure for a given element, Oak Ridge National Laboratory (ORNL)/Energy Systems procedure(s) will be used. **Revision of the matrices will not drive a corresponding revision of this QAP unless newly developed procedures change the current described quality program.**

The matrix approach is an efficient way of identifying the procedures to be followed during the course of the project. The matrices will be updated each time the QAP is updated.

1. PROGRAM

1.1 QUALITY POLICY

It is the policy of MSRE Remediation Project management that all activities in support of the project will be performed with appropriate attention to quality requirements commensurate with the risk associated with the failure of items, processes, or services and how the risk relates to the safety of employees and the public, protection of the environment, and achievement of project goals. The project will develop appropriate procedures and instructions to govern the conduct of activities and train appropriate project and support personnel in these requirements.

1.2 MANDATORY COMPLIANCE

Overall management responsibility rests with the MSRE Remediation Project Manager. Part of this responsibility is to ensure that activities performed in support of the project provide adequate confidence of satisfactory performance. To provide this assurance, the MSRE Remediation Project Manager has mandated the establishment and conduct of an integrated quality program.

Achieving the objectives described in this plan requires the support of all affected personnel. Adherence to this plan and to applicable implementation procedures and instructions is mandatory for all personnel who perform activities that come under the auspices of this QAP.

1.3 PERFORMANCE OBJECTIVES

The policies and objectives of the MSRE Remediation Project quality program are as follows:

- to ensure the attainment of the level of quality necessary to accomplish project objectives with the responsibility for the protection of the employees health and safety, protection of the environment, and reliable molten salt facility activities and operations;

- to ensure that structures, systems, components, etc. designed, procured, fabricated, installed, constructed, and tested for the molten salt facility conform to specified requirements; and

- to ensure that appropriate QA activities are implemented on the MSRE Remediation Project.

To monitor the achievement of these objectives, the project will track performance indicators. The performance indicators include items and activities such as the following:

- unsatisfactory internal audit and surveillance findings,
- commitment action and corrective action status,
- project cost and schedule,
- unsatisfactory external appraisal findings,
- occurrence reporting status, and
- corrective action verifications.

Performance indicators will be monitored by project management, and trends will be evaluated by knowledgeable technical personnel.

1.4 ROLES AND RESPONSIBILITIES

Each member of the project staff is responsible for the quality of the work they perform. The project staff, including supporting organizations, implement the quality program in accordance with project management direction and established procedures.

The MSRE QA Manager reports administratively to the Manager of the ORNL Office of Quality Services (OQS) and programmatically to the MSRE Project Manager. He is responsible for the day-to-day oversight of the quality program implemented on the project.

The MSRE Remediation Project Manager reports to the Director for Environmental Restoration Programs. The Project Manager is responsible for technical integration and program management; all technical and program planning; contract and project administration; and direction of all MSRE Remediation Project development, design, procurement, component fabrication, and testing efforts and the quality program.

The Quality Engineer reports administratively through the Energy Systems Quality Services Organization and programmatically to the Melton Valley Watershed Project Manager. This position provides administrative and technical quality assurance support services as requested by program management.

1.5 PROJECT ORGANIZATION

The interface relationships between the project and support organizations is shown in Fig.1. **Revision to the contents of Fig. 1 may not drive a corresponding revision to this QAP.**

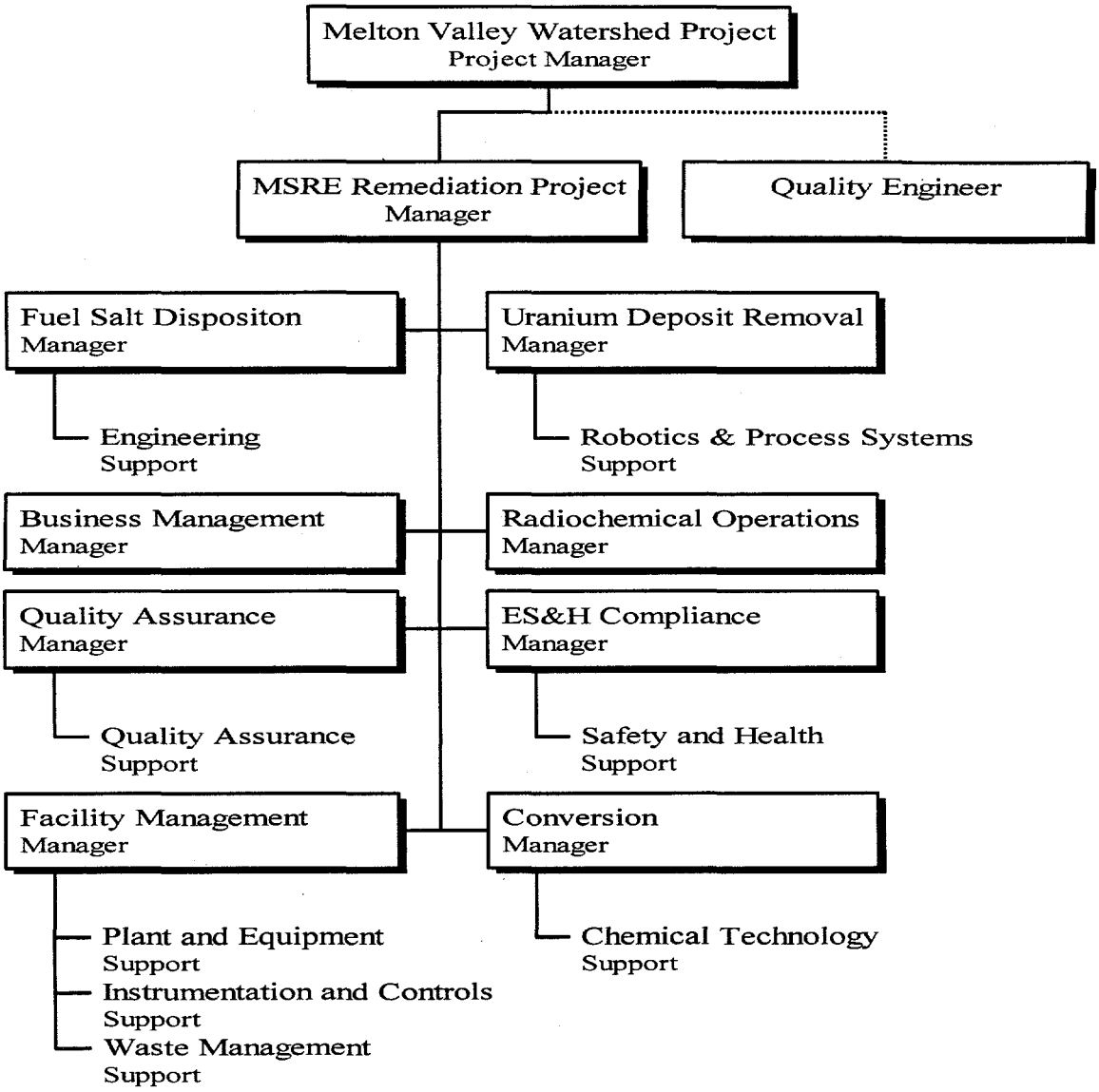

Fig. 1. MSRE Project organization chart—programmatic.

1.6 GENERAL DESCRIPTION OF ROLES AND RESPONSIBILITIES OF SUPPORT ORGANIZATIONS

1. Central Engineering Services: Provides design and construction support, including subcontractor oversight for the project. See Appendix B for quality requirements.

2. Environmental Management: Overall responsibility and management of the MSRE Remediation Project, including facility management. All activities conducted in the MSRE Facility are controlled by the Facility Manager. See Appendix C for quality requirements.

3. Chemical Technology Division: Provides MSRE Project and Facility management and support for testing and experimentation, including fabrication of testing and experimental components to be placed in the facility per approved procedures. See Appendix D for quality requirements.

4. Instrumentation and Controls Division: Provides design, procurement, and implementation of instrumentation systems to support MSRE facility maintenance and subtasks, such as reactive gas removal, uranium deposit removal, and fuel salts removal. See Appendix E for quality requirements.

5. Plant and Equipment Division: Certified personnel provide fabrication activities, such as welding and nondestructive testing, to approved drawings, procedures, etc. See Appendix F for quality requirements.

6. Robotics and Process Systems Division: Provides design, procurement, and fabrication activities, including qualified operators, for remote handling equipment for the MSRE Facility. See Appendix G for quality requirements.

Note: The support of radiation protection, industrial safety, and criticality safety for the project is addressed in ORNL/ER-326, *Health and Safety Plan for the Molten Salt Reactor Experiment Remediation Project at Oak Ridge National Laboratory* (Energy Systems 1995), or most recent revision.

1.7 MATRIX MANAGEMENT AT ORNL

Interface working agreements between supporting organizations are of the utmost importance. Memoranda of Agreements will be used in support of the Project Management Plan.

1.8 PLANNING, SCHEDULING, AND COSTING

Planning, scheduling, and costing for the MSRE Remediation Project will be managed by using an integrated project control system described in the Project Management Plan.

1.9 READINESS REVIEWS

Readiness reviews or assessments will be performed on major work activities having significant safety, reliability, or economic consequences before work commences (see Chaps. 9 and 10).

1.10 STOP WORK POLICY

All personnel have the authority and responsibility to stop work on the project that is considered to be a serious threat to the safety or health of workers, other personnel, the mission, or to the environment. Planning and scheduling considerations will not override safety considerations when this stop work policy is in effect. Supervision shall be immediately notified of any hazards that could pose a potential threat to worker safety or health. Retaliation against an employee exercising stop work authority will not be tolerated.

2. PERSONNEL TRAINING AND QUALIFICATION

2.1 WORK PERFORMANCE AND TRAINING

The supervisor of personnel working on project activities is responsible for ensuring that personnel are trained and qualified to perform assigned tasks. Training and qualification is completed before personnel are permitted to perform an operation. The supervisor ensures that the required level of competence for the qualified individual is maintained throughout the life of the operation.

Note: In emergency situations, training personnel for the specific task to be performed may not be possible. In this situation, emergency and project management has the responsibility for determining the personnel best qualified to perform the particular task.

2.2 QUALIFICATION REQUIREMENTS

Qualified indicates that personnel have been evaluated with respect to performance-based standards and that documentation issued by their supervisor is available to attest to this fact.

Certified is used to indicate that personnel have met recognized national job performance requirements for a particular function. As a minimum, project personnel are qualified while some personnel, such as those who have met the American Society of Nondestructive Testing Standard SNT-TC-1A, are considered both qualified and certified.

All welding and nondestructive testing personnel shall be qualified/certified in accordance with ORNL qualification/certification procedures or nationally accepted equivalent programs.

3. QUALITY IMPROVEMENT

3.1 MANAGEMENT EXPECTATIONS AND COMMITMENTS

Project management expects and authorizes facility management and project personnel to freely voice concerns and propose solutions pertinent to safety, quality, and any other types of problems that may affect the success of project activities. Project management is committed to a no-fault attitude in dealing with problems that may develop during project activities. Project personnel are

required and encouraged to identify problems as a first step in solving them and preventing recurrence. Problem identification is conducted and resulting corrective actions are formulated to effectively address systemic deficiencies not assign blame to individuals. This approach is crucial to ensure an open atmosphere that fosters the freedom necessary to find problems, fix them, and continue to improve in meeting project needs as identified in facility, technical, programmatic, environmental, safety, health, and quality commitments. Occurrences will be documented through the ORNL and/or Energy Systems Action Management System occurrence reporting system.

3.2 PROBLEM PREVENTION

Project controls for the prevention of problems consist of work breakdown structure planning, task planning, task leader review meetings, task and subtask readiness reviews, system design review meetings, project staff meetings, etc. These activities are designed to define and control work activities to ensure that requirements are identified, appropriate actions are specified, acceptable reviews and approvals occur, sufficient documentation is generated, and appropriate oversight is conducted to enable management to assess the adequacy of project controls.

Work breakdown structure planning is the fundamental element in defining the technical and quality work scopes for the project. Each discrete item or activity is accounted for, and plans are made to accomplish the activity.

Review meetings are conducted by the project to ensure that the facility equipment and components are designed in accordance with the applicable requirements and that designs meet the needs of the task.

Project-wide reviews, design review meetings, and other project meetings serve as peer/technical reviews for work activities.

3.3 CONTINUOUS IMPROVEMENT

When conditions adverse to quality are detected, they will be documented by means of nonconformance reports, occurrence reports, or assessment reports. These reports may require a plan for corrective action to prevent recurrence. Depending on the nature and frequency of the deficiency, follow-up action will be performed to verify implementation of the corrective action by surveillance, inspection, audit, or review.

The Quality Alert and Lessons Learned programs at ORNL and other DOE sites are designed to identify quality failures with potential widespread affects throughout the DOE Complex. The MSRE Project evaluates all received quality alerts and lessons learned for applicability to project activities.

3.4 NONCONFORMANCES

A nonconformance report is evaluated and resolved by the appropriate designer, user, and QA personnel. If a nonconforming item or failure is discovered at any time during the design, fabrication, construction, or testing phases of the project, it will be documented and resolved. **All nonconformances generated shall be reported to the Project Manager, Project QA Specialist,**

and Quality Engineer. A legible copy of nonconformance reports will be maintained by the MSRE Facility Work Package Coordinator.

4. DOCUMENTS AND RECORDS

In accordance with the American National Standards Institute/American Society of Mechanical Engineers *Quality Assurance Standards for Nuclear Facility Applications* (1994), a *document* is defined as any written or pictorial information describing, defining, specifying, reporting, or certifying activities, requirements, procedures, or results. A *quality assurance record* is a completed document that furnishes evidence of the quality of items and/or activities affecting quality. Quality records include drawings, specifications, procedures, logbooks, operation sheets, supplier certifications, inspection and test reports, nonconformance reports, audit reports, personnel qualifications, and computer media used as the primary means of data storage.

4.1 DOCUMENT AND RECORDS STORAGE

All quality assurance documents and records generated during the conduct of MSRE Remediation Project activities by all project support organizations shall be turned over to the project for storage at the MSRE Facility and subsequently stored at the Environmental Management and Enrichment Facilities Document Management Center or as designated by the Project Manager in accordance with approved procedures. QA documents and records should be originals or legible reproduced copies.

All stored documents and records shall be maintained in storage until orders to transfer or destroy are authorized by the cognizant managers of DOE and the Environmental Management and Enrichment Facilities business unit.

4.2 CORRECTIONS TO DOCUMENTS AND RECORDS

Corrections to records shall be performed by placing a single line through the incorrect item followed by the initials of the person making the correction and the date the correction is made.

5. WORK PROCESSES

5.1 CONFIGURATION CONTROL

Procedures MSRE-ER-502, "MSRE Facility Work Authorization" (Energy Systems 1998), and ORNL Facility Safety procedure FS-3.3, "Change Control," or approved alternatives shall be used to control work and maintain configuration control at the MSRE Facility.

5.2 IDENTIFICATION AND CONTROL OF ITEMS

General use items and laboratory equipment that are adequately labeled or identified by the supplier and stored such that item identity and status are maintained do not require any additional identification controls or markings.

Quality-related items that are important for the safe, reliable operations of facility activities shall be properly identified/labeled throughout receipt, processing, storage, shipping, and work activities as applicable. Identification of items shall be maintained by part number, serial number, or other appropriate means, either on the item or on records traceable to the item.

Special environmental conditions shall be provided where necessary to preserve the item or prevent deterioration.

When required, specific identification or traceability of codes, standards, specifications, procurement contracts, etc. shall be ensured by appropriate documents such as drawings, specifications, procurement documents, log books, test records, inspection and examination records, and nonconformance reports.

Safety-related and critical application items shall be verified to be correctly identified and suitable for use before release for use.

Processes shall be established and implemented to control samples taken from MSRE and ensure their traceability (see Sect. 5.5, "Analysis and Testing").

5.3 HANDLING, STORING, AND SHIPPING

Access shall be controlled to facilities where items are used, maintained, or stored to prevent loss or inadvertent mishandling.

5.4 CALIBRATION AND MAINTENANCE OF MONITORING AND DATA COLLECTION EQUIPMENT

Measuring and testing equipment (MTE) used to obtain test or experimental data or to verify the conformance of an item to established requirements will be controlled and included in a program of periodic calibration. The responsibility for those programs rests with the organizations that use the equipment.

All MTE requiring calibration will be labeled to identify its calibration status. When any MTE is not labeled because of size, location, or surface restrictions, the MTE will be identified, and the user will maintain documentation equivalent to the label.

When MTE is found to be out of calibration, the appropriate task manager will be notified. They will determine and document the effects of the error on the project test, analysis, or item certification data since the last calibration.

The Instrumentation and Controls Division performs the majority of MTE calibrations for the project. See the matrix in Appendix E for project specific procedures used for control and calibration of MTE.

5.5 ANALYSIS AND TESTING

One of the major project elements covers analysis and testing of processes and conditions within MSRE to promote the safe removal of uranium and fuel salt from the system. This element will include corrosion tests and evaluations, annealing data evaluation, and postulation of a UF_6 formation mechanism. Mapping uranium distribution, sampling the atmosphere in the drain tank cell, and understanding the chemical reactions that could occur in the auxiliary charcoal bed are also part of this element. Analysis and testing activities shall be defined, controlled, verified, and documented. These activities shall be conducted in accordance with written and approved instructions or procedures and documented evidence of results.

6. DESIGN

Many of the requirements pertinent to design control are applicable to facility activities and may be within the purview of other support organizations. Therefore, the Facility Manager may rely on these organizations to perform design activities. The Facility Manager, however, ensures that facility design activities applicable to items and systems pertinent to safety are identified, controlled, and verified.

Items or systems that affect safety-related attributes of the MSRE Facility, in most cases, are specifically identified in the facility's safety basis documentation. Design control requirements pertinent to safety-related items and systems may not apply to nonsafety-related, routine facility alterations, procurement of nonsafety-related items, or other activities that have no safety implications associated with their conduct or completion. The Facility Manager is responsible for making these judgements relative to planned activities. In practice, these judgements are made with the help of other facility personnel, subject matter experts, and other personnel.

Central Engineering Services performs the majority of design engineering management for the project. See the matrix in Appendix B for a listing of procedures used for project activities.

6.1 COMPUTER SOFTWARE

Energy Systems Standard ESS-QA-19.0 "Software Quality Assurance" (Martin Marietta Energy Systems, Inc. 1992) or an approved equivalent shall be followed to ensure quality of software development, procurement, implementation, and utilization activities.

6.2 ORNL QUALITY VERIFICATION DECAL

A quality verification decal shall be placed on applicable drawings as the method of listing requirements or controls for items procured, fabricated, constructed, and/or tested by or for the MSRE Remediation Project. The procedure to be used to meet this requirement is ORNL Standard

Practice Procedure X-QA-11, "ORNL Quality Verification Decal" (Lockheed Martin Energy Research Corporation 1996).

7. PROCUREMENT

The need for and the extent of application of the requirements of this element shall be determined at the time the purchase requisition, Accelerated Vendor Inventory Delivery order, credit card, or Stores order is prepared and processed. Drawings, specifications, etc. will define most of the item requirements necessary to be reflected in procurement documents. **Accelerated Vendor Inventory Delivery or credit card procurements for items or services having rigorous quality or safety attributes should be made only with sufficient controls to ensure that requirements are met.**

Procurement of items and services is accomplished in a manner that ensures that (1) quality, technical, and customer requirements are clearly communicated to the supplier; (2) prospective suppliers are evaluated to verify their capability to meet performance and schedule requirements; (3) the supplier's, designer's, and customer's requirements are being met during the production cycle; and (4) the customer receives all deliverables from the supplier in a timely manner. The depth and extent of quality and technical requirements contained in procurement documents are based on the item's or service's importance to health, safety, environment and security and affect on project mission.

Energy Systems Management Control Procedure QA-701, "Procurement Quality," should be followed when procuring critical application items and services and complex items.

See Appendix A matrix under 2.7 PROCUREMENT for requirements that must be met.

8. INSPECTION AND ACCEPTANCE TESTING

Throughout the phases of the project, it is necessary to ensure that the product is manufactured as designed and complies with the safety, quality, and performance requirements. This is accomplished by the review, inspection, and acceptance of material and procedures to perform the operation. **Records generated during these activities shall be maintained in accordance with the requirements of element 2.4 of Y/QD-15 and Chap. 4 of this QAP.**

Inspection and testing activities pertinent to the project and facility are primarily applicable to devices, instruments, fabricated components, etc. that may affect or have significance to safety. These devices, instruments, components, etc. primarily used for operations and process monitoring are specifically identified in the facility safety basis documents. Inspection and acceptance testing activities pertinent to devices, instruments, fabricated components, etc. identified in the safety documents are performed by support organizations such as the Instrumentation and Controls Division and Office of Quality Services. These organizations maintain procedures establishing acceptance and performance criteria as well as the records for the initial testing, maintenance, and periodic calibration of facility devices and instruments. These support organizations are also

responsible for generating the purchase documentation associated with the devices, instruments, or components not directly purchased by MSRE Facility personnel.

Inspection and testing activities associated with fabricated components to be certified for use in the MSRE Facility shall be performed by certified inspection and testing personnel (see Sect. 2.2).

Product types and attributes for safety-significant purchases are usually mandated on a site-wide basis by oversight groups, such as the Health Physics Instrumentation Committee for radiation monitoring equipment.

Facility and project support personnel are responsible for establishing calibration intervals and reviewing calibration results to ensure that equipment and associated items are performing at a level necessary to support intended work activities.

9. MANAGEMENT ASSESSMENT

The senior management on the MSRE Remediation Project consists of the Project Manager and the responsible Facility and Technical Managers. They routinely assess the effectiveness of the project's quality program through their involvement in the project on a day-to-day basis. They interact at the highest level of the project to achieve an integrated project management team and also interact with the technical support organizations directing their areas of responsible management.

9.1 PROJECT MANAGEMENT ASSESSMENT ACTIVITIES

The MSRE Remediation Project management self-assessment information is derived from the following project activities:

1. Program coordination efforts in which the Project Manager is involved in the overall coordination of project activities.

2. Project status reporting in which the Project Manager receives and responds to status reports for the overall project. These reports may include finance, construction, quality assurance, research and development tasks, and project status reports to DOE and ORNL. These reports provide information to be used in assessing where the project is in relation to established goals and milestones.

3. Project performance indicators and project performance objectives prepared by the Project Manager and management staff that identify project progress in relation to established milestones and performance criteria set by DOE and ORNL.

4. Project-level QA assessments that provide the Project Manager with information about the overall progress of the project organization in identifying and implementing administrative control systems, quality of work performed, and areas in which improvement is necessary.

5. Twice weekly meetings that provide a high-level assessment of activity plans. This information provides the Project Manager with an assessment of project capability and initiative in meeting requirements.

6. Peer/technical reviews performed on project design features or design concept feasibility. These assess the project's ability to address technical issues in arriving at an adequate design and operation for the remediation tasks.

7. Major project reviews consisting of monthly reviews of project costs, schedules, and EMEF project status reviews.

8. Readiness evaluations of major project activities. These assessments are conducted by the MSRE Certification Team.

9.2 PROJECT DISCIPLINE ASSESSMENTS

The MSRE Remediation Project self-assessment information for functional disciplines is derived from the following project activities:

1. Task analysis reviews conducted to determine the skills and training needed for the task participants to perform a particular operation.

2. QA assessments of ongoing work activities (such as work fabrication package reviews) to inform project management of the adequacy of the management controls applicable to the work activity. Surveillances are used as a monitoring method to evaluate in-process work, review corrective action completion status and effectiveness, and review documents and records pertinent to items or activities.

3. Project task leaders meetings that provide regular progress reporting, problem reporting, and adequacy assessments of tests, either ongoing or proposed.

4. Project reporting by line personnel to identify problems to line management for correction. This takes the form of occurrence reporting, nonconformance reporting, audit and surveillance reporting, etc.

9.3 REPORTING OF PROJECT TRENDS AND LESSONS LEARNED

Project management assesses project performance and relative project position within EMEF through the review of reports prepared by Energy Systems, ORNL, or support organizations, such as the following:

1. QA reports of corrective action status, corrective action tracking, and trending of conditions adverse to quality are prepared by support organizations.

2. Lessons Learned, provided by Energy Systems, provide management with information and experiences from other Energy Systems organizations by which project management can assess their operations and avoid making similar errors.

3. Occurrence reporting, including the Energy Systems Action Management System, provides project managers with problem and corrective action information status.

4. Project cost and schedule reports provide EMEF and project management with status assessments of the project.

10. INDEPENDENT ASSESSMENT

Independent assessments of the project consist of two distinct types: (1) assessments under the control of the project but performed by organizations and personnel that are independent of the activities being assessed and (2) assessments not controlled by the project and performed by outside organizations.

10.1 PROJECT-INITIATED INDEPENDENT ASSESSMENTS

The following activities are project-initiated independent assessments of project performance and quality program effectiveness:

1. Project-organized peer reviews, conducted by technically qualified personnel who are independent of the project, assess the adequacy of project decisions, design bases, and progress in meeting stated performance objectives.

2. Project readiness reviews, conducted by independent reviewers in accordance with Energy Systems procedures, supply management with assessments of project readiness to proceed with selected activities.

3. ORNL environmental safety and health assessments of the project provide both ORNL and the project with information regarding the adequacy of environmental safety and health initiatives. Assessment findings could result in the application of documented corrective measures by the project for improvement.

4. ORNL QA audits provide both ORNL and project management with information about the project's implementation of ORNL QA policies.

10.2 EXTERNAL ORGANIZATION ASSESSMENTS

The following activities are independent assessments of project performance and quality program effectiveness initiated by organizations that exercise overview of the project:

1. A DOE Environmental Safety and Health Assessment Team conducts environmental safety and health assessments and provides oversight to the project.

2. On-site DOE Facility Representative assesses current operations for compliance to facility requirements.

3. Assessments by regulatory agencies, such as the Tennessee Department of Environment and Conservation and U.S. Environmental Protection Agency.

4. Defense Nuclear Facilities Safety Board (DNFSB) conducts an ongoing assessment of MSRE Remediation Project activities in response to DNFSB Recommendation 94-1, Stabilization of Nuclear Materials.

5. Energy Systems corporate assessments provide reviews and evaluations of overall project performance in environmental safety and health and QA initiatives.

10.3 INDEPENDENT ASSESSMENT PERSONNEL

Independent assessments are performed by personnel independent of the work activity and are performed to notify EMEF, ORNL, and project management about the adequacy and effectiveness of project activities. External assessments are performed by appropriate personnel who have no direct connection with the project and are deemed by their sponsors to be technically qualified to assess the areas assigned.

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U.S. Department of Energy 1994. *Implementation Guide for Use with 10 CFR Part 830.120 Quality Assurance.*

APPENDIX A

Y/QD-15 MATRIX

	Y/QD-15 Rev. 2 program commitments	Related source requirement (10 *CFR* 830.120 or DOE Order 5700.6C)
2.1	**PROGRAM**	
2.1.1	**Introduction**	
(a)	Management systems should be developed to ensure safe, reliable products and services that meet or exceed the customer's requirements, needs, and expectations.	G-830.120.IV.1.1
(b)	(**PAAA 120-1**) A written QAP (program description) **SHALL** be developed, implemented, and maintained.	830.120 (c)(1)(i)
(c)	(**PAAA 120-2**) The written program **SHALL** describe the organizational structure, functional responsibilities, levels of authority, and interfaces for those managing, performing, and assessing the work.	830.120 (c)(1)(i)
(d)	(**PAAA 120-3**) The written program **SHALL** describe management processes, including planning, scheduling, and resource considerations.	830.120 (c)(1)(i)
(e)	Methods should be established for managing, performing, and assessing the adequacy of work, including work assigned to parties outside the organization.	G-830.120.IV.1.1
(f)	The scope and depth of the controls for a specific activity should be applied in a graded manner based on factors such as the level of risk and complexity of products or services involved.	G-830.120.IV.1.3
(g)	Documented readiness reviews and assessments should be performed on major work activities or on work having significant safety, reliability, or economic consequences before work commences.	5700.6C Attachment I, Sect. II.A.1.j
(h)	The requirements of 10 CFR 830.120, DOE Order 5700.6C, national standards and consensus documents, and other unique quality requirements should be translated into general guidance and Energy Systems policies and procedures. This Quality Program Description, when combined with other policies and procedures, constitutes the Energy Systems Quality Program.	
2.1.2	**Responsibilities**	
(a)	Management should retain the primary responsibility and accountability for the scope and implementation of the management system.	G-830.120.IV.1.2
(b)	Each individual in the organization should be responsible for achieving quality in his or her activities.	G-830.120.IV.1.2
(c)	Every employee **SHALL** have the right, obligation, and authority to ``stop work'' if imminent risks to safety, environment, or mission are identified. The employee should notify responsible management of the discrepant conditions so that remedial action can be taken.	5700.6C Attachment I, Sect. II.A.1.k

Y/QD-15 Rev. 2 program commitments	Related source requirement (10 *CFR* 830.120 or DOE Order 5700.6C)
2.2 PERSONNEL TRAINING AND QUALIFICATION	
2.2.1 Introduction	
(a) A fundamental requirement for effective accomplishment of any mission is that personnel be capable of performing their assigned tasks. Qualification and training programs should ensure that the required capabilities are achieved and maintained by personnel. Management should determine that personnel are suitably qualified to accomplish their assigned tasks. This determination is accomplished before personnel are allowed to perform the work for which they are being qualified. Required training should be identified for a particular task or category of job.	G-830.120.IV.2.1 G-830.120.IV.2.3
(b) (**PAAA 120-4**) Personnel **SHALL** be trained and qualified to ensure that they are capable of performing their assigned work.	830.120 (c)(1)(ii)
(c) (**PAAA 120-5**) Organizations **SHALL** address training and qualification of personnel.	G-830.120.IV.2.2
(d) (**PAAA 120-7**) Personnel **SHALL** be provided continuing training to ensure that job proficiency is maintained.	830.120 (c)(1)(ii)
(e) The development of training programs and the conduct of training should be the responsibility of line management. Training programs should be conducted according to Energy Systems training organization policies and procedures.	G-830.120.IV.2.2
2.2.2 Training Plans	
(a) (**PAAA 120-6**) Training plans **SHALL** be prepared for appropriate classes of personnel.	G-830.120.IV.2.5
(b) The content of training plans should prepare personnel to perform the job.	G-830.120.IV.2.5
2.2.3 Instructors	
(a) Instructors should possess adequate technical knowledge, experience, and instructional skills.	G-830.120.IV.2.6
2.2.4 Training	
(a) Training should provide knowledge of the work processes and methods to accomplish assigned tasks.	G-830.120.IV.2.4
(b) Lesson plans and other training materials should be consistently developed, reviewed by subject matter experts, approved, controlled, and used.	G-830.120.IV.2.4
(c) The effectiveness of the training program should be continually evaluated to ensure that the training objectives are accomplished. The evaluations should be made based on examination results, employee feedback, and the observations of the performed work. The results of these evaluations should be used as the basis for improving the training program.	G-830.120.IV.2.4

Y/QD-15 Rev. 2 program commitments	Related source requirement (10 *CFR* 830.120 or DOE Order 5700.6C)
2.3 QUALITY IMPROVEMENT	
2.3.1 Introduction	
Quality improvement is a key business strategy for Energy Systems. It should emphasize problem detection and prevention and continuous improvement.	830.120 (c)(1)(iii) G-830.120.IV.3.1 G-830.120.IV.3.2
2.3.2 Problem Detection and Prevention	
(a) (**PAAA 120-8**) Processes to detect and prevent quality problems **SHALL** be established and implemented.	830.120 (c)(1)(iii)
(b) Personnel **SHALL** have the freedom and responsibility to identify nonconforming items, activities, and deficient procedures without fear of reprisal or recrimination.	G-830.120.IV.3.1
(c) (**PAAA 120-9**) Items, services, and processes that do not meet established requirements **SHALL** be identified, controlled, and corrected according to the importance of the problem and the work affected.	830.120 (c)(1)(iii)
(d) (**PAAA 120-10**) Correction **SHALL** include identifying the causes of problems and working to prevent recurrence.	830.120 (c)(1)(iii)
(e) (**PAAA 120-11**) Item characteristics, process implementation, and other quality-related information **SHALL** be reviewed and the data analyzed to identify items, services, and processes needing improvement.	830.120 (c)(1)(iii)
(f) For disposition of nonconforming items, the organization that conducted the original review or that assigned it to another designated qualified organization **SHALL** document the justification for use.	5700.6C Attachment I, Sect. II.A.3.g.
(g) Repaired, reworked, or replacement items **SHALL** be installed and tested according to the original requirements or approved alternatives.	5700.6C Attachment I, Sect. II.A.3.h.
(h) Personnel who analyze or dispose of nonconforming items and activities **SHALL** be technically qualified and have pertinent background data available for their information and use.	5700.6C Attachment I, Sect. II.A.3.i.
2.3.3 Continuous Improvement	
(a) Quality improvement should be based on the premise that work activities can be planned, performed, measured, and improved. Management is responsible for building a culture in which improvement is continuous and an integral part of the organization.	G-830.120.IV.3.1
(b) Management policy for continuous improvement should be documented and communicated to the organization. The responsibility for improvement rests with each individual and organizational element and cannot be delegated to a particular person or group within the organization.	G-830.120.IV.3.1
(c) Process performance should be evaluated using assessments and performance indicators to identify improvement opportunities or required adjustments.	G-830.120.IV.3.1 G-830.120.IV.3.2

Y/QD-15 Rev. 2 program commitments	Related source requirement (10 *CFR* 830.120 or DOE Order 5700.6C)
2.4 DOCUMENTS AND RECORDS	
2.4.1 Introduction	
(a) Documents and records should be required to manage, perform, and assess work.	G-830.120.IV.4.1
(b) (**PAAA 120-12**) Management **SHALL** identify any documents that must be controlled and records that must be generated.	G-830.120.IV.4.1
2.4.2 Documents	
(a) Documents should be prepared, reviewed, approved, issued, used, and revised to prescribe processes, specify requirements, or establish design.	G-830.120.IV.4.2
(b) (**PAAA 120-13**) A document control process **SHALL** establish requirements, including preparation, review, approval, issuance, use, and revision requirements, to release documents for distribution, identify recipients, specify actions to be taken with existing documents when revisions are released for distribution or documents are canceled, and identify unique revisions and copies.	G-830.120.IV.4.2
(c) Documents that are controlled within the document control program should be clearly identified.	G-830.120.IV.4.1
2.4.3 Records	
(a) (**PAAA 120-14**) Records **SHALL** be specified, prepared, reviewed, approved, and maintained.	830.120 (c)(1)(iv)
(b) A record contains information that is retained for its expected future value. Records should be sufficient to support technical and regulatory decisions.	G-830.120.IV.4.3
(c) (**PAAA 120-15**) The records system **SHALL** include provisions for retention, protection, preservation, changing, traceability, accountability, and retrievability of records.	G-830.120.IV.4.3
(d) Stored records should be protected from damage, loss, and deterioration.	G-830.120.IV.4.3
(e) Records to be retained should be identified by line management within each specific procedure that generates a quality record.	
(f) The records management system should provide criteria for records retention and disposition.	G-830.120.IV.4.3
2.5 WORK PROCESSES	
A work process includes activities involved in performing defined tasks to achieve an objective. Work process activities include planning, scheduling, accounting, project management, design, analysis, fabrication, procurement, construction, installation, testing, operation, modification, maintenance, and decommissioning.	G-830.120.IV.5.1
2.5.1 Introduction	
(a) (**PAAA 120-16**) Work **SHALL** be performed to established technical standards and administrative controls using approved instructions, procedures, or other appropriate means.	830.120 (c)(2)(i)

	Y/QD-15 Rev. 2 program commitments	Related source requirement (10 *CFR* 830.120 or DOE Order 5700.6C)
(b)	(**PAAA 120-17**) The manager **SHALL** clearly identify authorities, responsibilities, and interfaces, both internal and external, regarding the work process in appropriate work process documents.	G-830.120.IV.5.4
(c)	Policies, procedures, goals, plans, and any other information affecting a process should be clearly communicated to the personnel working within that process.	G-830.120.IV.5.4
(d)	Work-related instructions, procedures, and other forms of direction should be developed, verified, validated, and approved by technically competent personnel.	5700.6C Attachment I, Sect. II.B.1.a
(e)	Workers should be retrained to new conditions if the work process is changed.	G-830.120.IV.5.2
2.5.2	**Identification and Control of Items**	
(a)	(**PAAA 120-18**) Items **SHALL** be identified and controlled to ensure their proper use.	830.120 (c)(2)(i)
(b)	Items, including consumables, should be identified, maintained, and controlled to prohibit the use of incorrect, deteriorated, damaged, or unidentified items.	G-830.120.IV.5.4
(c)	Procedures should provide for marking, labeling, and tagging items so that items are traced to supporting documentation and special controls are maintained.	G-830.120.IV.5.4
(d)	Items such as chemicals, reagents, solvents, petroleum products, asbestos, radioactive materials, and other hazardous materials should be identified and controlled to preclude contamination or damage to the plant and to prevent injury to personnel.	G-830.120.IV.5.4
2.5.3	**Handling, Storing, and Shipping**	
(a)	(**PAAA 120-19**) Items **SHALL** be maintained to prevent their damage, loss, or deterioration.	830.120 (c)(2)(i)
(b)	Procedures and specifications should establish controls for handling, storing, and shipping materials and for providing adequate protection to equipment.	G-830.120.IV.5.4
(c)	Handling tools and equipment should be used, tested, and routinely inspected in accordance with documented procedures.	G-830.120.IV.5.2 G-830.120.IV.5.4
2.5.4	**Computer Software Control**	
(a)	Energy Systems develops and implements computer software programs that can have a significant impact on safe and reliable plant operation, processing of data, or achievement of programmatic missions. Software controls should be based on the importance of the software application.	G-830.120.IV.1.3
(b)	Software controls should include verification and validation and configuration management.	G-830.120.IV.6.3
2.6	**DESIGN**	
2.6.1	**Introduction**	
(a)	(**PAAA 120-20**) Items and processes **SHALL** be designed using sound engineering/scientific principles and appropriate standards.	830.120 (c)(2)(ii)

	Y/QD-15 Rev. 2 program commitments	Related source requirement (10 *CFR* 830.120 or DOE Order 5700.6C)
(b)	The design management system should be documented and implemented using procedures and engineering standards developed by or compatible with Energy Systems Central Engineering Services.	G-830.120.IV.6.1
(c)	The design program **SHALL** provide the design documentation necessary for the maintenance of the configuration of Energy Systems facilities and systems.	G-830.120.IV.6.1
(d)	(**PAAA 120-21**) A formal design process **SHALL** be established to provide for control of design inputs, outputs, verification, configuration and design changes, documentation, records, and technical and administrative interfaces.	G-830.120.IV.6.1
(e)	(**PAAA 120-27**) Systems, structures, and components important to safety **SHALL** be subject to more stringent operational criteria and verification requirements than those not important to safety.	G-830.120.IV.6.1
(f)	Designs should provide for appropriate inspection, testing, and maintenance to ensure continuing reliability and safety of the system, structure, or component.	G-830.120.IV.6.1
(g)	The design should consider the expected use and life expectancy of the system, structure, or component in order to address appropriate disassembly and disposal requirements.	G-830.120.IV.6.1
2.6.2	**Design Input**	
(a)	Design inputs should consider such information as design bases, health and safety considerations, expected life cycle, performance parameters, codes and standards requirements, and reliability requirements.	G-830.120.IV.6.2
(b)	(**PAAA 120-26**) Design work, including changes, **SHALL** incorporate applicable requirements and design bases.	830.120 (c)(2)(ii)
(c)	(**PAAA 120-25**) The design process **SHALL** require that design inputs be technically correct and complete.	G-830.120.IV.6.3
2.6.3	**Design Process**	
(a)	(**PAAA 120-30**) Design interfaces **SHALL** be identified and controlled.	830.120 (c)(2)(ii)
(b)	(**PAAA 120-22**) The design process **SHALL** translate design input into design output documents that are technically correct and meet the end-user's requirements.	G-830.120.IV.6.3
(c)	(**PAAA 120-23**) Aspects critical to the safety or reliability of the designed system, structure, or component **SHALL** be identified during the design phase.	G-830.120.IV.6.3
(d)	(**PAAA 120-34**) Computer software used to originate or verify design solutions during the design process for criticality applications **SHALL** be validated.	G-830.120.IV.6.3
(e)	Computer software used to originate or verify design solutions during the design process **SHALL** be validated or the status of code validation be identified and documented prior to use.	G-830.120.IV.6.3

Y/QD-15 Rev. 2 program commitments	Related source requirement (10 *CFR* 830.120 or DOE Order 5700.6C)
(f) (**PAAA 120-32**) The agency accomplishing the design **SHALL** verify that design output documents meet design input requirements and that any deviations have been approved and documented.	G-830.120.IV.6.3
2.6.4 Design Output	
(a) Design records should be maintained to support the basis and output of the design process. These records include, as appropriate, the design input basis documents, calculations, approved drawings and their revisions, computer programs, analyses, and test data.	G-830.120.IV.6.4
(b) (**PAAA 120-24**) The completed design **SHALL** be recorded in design output documents such as drawings, specifications, test/inspection plans, maintenance requirements, and reports.	G-830.120.IV.6.4
(c) As-built drawings should be maintained after production or construction to show actual configuration of safety systems.	G-830.120.IV.6.4
2.6.5 Design Verification	
(a) Design verification is a formal documented process to establish that the resulting system, structure, or component will be fit for the intended use. The extent and number of design verifications should be based on a graded approach and depend on the designed product's complexity and importance to project success.	G-830.120.IV.6.5
(b) (**PAAA 120-31**) Design verification **SHALL** be performed by technically knowledgeable persons other than those who performed the design.	G-830.120.IV.6.5
(c) (**PAAA 120-33**) Verification and validation work **SHALL** be completed before approval and implementation of the design.	830.120 (c)(2)(ii)
2.6.6 Design Changes	
(a) (**PAAA 120-28**) Design changes, including field changes and nonconforming items dispositioned ``use-as-is'' or ``repair,'' **SHALL** be controlled by measures commensurate with those applied to the original design.	G-830.120.IV.6.6
(b) (**PAAA 120-29**) Temporary modifications **SHALL** receive the same levels of control as the designs of permanent modifications.	G-830.120.IV.6.6
2.7 PROCUREMENT	
2.7.1 Introduction	
(a) Energy Systems has the responsibility for establishing and implementing a procurement process to ensure that procured items and services comply with documented requirements and are fit for intended use. The procurement program **SHALL** comply with this QPD; Energy Systems policies, standards, and procedures; and the Procurement Division operating manual. Items or services procured from other Lockheed Martin corporate entities are also subject to these requirements.	830.120 (c)(2)(iii)
(b) The stringency of procurement requirements should be commensurate with the application of the purchased items or services.	G-830.120.IV.7.1

	Y/QD-15 Rev. 2 program commitments	Related source requirement (10 *CFR* 830.120 or DOE Order 5700.6C)
(c)	(**PAAA 120-35**) Procured items and services **SHALL** meet established requirements and perform as specified.	830.120 (c)(2)(iii)
(d)	The procurement process should be planned and controlled to ensure that the end-user's requirements are accurately, completely, and clearly communicated to the supplier; that the supplier's, designer's, and end-user's requirements are met during the production phase; and that the proper product is delivered on time and maintained until use.	G-830.120.IV.7.1
2.7.2	**Procurement Documents**	
(a)	Procurement documents should be reviewed and approved to ensure inclusion of or reference to specifications, standards, and other documents referred to by the design documents and to identify those records to be maintained or submitted.	G-830.120.IV.7.2
(b)	(**PAAA 120-36**) Procurement documents **SHALL** clearly state test/inspection requirements and acceptance criteria for safety- related purchased items and services.	G-830.120.IV.7.2
(c)	Critical parameters and requirements such as submittals, product- related documentation, nonconformance requirements, administrative documentation, personnel or materials qualifications, tests, inspections, and reviews should be clearly specified in the procurement documents.	G-830.120.IV.7.2
(d)	Procedures should describe the process for the preparation and control of procurement documents, supplier evaluation and selection, supplier performance monitoring, source verification, receiving inspection and testing, and item or service acceptance.	5700.6C Attachment I, Sect. II.B.3.a
(e)	Procedures should establish requirements and criteria to ensure that the appropriate quality elements have been incorporated into procurement documents.	5700.6C Attachment I, Sect. II.B.3.b G-830.120.IV.7.2
(f)	Commercial-grade item procurement documents should incorporate requirements to ensure that identified critical characteristics have been satisfied for items procured for critical applications.	5700.6C Attachment I, Sect. II.B.3.c
2.7.3	**Supplier Qualification**	
(a)	(**PAAA 120-39**) Suppliers **SHALL** be evaluated and selected on the basis of specified criteria.	830.120 (c)(2)(iii)
(b)	Critical application items and services should be identified early in the design and procurement process.	G-830.120.IV.7.3
2.7.4	**Supplier Monitoring**	
(a)	(**PAAA 120-40**) Processes to ensure that approved suppliers continue to provide acceptable items and services **SHALL** be established and implemented.	G-830.120.IV.7.4

Y/QD-15 Rev. 2 program commitments	Related source requirement (10 *CFR* 830.120 or DOE Order 5700.6C)
2.7.5 Inspection	
(a) (**PAAA 120-37**) The procurement process **SHALL** include provisions for inspections and tests. Inspections may include the following methods: inspections of materials or equipment at the supplier's plant; receipt inspection of the shipped items; review of objective evidence such as certifications and reports; and verification of testing of items prior to or following shipment.	G-830.120.IV.7.6
(b) (**PAAA 120-38**) Inspection **SHALL** be adequate to ensure conformance with purchase requirements, including verifying that specified documentation has been provided by the supplier.	G-830.120.IV.7.6
2.7.6 Nonconformance and Corrective Action	
(a) Significant nonconformances identified with supplier-furnished items or services should be identified, controlled, and documented according to the Energy Systems nonconformance report system.	5700.6C Attachment I, Sect. II.B.3.g
(b) Before releasing critical application items for installation or use, documentation should be available to support the acceptance of the item based on compliance with technical requirements.	5700.6C Attachment I, Sect. II.B.3.g
2.7.7 Product Documentation	
(a) Supplier-generated documents **SHALL** be accepted through the procurement system and controlled and processed by the end-user organization. These documents may include certificates of conformance, drawings, analyses, test reports, maintenance data, nonconformances, corrective actions, approved changes, waivers, and deviations.	G-830.120.IV.7.7
2.8 INSPECTION AND ACCEPTANCE TESTING	
2.8.1 Introduction	
(a) Inspections and tests should be accomplished to verify that physical characteristics and functions of systems, structures, and components are acceptable to the organization that will use the systems, structures, and components.	G-830.120.IV.8.1
(b) (**PAAA 120-41**) Inspection and testing of specified items, services, and processes **SHALL** be conducted using established acceptance and performance criteria.	830.120 (c)(2)(iv)
(c) Inspections and tests should be conducted on activities or items affecting quality to verify conformance with codes, standards, regulatory requirements, procedures, and procurement documents.	G-830.120 IV.8.2
(d) Systems, structures, and components requiring inspection and test should be identified early in the design phase.	G-830.120.IV.8.1
2.8.2 Process	
(a) Inspection and test methods should be established that define the requirements for activities that verify conformance of systems, structures, or components with specified requirements.	G-830.120.IV.8.2

	Y/QD-15 Rev. 2 program commitments	Related source requirement (10 *CFR* 830.120 or DOE Order 5700.6C)
(b)	Inspections and tests should be performed by technically qualified personnel.	G-830.120.IV.8.1
(c)	Inspection and test activities should be performed by persons other than those who performed or directly supervised the work being examined.	G-830.120.IV.8.2
(d)	The inspection and test process should identify the status of systems, structures, and components requiring examination to ensure that failed or untested systems, structures, and components are not used.	G-830.120.IV.8.1
(e)	The status of inspections and examinations should be identified by documentation and segregation of items and/or tagging to preclude the bypassing of required tests or the use of deficient items or products.	G-830.120.IV.8.1
(f)	Inspection and test results should be evaluated and verified by authorized personnel to document that all requirements have been satisfied.	G-830.120.IV.8.1 G-830.120.IV.8.2
(g)	(**PAAA 120-42**) Results of inspection and test activities **SHALL** be documented and retained as quality records.	G-830.120.IV.8.2
(h)	Nonconforming conditions identified during the inspection or examination of completed work **SHALL** be identified on nonconformance reports and dispositioned in accordance with approved procedures.	G-830.120.IV.8.1 G-830.120.IV.8.2
2.8.3	**Control of Measuring and Test Equipment**	
(a)	(**PAAA 120-43**) Equipment used for process monitoring or data collection and inspections and tests **SHALL** be calibrated and maintained in accordance with the significance of its function and the quality assurance requirements.	830.120 (c)(2)(iv)
(b)	The measuring and test equipment program should be established to identify each device and standard and to document the frequency of calibration, calibration accuracy, labeling requirements, and unique identification number.	5700.6C Attachment I, Sect. II.B.4.c
(c)	The frequency of measuring and test equipment calibration **SHALL** be based on intended use, stability characteristics, and required accuracy for the application.	5700.6C Attachment I, Sect. II.B.4.c
(d)	Procedures for testing, retesting, adjusting, and recalibration of measuring and test equipment should be maintained and documented by organizations performing inspection and testing functions.	G-830.120.IV.8.3
(e)	Measuring and test equipment should be calibrated to accepted standards, including, when applicable, standards traceable to the National Institute of Standards and Technology.	G-830.120.IV.8.3
(f)	Controlled measuring and test equipment **SHALL** be labeled, identified or traceable through the calibration program to identify its calibration status and ensure traceability of test data.	5700.6C Attachment I, Sect. II.B.4.c
(g)	Controlled measuring and test equipment and standards found to be out of calibration **SHALL** be identified and documented.	5700.6C Attachment I, Sect. II.B.4.c
(h)	An investigation **SHALL** be conducted to evaluate instances where the out-of-tolerance device has been used since the last known calibration to determine any impact on the validity of acquired data and to take appropriate corrective action if necessary.	5700.6C Attachment I, Sect. II.B.4.c

Y/QD-15 Rev. 2 program commitments	Related source requirement (10 *CFR* 830.120 or DOE Order 5700.6C)
2.9 MANAGEMENT ASSESSMENT	
2.9.1 Introduction	
(a) The management assessment program should provide a means for managers at every level to assess the performance of their organizations to determine how well those organizations are meeting customers' requirements and expectations and the organizations' goals and objectives.	G-830.120.IV.9.1
2.9.2 Responsibility	
(a) (**PAAA 120-44**) Managers **SHALL** assess their management processes.	830.120 (c)(3)(i)
(b) Managers should retain overall responsibility for management assessments. Direct participation by managers is essential to the process.	830.120 (c)(3)(i)
(c) Management assessments should be conducted by individuals who have the necessary skills required to evaluate system performance.	5700.6C 9.b(3)(b) 5700.6C Attachment I, Sect. II.A.2.c
2.9.3 Process and Results	
(a) (PAAA 120-45) Problems that hinder the organization from achieving its objectives **SHALL** be identified and corrected.	830.120 (c)(3)(i)
(b) Management assessments should focus on the identification and resolution of both systematic and cultural management issues and problems.	G-830.120.IV.9.3
(c) Strengths and weaknesses affecting the achievement of organizational objectives should be identified to improve quality.	830.120 (c)(3)(i)
(d) Assessments should include strategic planning, organizational interfaces, cost control, use of performance indicators, staff training and qualifications, and supervisory oversight and support.	G-830.120.IV.9.3
(e) Management assessment results should be used as input to the organization's continuous improvement process.	G-830.120.IV.9.4
2.10 INDEPENDENT ASSESSMENT	
2.10.1 Introduction	
(a) (**PAAA 120-46**) Management **SHALL** establish and implement a method for independent assessment of organizations, programs, and projects in order to evaluate the performance of work processes with regard to requirements and expectations of customers and toward achieving the mission and goals of the organization.	G-830.120.IV.10.1
(b) The independent assessment process should use a performance-based approach with emphasis on results and with compliance viewed as the baseline.	G-830.120.IV.10.1
(c) Independent assessments include methods such as inspections, peer and technical reviews, audits, surveillances, or combinations thereof. Surveillances should be defined as specific limited-scope assessments of short duration.	830.120 (c)(3)(ii)

Y/QD-15 Rev. 2 program commitments	Related source requirement (10 *CFR* 830.120 or DOE Order 5700.6C)
(d) Assessments should be conducted on activities that most directly relate to final objectives and emphasize safety, reliability, and product performance.	G-830.120.IV.10.1
2.10.2 Performing Organization	
(a) Independent assessments should be planned and coordinated by the assessing organizations with the organizations to be assessed.	
(b) (**PAAA 120-49**) The group performing independent assessments **SHALL** have sufficient authority and freedom from the line to carry out its responsibilities.	830.120 (c)(3)(ii)
(c) (**PAAA 120-50**) Persons conducting independent assessments **SHALL** be technically qualified and knowledgeable in the area assessed.	830.120 (c)(3)(ii)
(d) Personnel performing assessments should not have direct responsibilities in the areas they are assessing and should consider the organizations being assessed as customers for feedback concerning observations of performance.	G-830.120.IV.10.2
2.10.3 Process	
(a) The types and frequencies of independent assessments should be based on the status, complexity, and importance of the activities or processes being assessed.	G-830.120.IV.10.3
(b) The criteria used for assessments should describe acceptable work performance and promote improvement of the process or activity.	G-830.120.IV.10.1
(c) Personnel performing assessments should focus on improving output quality and process effectiveness by emphasizing continuous improvement methods.	G-830.120.IV.10.3
(d) The assessor's responsibilities should include evaluating work performance and process effectiveness; identifying abnormal performance and potential problems; finding opportunities for improvement; documenting and reporting results; and verifying satisfactory resolutions of reported problems.	G-830.120.IV.10.3 G-830.120.IV.10.4
(e) The assessment should be directed toward the requirements of the documented quality program and not toward subjective interpretation of codes and standards.	G-830.120.IV.10.3
(f) (**PAAA 120-47**) The independent assessment process **SHALL** include verification of the adequacy of corrective actions, including actions identified to prevent recurrence or to otherwise improve performance.	G-830.120.IV.10.3
2.10.4 Results	
(a) (**PAAA 120-48**) Assessment results **SHALL** be documented, presented to the organization that was assessed, and provided to the appropriate levels of management for review.	G-830.120.IV.10.4
(b) Findings identified should be tracked to closure. Actions should be taken to correct the deficiency and to identify the root cause and actions that could be taken to prevent recurrence.	830.120 (c)(1)(iii)
(c) Areas of poor or questionable performance should receive increased attention.	G-830.120.IV.10.4
(d) Lessons learned from the assessment process should be communicated to other organizations with similar activities or concerns.	G-830.120.IV.10.4

APPENDIX B

CENTRAL ENGINEERING SERVICES MATRIX

Procedure Modular Profile

QA Program basic elements	To be applied (Y/N)	Project-specific procedures[a]
1. Organization	Y	Project Management Plan
2. Quality Assurance Program	Y	Y/QD-15 EP-E-04 EP-E-09 EP-PS1-02
3. Design control	Y	EP-B-16 EP-C-03 EP-C-17 EP-C-18 EP-C-20 EP-C-21 EP-C-22 EP-C-23 EP-C-25 EP-C-35 EP-3-02 EP-E-07 EP-0A6-01 EG-C-26
4. Procurement document control	Y	QA-701 EP-C-22 EP-C-23 EP-C-25 EP-D-11
5. Instructions, procedures, and drawings	Y	ESS-QA-5.0 EP-C-30 EP-C-35
6. Document control	Y	QA-6.0 EP-A-12 EG-C-01 EP-PM3-01
7. Control of purchased items and services	Y	QA-701 EP-D-11
8. Identification & control of items	Y	ESS-QA-8.0 PRO-8
9. Control of processes	Y	ESS-QA-9.0
10. Inspection	Y	EP-E-12
11. Test control	Y	EP-E-12 ES-0.4-1 JSP-106

Procedure Modular Profile (continued)

QA Program basic elements	To be applied (Y/N)	Project-specific procedures[a]
12. Control of measuring and testing equipment	Y	ESS-QA-12.0 EP-E-12
13. Handling, storage, and shipping	Y	ESS-QA-13.0
14. Inspection, test, and operating status	Y	ESS-QA-14.0 EP-E-12
15. Control of nonconforming items	Y	QA-301 EP-D-10
16. Corrective action	Y	QA-301 QA-16.2 QA-331
17. Quality assurance records		QA-17.0
18. Audits	Y	QA-901 QA-904 QA-911
19. Software	Y	ESS-QA-19.0 EP-E-11

[a]When a division does not have project-specific procedures to cover a requirement, ORNL/Energy Systems procedures will be used.

APPENDIX C

MSRE FACILITY MATRIX

Molten Salt Reactor Experiment Quality Assurance Matrix

Y/QD-15 Rev. 2 program commitments	Method of compliance
1. Program	ORNL/ER-336, "Quality Assurance Plan for the Molten Salt Reactor Experiment Remediation Project" ORNL/ER-341, "Program Management Plan"
2. Personnel training and qualification	ORNL/ER-336, "Quality Assurance Plan for the Molten Salt Reactor Experiment Remediation Project" (Chap. 2) MSRE-ER-525, "Molten Salt Reactor Experiment (MSRE) Facility Training Program"
3. Quality improvement	ORNL/ER-336, "Quality Assurance Plan for the Molten Salt Reactor Experiment Remediation Project" (Chap. 3) MSRE-ER-521, "Fabrication Package Documentation Requirements for the MSRE Facility" X-QA-9, "Nonconformance Reporting." QA-16.1, "Corrective Action Program" QA-16.3, "ORNL Lessons Learned and Alert Program"
4. Documents and records	ORNL/ER-336, "Quality Assurance Plan for the Molten Salt Reactor Experiment Remediation Project" (Chap. 4) MSRE-ER-502, "Facility Work Authorization" MSRE-ER-516, "MSRE Control of Molten Salt Reactor Experiment Required Documents" MSRE-ER-521, "Fabrication Package Documentation Requirements for the MSRE Facility"
5. Work processes	ORNL/ER-336, "Quality Assurance Plan for the Molten Salt Reactor Experiment Remediation Project" (Chap. 5) MSRE-ER-502, "Facility Work Authorization" MSRE-ER-516, "Development, Review, Use, & Control of MSRE Procedures" Other applicable MSRE 500 series procedures ORNL FS-3.3, "Change Control" MSRE/CONOPS, "MSRE Conduct of Operations Manual"
6. Design	See Appendix B, CES Matrix MSRE-ER-502, "MSRE Facility Work Authorization" MSRE-ER-521, "Fabrication Package Documentation Requirements for the MSRE Facility" ORNL FS-3.3 "Change Control" ESS-QA-19.0, "Software Quality Assurance" X-QA-11, "ORNL Quality Verification Decal"
7. Procurement	ORNL/ER-336, "Quality Assurance Plan for the Molten Salt Reactor Experiment Remediation Project" (Chap. 7) X-GP-16, "Procurement of Critical Application/Safety-Class Items and Services at ORNL"

Molten Salt Reactor Experiment Quality Assurance Matrix (continued)

	Y/QD-15 Rev. 2 program commitments	Method of compliance
8.	Inspection and acceptance testing	ORNL/ER-336, "Quality Assurance Plan for the Molten Salt Reactor Experiment Remediation Project" (Chap. 8) QA-IC-12, "Control of M&TE" Applicable MSRE 500 series procedures Y50-53-30-005, "Testing of Criticality Accident Alarm Systems" X-QA-9 "ORNL Nonconformance Reporting"
9.	Management assessments	ORNL/ER-336, "Quality Assurance Plan for the Molten Salt Reactor Experiment Remediation Project" (Chap. 9)
10.	Independent assessments	ORNL/ER-336, "Quality Assurance Plan for the Molten Salt Reactor Experiment Remediation Project" (Chap. 10)

APPENDIX D

CHEMICAL TECHNOLOGY DIVISION MATRIX

Chemical Technology Division Radiochemical Technology Section (Bethel Valley)
Quality Assurance Program Matrix

10 CFR 830.120/DOE Order 5700.6C criteria	ANSI/ASME NQA-1 element	CTD/RTS procedures[a]
1. Program	2. QA Program	RTS/QA/17 CTD QA-2 CTD QA-3
	1. Organization	RTS-023
2. Personnel training and qualification	2. QA Program	TRN-1 RTS-028 RTS-029
3. Quality improvement	15. Control of Nonconforming Items	
	16. Corrective Action	CTD QA-5 RTS-031
4. Documents and records	5. Instructions, Procedures, and Drawings	RTS-002 ESG-001
	6. Document Control	RTS-006
	17. QA Records	
5. Work processes	8. Identification and Control of Items	RTS-032 RTS-011
	9. Control of Processes	RTS-026
6. Design	3. Design Control	ESG-001 RTS-003
	19. Software QA	
7. Procurement	4. Procurement Document Control	
	7. Control of Purchased Items and Services	RTS-011
	13. Handling, Storage and Shipping	
8. Inspection and acceptance testing	10. Inspection	
	11. Test Control	
	12. Control of Measuring and Testing Equipment	
	14. Inspection, Test and Operating Status	
9. Management assessments	2. QA Program	CTD GEN-1 CTD GEN-2 CTD GEN-3 RTS-023
10. Independent assessments	18. Audits	

[a]When a division does not have project-specific procedures to cover a requirement, ORNL/Energy Systems procedures will be used.

APPENDIX E

INSTRUMENTATION AND CONTROLS DIVISION MATRIX

Instrumentation and Controls Division Quality Assurance Program Matrix

10 CFR 830.120/DOE Order 5700.6C criteria	ANSI/ASME NQA-1 element	I&C Division procedure[a]
1. Program	2. QA Program	QA-IC-1
	1. Organization	QA-IC-2
2. Personnel training and qualification	2. QA Program	QA-IC-2
		QA-IC-OP40
3. Quality improvement	15. Control of Nonconforming Items	QA-IC-15
	16. Corrective Action	QA-IC-16
4. Documents and records	5. Instructions, Procedures, and Drawings	QA-IC-5
	6. Document Control	QA-IC-6
	17. QA Records	QA-IC-17
5. Work processes	8. Identification and Control of Items	QA-IC-8
	9. Control of Processes	QA-IC-9
6. Design	3. Design Control	QA-IC-3
	19. Software QA	QA-IC-19
7. Procurement	4. Procurement Document Control	QA-IC-4
		QA-IC-OP12
	7. Control of Purchased Items and Services	QA-IC-7
	13. Handling, Storage and Shipping	QA-IC-13
8. Inspection and acceptance testing	10. Inspection	QA-IC-10
	11. Test Control	QA-IC-11
	12. Control of Measuring and Testing Equipment	QA-IC-12
	14. Inspection, Test and Operating Status	QA-IC-14
9. Management assessments	2. QA Program	QA-IC-2
10. Independent assessments	18. Audits	QA-IC-18

[a]When a division does not have project-specific procedures to cover a requirement, ORNL/Energy Systems procedures will be used.

APPENDIX F

PLANT AND EQUIPMENT DIVISION MATRIX

Plant and Equipment Division Quality Assurance Program Matrix

10 CFR 830.120/DOE Order 5700.6C criteria	Project-specific procedures[a]
1. Program	
2. Personnel training and qualification	D-1.17 D-1.173 F-1.4 F-1.5 F-WELD-1.7
3. Quality improvement	
4. Documents and records	D-1.12 D-1.125 D-1.174 F-16.1 F-WELD-1.1
5. Work processes	D-1.16 F-1.2 F-1.6 F-17.2 F-WELD-1.4
6. Design	
7. Procurement	F-1.1 F-12.1 F-17.2
8. Inspections and acceptance testing	F-WELD-14.1 F-14.1 TO F-14.9
9. Management assessments	See Self-Assessment Program Plan (10/31/97)
10. Independent assessments	

[a]When a division does not have project-specific procedures to cover a requirement, ORNL/Energy Systems procedures will be used.

APPENDIX G

ROBOTICS AND PROCESS SYSTEMS DIVISION MATRIX

Robotics and Process Systems Division Applicable Quality Assurance Program Procedures

10 CFR 830.120/DOE Order 5700.6C criteria	QA procedure numbers[a]
1. Program	PQP-RPS-1-2 QA-RPS-2-1
2. Personnel training and qualification	QAS-RPS-2-3
3. Quality improvement	QA-RPS-4-2 QAV-RPS-3-5
4. Documents and records	QAS-RPS-2-10 QAS-RPS-2-22
5. Work processes	QAS-RPS-2-9 QAS-RPS-2-15 QAS-RPS-2-14 QAS-RPS-2-18 QAS-RPS-2-19
6. Design	QAS-RPS-2-19 QAS-RPS-2-20 QAS-RPS-2-19
7. Procurement	QAS-RPS-2-5 QAS-RPS-2-6 QAS-RPS-2-19
8. Inspections and acceptance testing	QAS-RPS-2-15 QAV-RPS-3-1 QAS-RPS-2-16 QAS-RPS-2-17 QAS-RPS-2-21 QA-RPS-4-2
9. Management assessments	QAS-RPS-2-3 QAV-RPS-3-5 QAV-RPS-3-4
10. Independent assessments	QAV-RPS-3-5 QAV-RPS-3-4 QAV-RPS-3-1

[a]When a division does not have project-specific procedures to cover a requirement, ORNL/Energy Systems procedures will be used.

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