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ORNL/TM-10846/R1



**OAK RIDGE
NATIONAL
LABORATORY**

MARTIN MARIETTA

**Maintenance Management Department
Operational Safety Requirements
Program**

Revision 1
Supersedes ORNL/TM-10846

J. D. Blanton
A. J. Millet

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MARTIN MARIETTA ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

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ORNL/TM--10846/R1

DE91 008075

Instrumentation and Controls Division

**MAINTENANCE MANAGEMENT DEPARTMENT OPERATIONAL
SAFETY REQUIREMENTS PROGRAM**

Revision 1
Supersedes ORNL/TM-10846

J. D. Blanton
A. J. Millet

Date Published—January 1991

Prepared by the
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MARTIN MARIETTA ENERGY SYSTEMS, INC.
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U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

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DEFINITIONS OF TERMS USED IN THIS DOCUMENT

Nuclear facility. A facility where operations involve radioactive materials in such form and quantity that a significant nuclear hazard potentially exists to the employees or the general public. Included are facilities that (1) produce, process, or store radioactive gases, liquids, or solids, including fissionable materials or wastes; (2) conduct separations operations; (3) conduct irradiated materials inspection, fuel fabrication, decontamination, or recovery operations; or (4) conduct fuel-enrichment operations. Included is any apparatus that is designed or used to sustain nuclear chain reactions in a controlled manner, including critical and pulsed assemblies and research, test, and power reactors, both operational and shut-down. Although accelerators may be subject to this SPP, they are not defined as nuclear facilities. Incidental use of radioactive materials in a facility operation (e.g., check sources, radioactive sources, and X-ray machines) does not necessarily require the facility to be included in this definition.

Facility manager/supervisor. The facility manager/supervisor oversees all matters relating to the administrative and technical management of the nuclear facility and maintenance and/or modification of all building services and safety systems associated with the facility. He is also responsible for ensuring that all operations are performed in compliance with ORNL and Energy Systems policies and procedures.

Final Safety Analysis Report (FSAR). Safety document that systematically identifies the hazards associated with a facility; describes and analyzes the adequacy of the measures taken to eliminate, control, or mitigate identified hazards; and analyzes and evaluates potential accidents and their associated risks.

Health and Safety Review Committee(s). Standing review committee(s) or ad hoc committee(s) designated by a committee charter, the Oak Ridge National Laboratory (ORNL) director or deputy director, or the Office of Operational Readiness and Safety to review safety analyses, preliminary safety analysis reports, final safety analysis reports, and operational safety requirements, as well as conduct preoperative and periodic facility reviews. (Ad hoc committees appointed by the ORNL deputy director may perform special reviews.)

Instrumentation and Controls (I&C) and Plant and Equipment (P&E) divisions. Oak Ridge National Laboratory service organizations responsible for maintaining facility safety systems, components, and structures in accordance with established practices.

Maintenance Management Department (MMD). Department of the Instrumentation and Controls Division responsible for the maintenance and calibration of facility instruments and safety systems.

Office of Operational Readiness and Safety. Representatives of the Laboratory director and deputy director for facility safety. The manager of this office is designated as the Installation Facility Safety Manager (IFSM).

Operational Safety Requirements (OSRs). Requirements that define the conditions, safe boundaries, and administrative controls required to ensure safe operation of a facility. These requirements are based on analyses and commitments made in final safety analysis reports.

Preliminary Safety Analysis Report (PSAR). Safety document that identifies the basic safety systems and administrative controls required in facility design and operation. It establishes the functional criteria applied to these systems, documents an accident analysis that examines the behavior of the safety systems for all reasonable accident situations, and sets forth safety system concerns to be included in the quality assurance plan for each project. The level of detail shall be commensurate with the available design definition.

Quality Department. Department responsible for developing and documenting the planning and implementation of specific hardware surveillance programs required for each facility as requested by the operating division.

Safety Systems. Equipment and/or hardware that actively provides a safety function by preventing or mitigating accidents, thus ensuring that the operation of the facility shall not cause unacceptable risk to the safety and health of employees and the public.

Surveillance. Deliberate and systematic inspection, test, calibration, or check of equipment to verify continuing safe performance in accordance with established criteria.

Configuration Control. System to ensure that: functional and physical characteristics are documented for components, structures, and systems required for safety as identified in the Safety Analysis and Review Program; changes to required systems are identified, controlled, and approved by authorized persons; and identification process and change process are documented.

ABSTRACT

This document describes the requirements, procedures, and responsibilities of Instrumentation and Controls Division's Maintenance Management Department for instrument maintenance in nonreactor nuclear facilities at Oak Ridge National Laboratory (ORNL) that have operational safety requirements. Applicable U.S. Department of Energy, Martin Marietta Energy Systems, Inc., and ORNL procedures are referenced.

The objective of this document is to present a surveillance plan for nonreactor nuclear facility safety hardware, thereby fulfilling the requirements of the responsible facility manager. Scheduled maintenance and surveillance plans for components or systems as specified in the ORNL facility operational safety requirements are also addressed.

1. INTRODUCTION

This document describes requirements, procedures, and supervisory responsibilities of the Oak Ridge National Laboratory (ORNL) Instrumentation and Controls (I&C) Division's Maintenance Management Department (MMD) for instrument maintenance in nonreactor nuclear facilities that have identified operational safety requirements (OSRs). Implementation of these requirements and procedures shall comply with the requirements of U.S. Department of Energy (DOE) Order 5480.5 and DOE 5481.1B, Martin Marietta Energy Systems, Inc., Policy Procedure ESH-8, and ORNL SPP X-ESH-20, Safety Analysis and Review Programs.

2. OBJECTIVE

The objective of this document is to present an MMD surveillance plan for nonreactor nuclear facility safety hardware, thereby assisting the responsible facility manager in fulfilling the OSRs. This document outlines scheduled maintenance and surveillance procedures for components or systems as specified in OSRs.

3. REQUIREMENTS

The following requirements apply to each nonreactor nuclear facility as defined in Martin Marietta Energy Systems, Inc., Policy Procedure ESH-8, DOE Order 5480.5, and ORNL SPP X-ESH-20.

- a. When requested, MMD shall assist the facility manager in the development and review of OSRs.
- b. When requested by either the Quality Department or the facility manager, MMD shall assist the Quality Department in the development of a surveillance plan for facility hardware.
- c. MMD shall develop and document a scheduled maintenance surveillance plan for facility systems, components, and structures and assist the facility manager in implementing configuration/control programs.
- d. MMD shall ensure that department personnel are trained in generic operational safety topics and are trained in and aware of each facility's specific procedures and safety requirements. Personnel training shall be documented and records shall be retained on file as outlined in MMD's training manual, "ORNL Nonreactor Nuclear Facility Training Program for I&C Division Maintenance Personnel."

4. RESPONSIBILITIES

4.1 MAINTENANCE MANAGEMENT DEPARTMENT HEAD

The Department head shall be responsible for the following tasks.

- a. Review requests for service, ensure compliance with the OSR program described herein, review and approve revisions to this program, review and approve each MMD OSR facility plan, and implement draft OSRs as above when they become available to MMD.
- b. Obtain the OSR from the program manager or the facility manager and authorize preparation of an MMD OSR facility plan.
- c. Distribute copies of the OSR to the responsible general supervisors and OSR program coordinator.

4.2 MAINTENANCE MANAGEMENT DEPARTMENT OPERATIONAL SAFETY REQUIREMENTS PROGRAM COORDINATOR

The MMD OSR program coordinator shall be responsible for administration of the MMD OSR program and perform the following tasks.

- a. Act as liaison to the facility manager and the Office of Operational Readiness and Safety.
- b. Arrange training sessions for maintenance personnel working in or on nonreactor nuclear facilities.
- c. Ensure systematic documentation of instrumentation, training, and notices or memos concerning each facility.
- d. Annually review each MMD OSR facility plan with MMD supervisors involved with the facility and report the results of this review to the MMD head and appropriate facility supervisor.
- e. Biennially review the OSR program described herein.

4.3 GENERAL SUPERVISORS

Each MMD general supervisor shall be responsible for the following tasks.

- a. Receive from the MMD head copies of the OSRs and assign the OSRs to the responsible supervisors.
- b. Assist each responsible supervisor prepare that supervisor's MMD facility OSR plan.

- c. Ensure compliance with the OSR program described herein and compliance with each facility plan within the scope of that general supervisor's responsibility.

4.4 SUPERVISORS

MMD supervisors shall review the OSRs obtained from the general supervisors and ensure that the facility manager has documented provision of services such as instrument identification, maintenance, scheduling, and calibration. MMD supervisors shall interface with the facility manager to clarify maintenance requirements. Supervisors shall be responsible for the following actions.

- a. Assist the facility manager in identifying instruments, components, or systems requiring special labels and ensure proper labeling to maintain configuration control.
- b. Prepare lists of designated OSR Safety System instruments with information as required on the OSR Safety System Instrument Listing form (see Appendix A).
- c. Identify maintenance personnel working in or on a given facility and provide training as directed by this document.
- d. Place instruments in the MMD *Maintenance Information Data Acquisition System (MIDAS)*, Sect. 10, "Maintenance, Accountability, Jobs, and Inventory Control (MAJIC) System" (Ref. 1) recall system for surveillance, calibration, and preventive maintenance (PM), identifying them as safety or limiting-condition instruments in the MAJIC data base, and removing from MAJIC the OSR designation for any instrument no longer a component of an OSR system.
- e. Maintain documentation indicating special actions or procedures needed to maintain components or systems.
- f. Ensure that all work required by approved change notices originated by the facility manager, I&C Division, or appropriate engineering section has been performed and that copies of approved change notices are filed at the shop location and supplied to the MMD OSR coordinator.
- g. Supply the facility manager and MMD OSR coordinator written notification of interruptions in maintenance or calibration schedules.
- h. Maintain spare parts and a spare-parts list identifying each piece of safety system equipment and maintaining in storage an adequate identified inventory to meet maintenance requirements.
- i. Update MAJIC work requests to indicate instruments "on hold."
- j. Verify that all OSR identification labels have been removed from instruments that are no longer components of an OSR system.

5. PROCEDURES FOR DEVELOPING MAINTENANCE MANAGEMENT DEPARTMENT OPERATIONAL SAFETY REQUIREMENTS FACILITY PLANS

5.1 MAINTENANCE MANAGEMENT DEPARTMENT OPERATIONAL SAFETY REQUIREMENTS FACILITY PLANS

The purpose of an MMD OSR facility plan is to ensure compliance with all surveillance specifications of the facility OSRs. The facility plan shall contain the following items.

- a. Approval page. This page shall be signed by the responsible MMD and facility manager's representative(s) upon completion of all initial requirements (see Appendix A).
- b. Action check list. This list shall be initialed and dated by the MMD OSR coordinator upon verification of completion of required actions by responsible personnel (see Appendix A).
- c. OSR Safety System instrument listing. This listing shall include identification (ID) number, description, instrument location, maintenance information file point and location, spare parts location, set point(s) and/or limit(s), preventive maintenance, and calibration and associated alarm system(s) (see Appendix A).
- d. Attachments. The attachments shall contain special procedures, training documentation, OSR instrument listing, change notices, and other information as needed. (See Appendix A for examples of supplemental information.)

5.2 DOCUMENTATION

Procedures for documenting OSRs are listed below.

- a. Scope. A copy of the OSR as submitted by the facility manager shall be retained with the MMD OSR facility plans.
- b. OSR log. Each OSR document on file shall be logged and assigned a unique identifier as outlined in the "MMD Document Procedure Guide," Sect. 8.2, Numbering of Procedures, for MMD document numbering consistency. For example, in OSR log identifier MMD/AOSR1010:

"MMD" identifies the Maintenance Management Department;

"/A" indicates an administrative category;

"OSR" indicates OSR classification code;

"101" represents the first three digits (sequentially numbered beginning with 100), of which the second and third digits indicate the OSR number; those lower than 10 require a leading zero (e.g., "01" through "09" for "1" through "9"); and

"0" is the fourth (final) digit, which normally indicates the revision number or the status code (complete or incomplete); for OSRs, this digit is zero.

The given example (MMD/AOSR1010) indicates the unique identifier for OSR 01.

- c. **Distribution.** The MMD OSR coordinator shall distribute copies of MMD OSR facility plans and any change notices to responsible supervisors and the facility manager's representative(s).
- d. **Status report.** A summary of the current status of OSR facilities shall be maintained by the OSR coordinator.
- e. **Location.** Copies of OSRs, MMD OSR facility plans, OSR logs, status reports, and other pertinent information shall be filed in the office of the MMD head in Building 3500.

5.3 INSTRUMENT DESIGNATION AND LABELING

Identification and labeling of OSR instruments located in nonhazardous environments are described in Sects. 5.3.1 and 5.3.2. An alternate method of labeling instruments located in hazardous environments is described in Sect. 5.3.3. Under no circumstances shall information on OSR labels be marked over, marked out, or changed. When a change in information is required, the old label shall be removed and destroyed and a new label shall be completed and affixed to the instrument.

5.3.1 Operational Safety Requirement Safety System Instrument Labeling

Any instrument required by the facility OSR as a safety system item shall be designated an "OSR safety system instrument" and identified with a yellow label, Form UCN-15544 (Fig. 1a), displaying the ID number, date label is applied, and MMD OSR number. This label is printed on self-adhesive paper with a reasonably protective surface suitable for instruments located in nonhazardous environments.

5.3.2 Operational Safety Requirement Limiting-Condition Instrument Labeling

Any instrument that must be operable as a limiting condition of the facility operation shall be designated an "OSR instrument" and identified with a green label, Form UCN-15545 (Fig. 1b), displaying the ID number, date label is applied, and MMD OSR number. This label is printed on self-adhesive paper with a reasonably protective surface suitable for instruments located in nonhazardous environments.

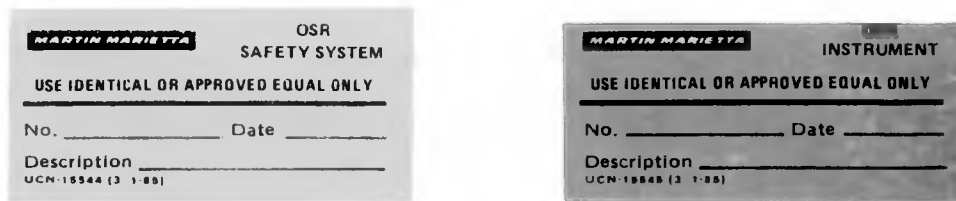


Fig. 1. Labels for Operational Safety Requirement (OSR) instruments located in nonhazardous environments are printed in black letters on paper with a protective surface. (a) OSR safety system limiting-condition instrument (yellow), Form UCN-15544; (b) OSR instrument (green), Form UCN-15545.

5.3.3 Operational Safety Requirements Safety System and Limiting-Condition Instruments in Hazardous Environments Labeling

This alternate method of labeling shall be used in lieu of labeling described in Sects. 5.3.1 and 5.3.2 on instruments located in hostile environments.

The label material shall be laminated plastic capable of withstanding all environmental hazards. Two label sizes are available. The physical size of the label shall be determined by instrument location and legibility requirements.

Labels used for OSR safety system instruments shall have a yellow background with black letters; labels used for OSR instruments (limiting condition) shall have a green background with white letters (Fig. 2).

Information on the label shall include the letters "OSR", "/" (slash), letter "S" or "R" (as indicated in Sect. 5.4) and two digits indicating the OSR number. Numbers below 10 require a leading zero (e.g., 01 through 09). Labels shown in Fig. 2 include examples of large and small (depending on legibility and location requirements) for both OSR safety system instruments and OSR instruments.

5.4 INSTRUMENT IDENTIFICATION IN THE MAINTENANCE ACCOUNTABILITY, JOBS, AND INVENTORY CONTROL (MAJIC) SYSTEM

Each instrument designated as an OSR safety system instrument or OSR instrument shall be identified in the MAJIC inventory by using Form UCN-10598 (Fig. 3). This information is entered in the field labeled "OSR" by using one of the following codes:

S00 to designate OSR safety system instrument or
R00 to designate OSR instrument.

The zeros represent the two digits required for the MMD OSR document number. Numbers lower than 10 require a leading zero (e.g., 01 through 09, but 10 through 99 for numbers higher than 9).

• OSR / S27 •

OSR / R27

• OSR/S27 •

OSR/R27

Fig. 2. Alternate labels used for instruments located in hostile environments are made of laminated plastic material to withstand all environmental hazards. (a) Yellow labels (large and small) with black lettering for Operational Safety Requirement safety system instruments. (b) Green labels (large and small) with white lettering for Operational Safety Requirement (limiting-condition) instruments.

I & C INSTRUMENT INVENTORY

☐ CHECK IF REVISION DATE

I. D. NO.		Description											
Mfr. Code		Model No.				Classification Code				F. P.			
Purchase Order		Cost New		Year	Division	ST.	Cat.						
Serial No.					Service Designation								
Maint. Document No.		ADP			OSR								
D-													
Range From	To	Units	CB Freq.	PM Freq.	Start Mo.	Est. Hr.							
Bldg.	Room	Custodian											
Remarks													
Remarks CB/ PM													

UCN-10598
(3 7-88)

Fig. 3. Instrumentation and Controls instrument inventory, Form UCN-10598.

5.5 HANDLING OF INSTRUMENTS "ON HOLD"

Instruments "on hold" are those awaiting parts to complete repair. The following requirements shall apply.

- a. The work request shall remain open until the instrument is repaired.
- b. Instruments "on hold" shall be identified in MAJIC with the appropriate delay code.
- c. A copy of the work request shall be affixed to the instrument.
- d. When parts are ordered on a purchase requisition specifically for an "on-hold" OSR instrument, the purchase requisition number shall be written on the work request.

5.6 REMOVAL OF INSTRUMENTS FROM OPERATIONAL SAFETY REQUIREMENTS SERVICE

5.6.1 No changes shall be made to a safety system without prior approval from the facility manager via an approved configuration control change request.

5.6.2 Each instrument removed from OSR service as a result of equipment upgrade, excessive maintenance, or changes to the OSR shall have all OSR identification (yellow or green label) removed. Additionally, MAJIC shall be immediately updated to indicate that these instruments are no longer components of an OSR system.

6. TRAINING

The MMD training manual, "ORNL Nonreactor Nuclear Facility Training Program for I&C Division Maintenance Personnel," was designed to meet the requirements of DOE Order 5480.5 and Martin Marietta Energy Systems, Inc., Policy Procedure ESH-8. This training program ensures that competent maintenance personnel are available to perform the work necessary to support nonreactor nuclear facilities at ORNL. Training for maintenance personnel is performed and documented for each operating facility. A copy of the documenting form, "Qualified Facility Maintenance Personnel (I&C)," is shown in Appendix A.

7. OPERATIONAL SAFETY REQUIREMENTS REVIEW PROCEDURES

MMD facility plans for nonreactor nuclear facilities are reviewed annually, consistent with the requirements of Martin Marietta Energy Systems, Inc., and DOE procedures.

7.1 FACILITY PLAN REVIEW OBJECTIVES

The objectives of the MMD OSR facility plan reviews are to ensure that

- a. changes in facility operation affecting MMD's responsibility are systematically and regularly identified;
- b. maintenance personnel working in or on the facility are regularly identified and trained as required by applicable DOE procedures and the MMD training program for nonreactor nuclear facilities;
- c. scheduled maintenance and surveillance plans are followed as outlined in the facility OSR; and
- d. proper documentation is maintained on file for each facility and all MMD personnel involved in that facility.

7.2 ANNUAL REVIEW RESPONSIBILITIES

MMD supervisors and the MMD OSR coordinator shall perform the activities outlined below.

7.2.1 Maintenance Management Department Supervisors

MMD supervisors shall

- a. identify MMD personnel working in or on the facilities;
- b. inventory OSR instruments and spares for approved markings (i.e., green or yellow labels as appropriate) and documentation;
- c. review maintenance procedures and access requirements with instrument technicians and engineering technologists;
- d. ensure proper documentation in MAJIC for OSR instruments, using I&C instrument inventory Form UCN-10598;
- e. supply written notification to the appropriate facility supervisor and the MMD OSR coordinator of interruptions in maintenance and calibration schedules; and

- f. provide documentation of listed actions to the MMD OSR coordinator, as outlined in the facility review notification.

7.2.2 Maintenance Management Department Operational Safety Requirements Coordinator

The MMD OSR coordinator shall

- a. ensure that the MMD OSR file in Building 3500 maintains copies of every OSR facility plan, facility review, training record, notice, and memorandum relating to OSR;
- b. interface with the facility manager, Office of Operational Readiness and Safety, and MMD personnel on any developments concerning OSR;
- c. review each facility plan and generate a facility review report based on current information;
- d. notify the appropriate facility manager of any needs for facility-specific training of MMD personnel;
- e. schedule reviews of OSR and facility plans with the general supervisors and maintenance supervisors; and
- f. inform MMD staff and appropriate facility manager upon completion of a facility review.

8. REFERENCE

1. C. T. Stansberry, S. M. Odom, and C. D. Martin, *Maintenance Information Data Acquisition System (MIDAS)*, ORNL/TM-11287/Rev. 1, Oak Ridge National Laboratory, Oak Ridge, Tenn., September 1989.

Appendix A

EXAMPLES OF FORMS USED FOR FACILITY PLAN PROCEDURES, MAINTENANCE PERSONNEL ASSIGNMENTS, AND INSTRUMENT LISTINGS

MAINTENANCE MANAGEMENT DEPARTMENT (MMD) OPERATIONAL
SAFETY REQUIREMENTS (OSR) FACILITY PLAN

OPERATIONAL SAFETY REQUIREMENTS PROCEDURES

for

Facility

Prepared by Maintenance Management Department

Instrumentation and Controls Division

Oak Ridge National Laboratory

Approved by: MMD department head, Instrumentation
and Controls Division

Date

Approved by: MMD/OSR coordinator, Instrumentation
and Controls Division

Date

Approved by: Facility manager

Date

**MAINTENANCE MANAGEMENT DEPARTMENT (MMD) OPERATIONAL
SAFETY REQUIREMENTS (OSR) FACILITY PLAN CHECK LIST**

Facility

<u>Action</u>	<u>Initials</u>	<u>Date</u>
1. OSR documentation received from the facility manager (department head)	_____	_____
2. Assign MMD OSR documentation number and initiate facility plan; open new facility file in Bldg. 3500 (coordinator)	_____	_____
3. Distribute OSR to responsible supervisor(s) for review (department head)	_____	_____
4. Review OSR with responsible supervisor(s) and facility manager (coordinator)	_____	_____
5. Identify facility instrumentation that will be designated critical; OSR/S safety system with a yellow label and OSR/R instruments with a green label (MMD supervisor ^a)	_____	_____
6. Prepare listing of designated OSR safety system instruments by identification number with pertinent information on instrument list ^b [supervisor(s)]	_____	_____
7. Identify and label spare parts associated with OSR safety systems on instrument list ^b [supervisor(s)]	_____	_____
8. Enter instruments into MAJIC for scheduled recall on calibration and preventive maintenance and identify as a safety-related instrument on instrument list ^b [supervisor(s)]	_____	_____
9. Provide guidance for action concerning any calibration or maintenance procedures unique to this OSR facility that are to be included in the MMD OSR facility plan [supervisor(s)]	_____	_____
10. Identify maintenance personnel working in or on the facility and provide training as directed in facility requirements and MMD maintenance procedures on instrument list ^b [supervisor(s)]	_____	_____
11. Submit final draft of facility plan for approval of MMD staff and facility manager (coordinator)	_____	_____

NOTE: Changes in procedures, instrumentation, or requirements should be brought to the attention of the MMD OSR coordinator.

^aIn collaboration with facility manager(s).

^bSample attached.

**QUALIFIED INSTRUMENTATION AND CONTROLS DIVISION
FACILITY MAINTENANCE PERSONNEL**

Facility _____

- A. The following maintenance personnel have been identified to perform maintenance and calibration on instruments at this facility. The following items have been addressed:
1. Technicians have received training in maintenance procedures for this facility.
 2. Technicians were observed performing actual maintenance and calibration on these or similar instruments.
 3. Technicians have been provided with names and locations of contact persons for this facility.
- B. Each signature below indicates that the technician has read the Operational Safety Requirements for this facility and is aware of instrument or system requirements.

<u>Technician signature</u>	<u>Badge number</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

_____ Maintenance Management Department supervisor	_____ Date
--	---------------

**MAINTENANCE MANAGEMENT DEPARTMENT (MMD)
OPERATIONAL SAFETY REQUIREMENTS (OSR) SAFETY SYSTEM
INSTRUMENT LISTING**
for _____

MMD OSR Number

Supervisor

Date

Identification number	Description	Instrument location	Maintenance information location (file point)	Parts location	Set-points limits	Calibration frequency	Preventive maintenance frequency	Associated alarms

INTERNAL DISTRIBUTION

- | | |
|---------------------|--------------------------------------|
| 1. J. F. Alexander | 19-22. D. R. Miller |
| 2. C. G. Allen | 23-34. A. J. Millet |
| 3. K. L. Allison | 35. D. G. Prater (QAS) |
| 4-5. J. D. Blanton | 36. R. T. Roseberry |
| 6. H. R. Brashear | 37. R. P. Rosenbaum |
| 7. R. H. Brown | 38. C. T. Stansberry |
| 8. B. L. Carpenter | 39. C. W. Tompkins |
| 9. T. E. Chambers | 40. R. A. Vines |
| 10. C. R. Cinnamon | 41. A. Zucker |
| 11. B. G. Eads | 42. ORNL QA Manager |
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