



Department of Energy
 Oak Ridge Operations
 Office of Environmental Management
 Procedure

ENVIRONMENTAL MANAGEMENT
 SYSTEMS ENGINEERING

EM-2.2
 Revision 0

Prepared:

Procedure Owner

October 6, 2003
 Date

Approved:

Assistant Manager for Environmental Management

Date

Concurrence
Rtg. Symbol SE-31
Initials Allen TBA
Date 10/6/03
Rtg. Symbol EM-94
Initials Smyth S
Date 10/8/03
Rtg. Symbol EM-90
Initials Boggs
Date 10/8/03
Rtg. Symbol EM-90
Initials McCracken
Date
Rtg. Symbol
Initials
Date
Rtg. Symbol
Initials
Date
Rtg. Symbol
Initials
Date
Rtg. Symbol
Initials
Date



**Department of Energy
Oak Ridge Operations
Office of Environmental Management
Procedure**

**ENVIRONMENTAL MANAGEMENT
SYSTEMS ENGINEERING**

**EM-2.2
Revision 0**

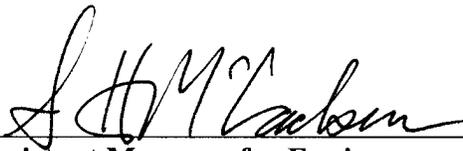
Prepared:



Procedure Owner

October 6, 2003
Date

Approved:



Assistant Manager for Environmental Management

10/14/03
Date

TABLE OF CONTENTS

Table of Contents	2
List of Acronyms	3
1.0 PURPOSE	4
2.0 SCOPE	4
3.0 REFERENCES & DEFINITIONS	4
3.1 References	4
3.2 Definitions	4
4.0 RESPONSIBILITIES	4
4.1 Assistant Manager for Environmental Management (AMEM).....	4
4.2 Technical Support and Assessment Division Director.....	4
4.3 Safety System Oversight Personnel	5
4.4 Relationship Between Facility Representatives and SSO Personnel.....	5
5.0 PROCEDURE	5
5.1 Programmatic Action Steps	5
5.2 Oversight Action Steps.....	6
6.0 RECORDS	7
7.0 ATTACHMENTS	7
7.1 Attachment 1: Criteria and Approach Document	8

ACRONYMS

AMEM	Assistant Manager for Environmental Management
DOE	U.S. Department of Energy
EM	Office of Environmental Management
ISMS	Integrated Safety Management System
ORO	Oak Ridge Operations

1.0 PURPOSE

To establish requirements and responsibilities for the EM Safety System Oversight program (SSO). The SSO program is a mechanism for applying technical expertise to provide EM line management with accurate, objective information on the performance of active safety systems and the associated effectiveness of contractor work performance and practices, including the contractor's System Engineer Program, maintenance of the design basis, control of system configuration, and performance reliability and operability of designated active safety systems at EM facilities.

2.0 SCOPE

This procedure applies to ORO staff identified as SSO personnel by their EM management. This procedure describes responsibilities for the safety system oversight personnel, their supervision and management, and those directly supporting the safety system oversight function.

3.0 REFERENCES AND DEFINITIONS

3.1 References

- 3.1.1 DOE Order 420.1A, Facility Safety.
- 3.1.2 DOE Guide 420.1-1, Nonreactor Nuclear Safety Design Criteria and Explosive Safety Criteria Guide for use with DOE O 420.1 Facility Safety.
- 3.1.3 DOE Policy 450.4, Safety Management System Policy.
- 3.1.4 DOE Order 433.1, Maintenance Management Program.
- 3.1.5 DOE-STD-1073-93, Guide for Operational Configuration Management Program.
- 3.1.6 DOE-STD-3024-98, Content of System Design Descriptions.
- 3.1.7 Memorandum from the Secretary of Energy dated February 20, 2001, Establishment of SE Programs under Implementation Plan for DNFSB Recommendation 2000-2, Configuration Management, Vital Safety Systems.
- 3.1.8 Memorandum from the Principal Deputy Assistant Secretary Environment, Safety, and Health dated November 30, 2001, Model Assessment Criteria and Guidelines for Performing Phase II Assessments of Safety Systems At Defense Nuclear Facilities.
- 3.1.9 DOE Order 5480.20A, Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities.

3.1.10 EM-3.3, Integrated Assessment Program

3.2 Definitions

3.2.1 Safety System Oversight Personnel - Individuals assigned responsibility for contractor oversight based on a specific system or group of systems. This oversight can be applied to various facilities, projects, and/or operations. With respect to the safety system oversight personnel's expertise, the individual has technical understanding of system requirements, design, operation, testing, and maintenance and knowledge of relevant codes, standards, procedures, and acceptance criteria.

3.2.2 Active Safety Systems – Safety systems credited in Safety Basis documents as controls that perform important roles to protect the health and safety of the public, workers and the environment, including safety-class systems, safety-significant systems, and other systems that, in the judgment of line management, perform an important defense in depth safety function.

4.0 RESPONSIBILITIES

4.1 Assistant Manager for Environmental Management

4.1.1 Ensures EM contractors, where applicable, develop a System Engineer Program according to DOE O 420.1A, Section 4.5.

4.1.2 Ensures appointment of SSO personnel with respect to EM resource needs.

4.2 Technical Support and Assessment Division Director

4.2.1 Ensure that the list of Active Safety Systems identified by the contractors is verified to accurately reflect the current Safety Basis Documents and is maintained up-to-date.

4.2.2 Identify necessary coverage areas for SSO personnel with respect to the EM mission and programs.

4.2.2 Define roles, responsibilities and training requirements of SSO personnel commensurate with the EM mission in coordination with the Closure Project Directors.

4.2.3 Ensures identification of resource needs for SSO coverage.

4.2.4 Assigns SSO personnel to specific systems as necessary and provides the technical supervision for SSO personnel related to their assignment to oversee EM systems.

4.2.5 Ensures appropriate training is provided and documented for SSO personnel roles and responsibilities, coordinating with the ORO Training and Development Group.

4.2.6 Ensure SSO personnel qualifications are maintained current.

4.2.7 Arranges for periodic assessments of the EM contractors' System Engineer Program.

4.3 Safety System Oversight Personnel

- 4.3.1 Provide oversight of assigned systems and the contractors' application of the system engineer program as described in DOE O 420.1A, Section 4.5.
- 4.3.2 Perform reliability, availability, and maintainability reviews of assigned systems, including configuration and material condition.
- 4.3.3 Provide oversight of contractor planned actions regarding assigned Active Safety Systems. Ensures EM expectations are met.
- 4.3.4 Review new and revised contractual safety basis documentation, system description documents, drawings, project related documents, and design changes directly related to assigned active safety systems. Provide input to the development of special operating/test procedures.
- 4.3.5 Provide technical support to Facility Representatives, Subject Matter Experts (SMEs), and Program/Project Managers in evaluating the significance and impact of identified system problems and on other issues related to assigned systems as necessary. Review and provide input to all occurrence reports related to assigned systems.
- 4.3.6 Participate on Operational Readiness Reviews, Readiness Assessments, and Safety Basis Implementation review and project review teams as assigned.
- 4.3.7 Keep EM management informed of contractor actions within assigned Active Safety System area.
- 4.3.8 Ensure documents (e.g., drawings, calculations, applicable portions of documented hazard and accident analyses, and vendor manuals) that define the design basis for a system important to facility safety, are kept up to date using a formal work control process.
- 4.3.9 Ensure, where a facility design basis has not been clearly defined, the identification of system requirements, performance criteria, and documents considered to be essential to system operation. DOE-STD 3024-98 (Content of System Design Descriptions) provides guidance regarding the identification and consolidation of key design documents.
- 4.3.10 Ensure work control and change control processes are followed and also ensure regular assessments of the system are performed to confirm continued operational readiness.
- 4.3.11 Remain apprized of assigned active safety system operational status and ongoing maintenance and modification activities. Operational status includes material condition, system parameters, system performance and any actions to correct problems.

- 4.3.12 As appropriate, participate in budget reviews to ensure adequate funding is requested to maintain system operability and reliability.

4.4 Relationship between Facility Representatives and SSO Personnel

- 4.4.1 Facility Representatives perform oversight of their assigned facilities to ensure that the contractor operates facilities safely and effectively (i.e., within the boundaries of those controls invoked in the facility authorization basis), communicating system and facility status and operational performance information to EM management.
- 4.4.2 SSO personnel coordinate with Facility Representatives to ensure, and report to EM management, the operability of specific safety systems. SSO personnel focus on the details of safety system operability implementation while Facility Representatives focus on the integrated operational aspects of these systems and programs with respect to the overall operation of their assigned facilities.

5.0 PROCEDURE

DOE SSO personnel typically will be assigned based on engineering disciplines and necessary areas of coverage as defined by EM management. Thus, SSO personnel may be assigned to cover areas such as criticality alarms, fire detection and suppression, radiation alarms, and ventilation and mechanical systems.

EM is additionally staffed by Facility Representatives, who have day-to-day operational oversight responsibility for assigned facilities, and SMEs, who provide support for oversight of specific ES&H programs (e.g., Fire Protection, Criticality Safety, Radiation Protection, Facility Safety, etc.). The SSO personnel position are not meant to infringe on the duties of these two positions or of EM Program/Project personnel, but rather to enhance EM oversight and provide a focused view on certain specific systems. The Facility Representatives, SMEs, and SSO personnel will, on occasion, be required to simultaneously provide management with input on the same contractor operations. Coordination between individuals performing each of these functions will be necessary to avoid duplication and provide consistent input to EM management and to the contractor. The assigned SSO personnel will be expected to provide this coordination for issues involving the active safety systems to which they are assigned.

5.1 Programmatic Action Steps

- 5.1.1 Review the selection of "important to safety" structures, systems, and components with respect to classification and functionality and verify the accuracy and completeness of the contractors' Active Safety System List
- 5.1.2 Ensure that the Training Qualification requirements for SSO personnel assigned to EM systems are defined.
- 5.1.3 Recruit and assign SSO personnel based on established resource needs.
- 5.1.4 Ensure SSO personnel have competence commensurate with assigned responsibilities.

- 5.1.5 Perform periodic Safety System Oversight program self-assessments in accordance with EM-3.3, Integrated Assessment Program

5.2 Oversight Action Steps

- 5.2.1 Tailor the Safety System assessment criteria (Reference 3.1.8) for the identified active safety systems.
- 5.2.2 Perform reliability, availability, and maintainability reviews of assigned systems, including configuration and material condition.
- 5.2.3 Ensure that adequate numbers of qualified Contractor System Engineers have been assigned for the identified active safety systems
- 5.2.4 Ensure the training and qualifications of the Contractor System Engineers are commensurate with the systems to which they are assigned and are maintained up-to-date.
- 5.2.5 Ensure Contractor System Engineers are adequately involved with the operation, maintenance, and configuration of their systems and periodically observe the Contractor System Engineer in the performance of system condition walkdowns for assigned Active Safety Systems.

6.0 RECORDS

6.1 Program Records

- 6.1.1 Records generated as a result of implementation of this procedure may include, but are not limited to:
1. Assessment Plans
 2. Lines-of-Inquiry
 3. Attendance Sheets
 4. Assessment Reports
 5. Walkthrough Reports
 6. Corrective Action Plans
 7. Correspondence on changes to CAPs, including extensions and rejections
 8. Letters requesting Corrective Action Plans
 9. CAP approval letters
 10. Evidence files for corrective action closure
 11. Any other assessment correspondence
- 6.1.2 Records shall be maintained in accordance with the established ORO EM records management system.

7.0 ATTACHMENTS

- 7.1 Attachment 1** (from Reference 3.1.8)

CRITERIA AND APPROACH

The *Criteria and Approach* section is divided into topical areas: (1) safety function definition, (2) configuration management, (3) system maintenance, and (4) system surveillance and testing. Each of these topical areas includes:

- *Objective* describes the intent that the topical area should contribute to assessment of the safety system
- *Criteria* suggest characteristics of a system that should be verified
- *Approach* suggests collection of information needed to assess the condition of the system according to the criteria. The items in the *Approach* section are to guide the assessment team; however, the assessment team may choose to select another approach to meet assessment-specific needs.

For each topical area, the criteria and approach items are numbered for easy reference. The items under the *Approach* subsection are numbered such that the items can be readily linked back to the most applicable criterion (e.g., item number 2-1 under the Approach is most directly linked to Criterion 2). However, the evaluation of each criterion should consider all relevant information collected during the assessment (not only information related to the linked items).

The 2000-2 Phase I assessment or other reviews of the system being assessed may satisfy some of the objectives and criteria that follow. Previous reviews may also contain information relevant to this assessment, which can be cited and used in this assessment. In such situations, this assessment should be limited to objectives and criteria not covered in previous assessments and should not unnecessarily duplicate previous assessments.

Safety Function Definition

Objective:

Safety basis-related technical, functional, and performance requirements for the system are identified/defined in appropriate safety documents.

Criteria:

Safety/Authorization Basis documents identify and describe 1) the system safety functions and the safety functions of any essential supporting systems, and 2) the system requirements and performance criteria that the system must meet to accomplish its safety functions.

Approach:

Review the appropriate safety/authorization basis documents, such as safety analysis reports, basis for interim operations, technical safety requirements, safety evaluation reports, and hazards and accident analyses, to determine if the definition/description of the system safety functions includes:

- The specific role of the system in detecting, preventing, or mitigating analyzed events
- The associated conditions and assumptions concerning system performance
- Requirements and performance criteria for the system and its active components, including essential supporting systems, for normal, abnormal, and accident conditions relied upon in the hazard or accident analysis.

Configuration Management

Objective:

Changes to safety basis-related requirements, documents, and installed components are controlled.

Criteria:

1. Changes to system safety basis requirements, documents, and installed components are designed, reviewed, approved, implemented, tested, and documented in accordance with controlled procedures. Consistency is maintained among system requirements and performance criteria, installed system equipment and components, and associated documents as changes are made.
2. Limited technical walkdown of selected system components verifies that the actual physical configuration of these components conforms to documented design and safety basis documents for the system.
3. Changes to system safety basis requirements, documents, and installed components conform to the approved safety/authorization basis (safety envelope) for the facility, and the appropriate change approval authority is determined using the Unreviewed Safety Question (USQ) process.
4. Facility procedures ensure that changes to the system safety basis requirements, documents, and installed components are adequately integrated and coordinated with those organizations affected by the change.
5. Software used in system instrumentation and control (I&C) components that perform functions important to safety is subject to a software quality process consistent with 10 CFR 830.120.

Approach:

- 1-1 On a sample basis, review and evaluate the change control process and procedures and associated design change packages and work packages to determine whether the change control process and procedures are adequate and effectively implemented. Determine whether:
 - SSCs and documents affected by the change are identified
 - Changes are accurately described, reviewed and approved as appropriate
 - Installation instructions, post-modification testing instructions and acceptance criteria for turnover to facility operations are specified, and
 - Important documents affected by the change (e.g., operating and test procedures, Master Equipment List, etc.) are revised in a timely manner.

- 1-2 Interview a sample of cognizant line, engineering, QA managers and other personnel to verify their understanding of the change control process and commitment to manage changes affecting design and safety basis in a formal, disciplined and auditable manner.
- 2-1 Walkdown selected system components and compare the actual physical configuration of these components to system documents such as design basis and safety/authorization basis documents, system design descriptions, and system drawings such as piping and instrumentation diagrams. Identify any temporary changes, or configuration discrepancies that call into question (1) the operability or reliability of the system or (2) the adequacy of the change control or document control processes, including drawing revision, applied to the system.
- 3-1 Review documentation, such as change travelers and changes packages, and interview individuals responsible for processing selected changes made to the system requirements, installed equipment, and associated documents. Determine whether:
- Changes to the system are reviewed to ensure that system requirements and performance criteria are not affected in a manner that adversely impacts the ability of the system to perform its safety functions
 - The USQ process (i.e., USQ screens and USQ safety evaluations/ determinations) is being appropriately used
- 4-1 Determine whether engineering (including the design authority and technical disciplines for process control, electrical, mechanical, chemical, HVAC, nuclear, criticality, structural, etc.), operations, and maintenance organizations are made aware of system changes that affect them, and are appropriately involved in the change process. Verify integration and coordination with other organizations that could logically be affected by the change such as facility training, document control, construction, radiological control, OSHA occupational safety, industrial hygiene, occupational medicine, hazard analysis/safety basis, safeguards and security, and fire protection.
- 5-1 For software used by safety system I&C components, request the facility staff to identify:
- The applicable software quality assurance requirements,
 - The software quality assurance standards/controls applied to software development, procurement, acceptance, and testing
 - The basis for acceptance of these standards/controls as providing adequate assurance that the software is acceptable for performing its associated safety functions
- 5-2 Review software quality assurance requirements, procedures, and records. Determine whether:
- Software quality assurance documentation exists for software in use
 - Configuration management procedures exist for updates, changes, and version control of software and related documentation such as software design documents and a list of software configuration items installed on computer-based components
 - An appropriate degree of independence exists between those responsible for software development and quality assurance functions

- A process is in place and used to identify, evaluate, and resolve operational problems that are attributable to software
- 5-3 Interview facility engineering and operations staff to determine their awareness of software quality assurance requirements for system software under their cognizance.

System Maintenance

Objective:

The system is maintained in a condition that ensures its integrity, operability and reliability.

Criteria:

1. Maintenance processes consistent with the system safety classification are in place for prescribed corrective, preventive, and predictive maintenance, and to manage the maintenance backlog.
2. The system is periodically walked down in accordance with maintenance requirements to assess its material condition.

Approach:

- 1-1 Verify that maintenance for the system satisfies system requirements and performance criteria in safety basis documents or other local maintenance requirements.
[NOTE] The following approach statements 1-2 and 1-3 need to be reviewed only once for common site or facility-specific implementation of maintenance management processes or programs.
- 2-1 Evaluate maintenance of aging system equipment and components.
 - Determine whether there are criteria in place to accommodate aging-related system degradation that could affect system reliability or performance
 - Review the plans and schedules for monitoring, inspecting, replacing, or upgrading system components needed to maintain system integrity, including the technical basis for such plans and schedules
 - Determine whether maintenance source documents such as vendor manuals, industry standards, DOE Orders, and other requirements are used as technical bases for development of system maintenance work packages.
- 2-2 Verify that the system is inspected periodically according to maintenance requirements.
- 2-3 On a sample basis, perform a walkdown inspection of the system with emphasis on the material condition of installed equipment, components, and operating conditions. Identify and document any observed conditions that could challenge the ability of the system to perform its safety function (e.g., leaks, cracks, deterioration, or other degraded or abnormal conditions). Determine whether observed deficiencies have been identified and addressed in a facility condition assessment or deficiency tracking system.

- 2-4 Review system or component history files for selected system components for the past three years.
- Identify whether excessive component failure rates were identified.
 - Determine how failure rates were used in establishing priorities and schedules for maintenance or system improvement proposals.
- 2-5 Review the procedure and process for performing walk downs of the system. Verify through manager and worker interviews that personnel performing walk downs understand operational features, safety requirements and performance criteria for the system.

System Surveillance and Testing

Objective:

Surveillance and testing of the safety system demonstrates that it is capable of accomplishing its safety functions and continues to meet applicable system requirements and performance criteria.

Criteria:

1. Requirements for surveillance and testing are adequate for demonstrating overall system reliability and operability, and are linked to the technical safety basis.
2. Surveillance and test procedures confirm that key operating parameters for the overall system and its major components are maintained within operating limits.
3. Instrumentation and measurement and test equipment for the system are calibrated and maintained.

Approach:

- 1-1 Identify the acceptance criteria from the surveillance test procedures used to verify that the system is capable of performing its safety functions. Compare the acceptance criteria with the safety functions, functional requirements, performance criteria, assumptions and operating characteristics discussed in safety documents. Verify that there is a clear linkage between the test acceptance criteria and the safety documentation, and that the acceptance criteria are capable of confirming that safety/operability requirements are satisfied.
- 2-1 Review surveillance and testing procedures for the system's major components. Review a sample of the test results. Perform a walkthrough of the surveillance test procedure with appropriate facility personnel and verify:
 - Validity of test results
 - System performance meets system requirements
 - Performance criteria are appropriate for current facility mission life-cycle
 - Parameters that demonstrate compliance with the safety requirements can be measured
 - Test personnel are knowledgeable and able to satisfactorily perform the test
 - The procedure cites applicable Technical Safety Requirements/Limiting Conditions for Operation
 - Limits, precautions, system and test prerequisite conditions, data required, and acceptance criteria are included
 - Appropriate data recording provisions are included or referenced and are used to record results
 - The procedure includes provisions for listing discrepancies

- The procedure requires timely notification of facility management about any failure or discrepancy that could impact operability
- Appropriate personnel reviewed the test results and took appropriate action

3-1 For the surveillance and test procedures and records reviewed, determine whether the test equipment used for testing was calibrated.

REPORT FORMAT and CONTENT

The report is intended for the cognizant facility managers and DOE line management and should include the following sections. The report must conform to security requirements, be subject to classification review if needed, and should not contain classified information or UCNI.

1. **Title Page (Cover).** The cover and title page state the name of the site, facilities, and dates of assessments of one or more confinement ventilation systems (one report may cover a combination of assessments).
2. **Signature Page.** A signature page should be signed by all team members, signifying their agreement as to the report content and conclusions in the areas to which they were assigned. In the event all team member signatures cannot be obtained due to logistical considerations, the team leader should gain members' concurrence and sign for them.
3. **Table of Contents.** The table of contents should identify, with page numbers, all sections and subsections of the report, illustrations, charts, and appendices.
4. **Acronyms.**
5. **Introduction.** The introduction should provide information and background regarding the site, facility, system, team composition, methodology, and any definitions applicable to the review.
6. **Scope.** The physical boundaries the system(s) and supporting systems and equipment included in the assessment should be identified and documented in this section.
7. **Assessment Results.** State whether the assessment criteria are satisfied and describe any exceptions. Summarize opportunities for improvement, and include a qualitative conclusion regarding the ability of the system to perform its safety functions in its current condition and to remain reliable over the long term. Recommended actions may also be included. Note any topical areas that were not assessed and any limitations on the qualitative conclusion. Detailed discussion of results in each topical area that was assessed should be included as a separate attachment or appendix.

The assessment results should clearly state whether challenges to system operability/reliability due to age-related degradation were found to exist, and if so, if they were already known to exist with appropriate corrective actions identified and being implemented. The results should also address the adequacy of existing programs/processes to monitor, detect, correct, and prevent age-related degradation. Provide a qualitative assessment/judgment of the ability of the system to reliably perform its safety functions during its anticipated remaining operational service life. These results should be supported by the detailed results (item 9 below).

8. **Lessons Learned.** Identify lessons learned that may be applied to future reviews.

9. **Detailed Results.** In each topical area assessed, include enough detail to enable a knowledgeable individual to understand the specific results. As specified in the Implementation Plan, assessment results needing correction will be tracked either locally or in DOE-wide systems.

The suggested format for this section is as follows:

- Is the criterion met [Yes/No]
- How review was conducted [Include lists of documents reviewed, including any system software documentation and QA, and titles of persons interviewed]
- System operability issues or concerns
- Opportunities for improvement
- Recommended changes to criteria and guidance.

10. **Documents and References.** Title, number, revision and issue date as applicable.

11. **Biographies of Team Members.**