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ORNL Nuclear Reactor Qualification and Training Requirements for I&C Division Maintenance Personnel

C. T. Stansberry

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Instrumentation and Controls Division

ORNL NUCLEAR REACTOR QUALIFICATION AND TRAINING REQUIREMENTS FOR I&C DIVISION MAINTENANCE PERSONNEL

C. T. Stansberry

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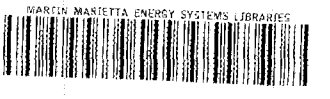

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ORNL NUCLEAR REACTOR QUALIFICATION AND TRAINING REQUIREMENTS FOR I&C MAINTENANCE PERSONNEL

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DEFINITIONS

The following definitions are applicable to this document:

Qualification and Certification:	Qualification indicates that an individual has met the requirements and management approval to perform work on nuclear reactor instrumentation.
Reactor Facility:	The reactor facility includes the reactor building and any auxiliary buildings providing some function in the operation of the reactor (e.g., electrical building, chemical treatment building, office building, etc.).
Nuclear Reactor:	A nuclear reactor 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.
Critical Experiments Facility:	The CEF is a special facility located at the Y-12 Plant at which shutdown margin tests are performed on new High Flux Isotope Reactor fuel elements. Because the facility is designed to perform both subcritical and critical experiments, it shall be considered a nuclear reactor.

ACRONYMS

ANS - American Nuclear Society
ANSI - American National Standards Institute
ALARA - As Low As Reasonably Achievable

BSR - Bulk Shielding Reactor

CAM - Constant Air Monitor
CEF - Critical Experiments Facility

DOE - U.S. Department of Energy
DOE-ORO - U.S. Department of Energy - Oak Ridge Operations
DOSAR - Dosimetry Application Research

FSAR - Final Safety Analysis Report
FEMA - Federal Emergency Management Agency
FRCAS - Facility Radiation and Contamination Alarm System

GED - General Education Development
GET - General Employee Training

HFIR - High Flux Isotope Reactor
HPRR - Health Physics Research Reactor

I&C - Instrumentation and Controls
INPO - Institute of Nuclear Power Operation

LITR - Low Intensity Test Reactor

MMD - Maintenance Management Department
MTR - Materials Testing Reactor

NRC - U.S. Nuclear Regulatory Commission

ORNL - Oak Ridge National Laboratory
ORR - Oak Ridge Research Reactor
OSR - Operational Safety Requirements

PCA - Pool Criticality Assembly
P&E - Plant and Equipment

QA - Quality Assurance

SAR - Safety Analysis Report

TRU - Transuranium
TSR - Tower Shielding Reactor

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This document is dedicated to the instrument technicians and maintenance supervisors who continuously perform routine and challenging assignments in an exemplary manner. Appreciation is extended to the I&C Publications and Information Processing Center for typing and to LaWanda Klobe and Susan Fisher for editing.

ABSTRACT

This document describes the qualification and training requirements for personnel of the Instrumentation and Controls Division (I&C) Maintenance Management Department (MMD) who perform maintenance activities on nuclear reactors at Oak Ridge National Laboratory (ORNL).

This document addresses requirements stipulated in DOE Order 5480.6 (Safety of DOE-Owned Reactors) which endorses ANSI/ANS 3.1, draft 10-80 (Selection, Qualification, and Training of Personnel for Nuclear Power Plants). The intent of this program is to comply with the DOE order as applicable to ORNL nuclear reactors.

1. INTRODUCTION

This document describes the qualification and training requirements for instrument maintenance personnel involved in modification, repair, and preventive maintenance of reactor systems instrumentation. ANSI/ANS Standard 3.1[1] has been used as a guide in developing requirements to support reactor operations at the Oak Ridge National Laboratory (ORNL). This document addresses applicable requirements of DOE Order 5480.6 (Safety of DOE-Owned Reactors).

2. OVERVIEW

The ORNL is operated by Martin Marietta Energy Systems, Inc., for the U.S. Department of Energy (DOE). The following reactors, used primarily for research, are included in this operation:

1. HFIR - High Flux Isotope Reactor
2. ORR - Oak Ridge Research Reactor
3. BSR - Bulk Shielding Reactor
4. TSR - Tower Shielding Reactor
5. HPRR - Health Physics Research Reactor
6. PCA - Pool Criticality Assembly
7. CEF - Critical Experiments Facility

The Instrumentation and Controls (I&C) Division is one of 29 divisions at ORNL. The Maintenance Management Department (MMD) is part of the I&C Division, having people in the Reactor Systems Maintenance and Engineering Support Group assigned to Reactor Instrumentation and Controls Maintenance (see the MMD Functional Organizational Chart for reactor maintenance, Appendix A). The MMD provides reactor I&C maintenance services at the request and direction of the Operations Division.

3. ASSIGNMENTS

The Category-A reactors (i.e., reactors having a steady-state power level of 20 MW or above) are operated on a 24-hours-per-day basis; the Category-B reactors (i.e., reactors operating below 20 MW) are normally operated only on the day shift. Maintenance shops are located in the HFIR, ORR, HPRR, and TSR; personnel are assigned coverage during the day

[1]American Nuclear Society, American Standards for Selection and Training of Nuclear Power Plant Personnel, ANSI/ANS, La Grange Park, Ill., Draft, October 1980, Standard 3.1 (Exclusive of those requirements dealing with power plant operation).

shift for all facilities. Work performed during other shifts is done upon request from the Operations Division. Additional I&C and MMD personnel have access to the reactor buildings to perform work on job-related activities.

4. POSITION CLASSIFICATIONS

4.1 DEPARTMENT HEAD

The department head assigns personnel responsibilities and ensures compliance with schedules and procedures. He/she reports to the division director.

4.2 GENERAL SUPERVISOR

The general supervisor assists the department head in recommendations for assignments of personnel and oversees the job performance of assigned personnel. He/she reports to the department head.

4.3 MAINTENANCE SUPERVISOR

The maintenance supervisor schedules and coordinates maintenance-type work with the Operations Division and the MMD of the I&C Division. The maintenance supervisors report to a general supervisor.

4.4 ENGINEERING TECHNOLOGIST

The engineering technologists assist maintenance personnel on technical matters relating to instrumentation and controls but do not perform repair of equipment. Engineering technologists report to the maintenance supervisor.

4.5 INSTRUMENT TECHNICIAN

The instrument technicians are responsible for performing repair, preventive maintenance, calibration, and related services on reactor instrumentation and controls. Instrument technicians report to the maintenance supervisor.

4.6 TRAINING COORDINATOR

The training coordinator, who is independent of the Reactor Systems and Engineering Support Group, coordinates all training for the MMD, is the liaison between other divisions and the department, and informs the training manager of DOE qualification and training requirements. The

training coordinator reports functionally to the department head. Normally, this individual will perform in dual capacity with other management functions.

4.7 TRAINING MANAGER

The training manager is responsible for implementing the reactor training as required in this document. He may instruct or utilize staff members of other ORNL divisions to assist as instructors. The training manager performs work in dual capacity with other supervisory or administrative assignments. The training manager reports functionally to the training coordinator.

4.8 INSTRUCTOR/EXAMINER

Instructors are individuals who have expertise in specialized fields and conduct classes upon request of the training manager. The instructor is the examiner for the subject being presented. The instructor/examiner, while serving in this capacity, reports functionally to the training manager.

4.9 OTHER I&C PERSONNEL

Other I&C personnel include any member of the department and/or I&C Division who must gain access to a reactor building to perform a job-related task.

5. POSITION QUALIFICATIONS

5.1 REQUIREMENTS

Position requirements, established through informal task analysis to guide selection of the reactor instrument maintenance personnel, are included in Appendix B. These requirements define the minimum levels required for each specified classification and include the following areas of consideration:

1. Education
2. Experience
3. Verification of qualification
4. Medical
5. Training
6. Responsibilities and duties

5.2 TRAINING

The following training categories and topics are selected to meet general and specific training requirements. Module outlines for reactor training topics are included in Appendix C.

Categories and topics include the following areas:

A. Access training (minimum building access)
B. ORNL General Employee Training (GET)
C. Reactor training (outlined in ANSI/ANS 3.1)
    1. Generic (pertaining to all reactors)
        a. Industrial hygiene
        b. Radiation protection
        c. Fire protection
        d. Security programs
        e. Quality assurance (QA)
    2. Site-specific (specific to each reactor)
        a. General description of plant and facility
        b. Job-related procedures and instructions
        c. Facility emergency plan
D. Technical training

5.3 EXAMINATION

An examination will be given following completion of each training module. The examination results will be used to determine the levels of comprehension and to diagnose areas in which additional training is needed. A minimum score of 70 will be considered as a passing grade. Module examinations must be signed and dated by the instructor and signed by the person taking the exam.

6. SCHEDULING

Initial training shall be completed in a two-year period. Annual retraining schedules will be adjusted to cover specific subjects biennially, except for the Facility Emergency Plan Module, which will be completed annually.

7. CERTIFICATION

Upon completion of the required training, a dated summary (see Qualification form, Appendix D) will be reviewed and approved by the directors of the Operations and I&C divisions and by the training coordinator and Department Head of the Maintenance Management Department, I&C. Recertification is required every two years.

8. DOCUMENTATION

The original examinations are kept in the personnel training files located in the MMD office. Copies of course outlines are kept in the training modules files in the MMD office. Appropriate forms are used to summarize and track progress. A copy of this document and other related material is on file in the MMD office under the heading "Reactor Training Program." Qualification forms are kept in the personnel training files.

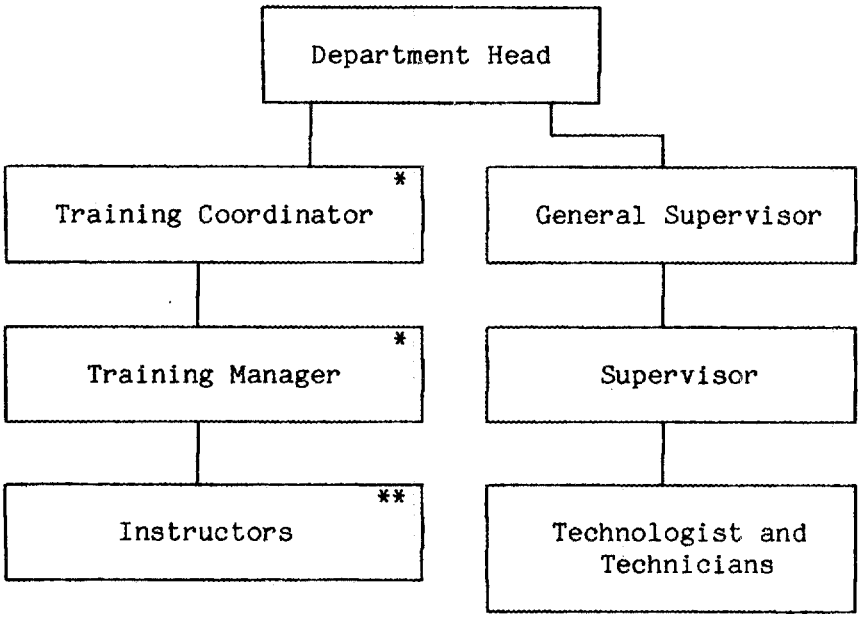
9. DEVIATIONS

Deviations from the procedures described in this document require individual consideration and the written approval of the department head and division directors. Temporary assignments to fill positions due to absences may be made, providing the personnel filling these positions shall be qualified, as a minimum to the next lower level.

APPENDIX A

FUNCTIONAL ORGANIZATIONAL CHART

Maintenance Management Department
Functional Organizational Chart
for Reactor Maintenance



*Dual capacity with other department functions.
**Instructors may be from other divisions.

APPENDIX B

POSITION TASK ANALYSIS

B.1 REACTOR INSTRUMENT MAINTENANCE SUPERVISOR

B.1.1 EDUCATION

Each maintenance supervisor shall have a high school diploma or equivalent. An acceptable equivalent is successful completion of the General Education Development (GED) test.

B.1.2 EXPERIENCE

At the time of appointment, an instrument supervisor shall have a minimum of four years' experience in the craft or discipline to be supervised; at least one year shall be nuclear reactor experience.

B.1.3 CERTIFICATION OF QUALIFICATION

The qualification of each maintenance supervisor shall be reviewed and approved by the directors of the I&C and Operations divisions at ORNL in compliance with this document (see Qualification form, Appendix D).

B.1.4 MEDICAL

In order to minimize the probability of accidents occurring at a reactor facility because of maintenance personnel health problems, the hire-in process, the initial qualification, and the requalification process shall be dependent on relatively stringent health assessments.

An individual invited to visit ORNL for a job interview shall be informed of the fact that a job offer will be contingent upon his/her health assessments. The ORNL medical section shall perform the physical examination during the stay of the interviewee and shall report the results to the MMD head prior to finalizing any job offer. Periodic health assessments shall be conducted by the ORNL medical section to ensure continued qualification. Health problems, which may result in temporary or permanent restrictions as reported by the ORNL medical section, shall be documented and submitted to the individual's supervisor. Health problems shall be reviewed by the MMD head, with the assistance of the director of the Health Division, to determine the limits and conditions of work assignments. Health restriction information shall be maintained in the division and department personnel records, located in the division director's and department head's offices.

B.1.5 TRAINING

Each candidate shall complete the following training:

1. access training for each reactor where work is to be supervised;
2. ORNL General Employee Training (GET);
3. reactor training as described in Appendix C; and
4. technical and management training as needed to perform the job requirements, to be determined by the training coordinator with approval of the department head.

B.1.6 RESPONSIBILITIES AND DUTIES

The supervisor shall be responsible for supervision of his assigned personnel and those support personnel loaned from other ORNL shops, in performing required maintenance or alterations to reactor experiments or controls. Each supervisor shall:

1. arrange for all work to be performed in an orderly and safe manner;
2. participate in all required training and retraining programs, safety meetings, drills, etc.;
3. correct or report any unsafe conditions or practices that may compromise the safety of personnel or equipment;
4. perform assigned tasks in accordance with established procedures, plans, and performance standards and not deviate from such without proper authorization;
5. maintain a high degree of familiarity with the tasks of assigned personnel;
6. maintain a practical knowledge of the limitations imposed on maintenance activities by operating conditions and other restrictions in and around the reactor facility; and
7. keep abreast of procedural changes, facility changes, emergency procedures, and unusual occurrences that could change operating conditions in the reactor and the reactor area.

B.2 ENGINEERING TECHNOLOGIST

B.2.1 EDUCATION

Each engineering technologist shall have completed advanced technical training in instrumentation above the requirements for instrument technician.

B.2.2 EXPERIENCE

Each engineering technologist shall have served as an instrument technician for at least three years or shall have at least five years of experience in instrumentation.

B.2.3 CERTIFICATION OF QUALIFICATIONS

The qualifications of each engineering technologist shall be reviewed and approved by the I&C and Operations division at ORNL in compliance with this document (see Qualification form, Appendix D).

B.2.4 MEDICAL

Refer to B.1.4 for medical statement.

B.2.5 TRAINING

Each engineering technologist assigned to assist in reactor maintenance shall complete the following training:

1. access training for each reactor where work is to be performed;
2. ORNL GET;
3. reactor training as described in Appendix C; and
4. technical training as needed to perform job functions, to be determined by the training coordinator with approval of the department head.

B.2.6 RESPONSIBILITIES AND DUTIES

The engineering technologist shall be responsible for technical assistance associated with instrument maintenance at an ORNL reactor and shall:

1. conduct all assigned tasks in an orderly and safe manner;
2. participate in all required training and retraining programs, safety meetings, drills, etc.;
3. report to the immediate supervisor any unsafe condition or practice that may compromise the safety of personnel or equipment at the facility;
4. perform assigned tasks in accordance with established procedures, plans, and performance standards and not deviate from such without proper authorizations;
5. maintain a high degree of familiarity with the job task to be performed, the emergency equipment, and the procedures; and
6. maintain a practical knowledge of the limitations imposed on instrument maintenance activities by operating conditions and other restrictions in and around the reactor facility.

B.3 REACTOR INSTRUMENT TECHNICIAN

B.3.1 EDUCATION

Each instrument technician shall be qualified at the journeyman level.

B.3.2 EXPERIENCE

Each instrument technician shall have at least three years' work experience in instrumentation.

B.3.3 CERTIFICATION OF QUALIFICATIONS

The qualifications of each instrument technician assigned to reactor maintenance shall be reviewed and approved by the I&C and Operations divisions in compliance with this document (see Qualification form, Appendix D).

B.3.4 MEDICAL

Refer to B.1.4 for medical statement.

B.3.5 TRAINING

Each candidate shall complete the following training:

1. access training for each building where work is to be performed;
2. ORNL GET;
3. reactor training as described in Appendix C; and
4. technical training as needed to perform job requirements, to be determined by the training coordinator with approval of the department head.

B.3.6 RESPONSIBILITIES AND DUTIES

The reactor instrument technician shall be responsible for performing job assignments associated with instrument maintenance at an ORNL reactor and shall:

1. conduct all assigned tasks in an orderly and safe manner;
2. participate in all required training and retraining programs, safety meetings, drills, etc.;
3. report to the immediate supervisor any unsafe condition or practice that may compromise the safety of personnel or equipment at the facility;

4. perform assigned tasks in accordance with established procedures, plans, and performance standards and not deviate from such without proper authorizations;
5. maintain a high degree of familiarity with the job task to be performed, the emergency equipment, and the procedures; and
6. maintain a practical knowledge of the limitations imposed on instrument maintenance activities by operating conditions and other restrictions in and around the reactor facility.

B.4 TRAINING COORDINATOR

B.4.1 EDUCATION

The training coordinator shall have a bachelor's degree in engineering or related science or equivalent practical background and shall have a practical working knowledge of federal (DOE and U.S. Nuclear Regulatory Commission) and ORNL requirements applicable to the qualifications of reactor maintenance personnel.

B.4.2 EXPERIENCE

The training coordinator shall have a minimum of two years of experience in developing and coordinating I&C Division training programs. He/she shall have a practical knowledge of all ORNL reactor facilities.

B.4.3 TRAINING

The training coordinator shall become familiar with the operation and literature (descriptive material, operations manuals, emergency manuals, technical specifications, etc.) for the I&C MMD activities at each ORNL reactor facility. He/she shall complete the ORNL GET program.

B.4.4 RESPONSIBILITIES AND DUTIES

The training coordinator is expected to:

1. assume the responsibility of keeping the training manager informed of the current DOE requirements applicable to the qualification and training of MMD personnel and inform management of any pertinent changes in policy;
2. review applicable DOE, NRC, Institute of Nuclear Power Operation, and American Nuclear Society documents in order to remain knowledgeable of current industry standards, requirements, and trends;
3. monitor the various training programs and report deficiencies to the MMD head and other concerned individuals;

4. suggest or originate improvements to the training programs as industry standards change;
5. attend periodic meetings, as required, to address the status of maintenance personnel training and/or learn new training methodologies and requirements;
6. assist in the preparation of certain written material regarding maintenance personnel training (e.g., the training programs, scenarios for various types of emergency drills, control manipulation, etc.);
7. be cognizant of the radiological and industrial safety programs and policies;
8. be cognizant of the QA requirements; and
9. maintain an approved version of this document.

B.5 TRAINING MANAGER

B.5.1 EDUCATION

The training manager shall have advanced training above the requirements for journeyman or related science.

B.5.2 EXPERIENCE

The training manager shall have a minimum of two years of experience as a maintenance supervisor or approved equal.

B.5.3 TRAINING

The training manager shall become familiar with the operation and literature (descriptive material, operations manuals, emergency manuals, technical specifications, etc.) for the I&C MMD activities at each ORNL reactor facility. He/she shall complete the ORNL GET program.

B.5.4 RESPONSIBILITIES AND DUTIES

Each training manager is expected to:

1. Evaluate the training of new reactor maintenance personnel assigned to an ORNL reactor facility in order to prepare them for the initial qualification;
2. oversee the training activities of I&C Reactor Personnel.
3. give lectures and/or schedule lectures by guest speakers on required subjects during the training and the requalification program;

4. monitor the progress of trainees in the program by reviewing written examinations and reporting results to the department head;
5. arrange a schedule with the instructor/examiner to conduct the module and examinations and to complete the necessary documentation indicating the completion of the training program;
6. maintain a liaison with the training coordinator to ensure proper flow of information regarding the status of training and retraining of personnel;
7. be cognizant of the radiological and industrial safety programs and policies;
8. be cognizant of QA requirements.

B.6 INSTRUCTOR/EXAMINER

B.6.1 EDUCATION

The instructor/examiner for the Reactor Maintenance Personnel Training shall have a bachelor's degree in the related module subject, or shall have a practical knowledge of the module subject being taught.

B.6.2 EXPERIENCE

The instructor/examiner shall have a minimum of three years of experience in the module subject being taught. The instructor/examiner shall have had some experience or training in preparing lesson plans, administering class work, and grading examinations.

B.6.3 TRAINING

The instructor/examiner shall become familiar with the literature (descriptive material, operations manual, emergency manuals, technical specifications, etc.) for the module being taught.

B.6.4 RESPONSIBILITIES AND DUTIES

The instructor/examiner is expected to:

1. prepare and administer lectures on the module subject being taught and evaluates examinations required for the qualification and requalification of reactor maintenance personnel at all ORNL reactor facilities, in accordance with the policies and procedures stipulated in this document;

2. recommend for qualification those candidates who have successfully completed the required training module to the MMD training manager;
3. maintain a high degree of knowledge of ORNL standards and requirements applicable to the module subject being taught;
4. arrange with the MMD training manager to schedule the module lecture and written examinations; and
5. prepare, administer, and grade all examinations for the qualification and requalification in accordance with the requirements stipulated in this document.

B.7 OTHER I&C PERSONNEL

Other I&C Division personnel must demonstrate a need for reactor building access and must qualify by completing the building access training or be escorted by a person who is qualified for building access. All I&C Division personnel must complete the ORNL GET program.

APPENDIX C

TRAINING MODULES

C.1 REACTOR ACCESS TRAINING

This training is required for access to the HFIR, ORR, and BSR/PCA as specified and directed by the Operations Division. A videotape program is shown covering emergency procedures, safety, security, and alarms for each of the above reactors. Information on each reactor must be covered separately. The Operations Division training coordinator for each site or his designated alternate must explain the "do's and don'ts" for accessing each reactor building and must complete the training session before he/she is allowed access to any of the buildings.

Access to each facility may be done without this training if an escort is present at all times. The MMD training coordinator is designated by the Operations Division as an alternate and may verify training.

C.2 ORNL GENERAL EMPLOYEE TRAINING

The ORNL General Employee Training (GET) program provides basic information in the following areas:

1. Emergency response
2. Radiation protection
3. Industrial hygiene
4. Occupational safety

All employees are required to view a videotape covering the above areas, complete a site-specific questionnaire, and verify completion with his/her supervisor's signature. Completed questionnaires are kept on file with the personnel training records in the MMD office.

The ORNL GET program is documented in the ORNL General Employee Reference Training Guide and is not addressed in this document. It covers training requirements for all ORNL employees and includes personnel whose work does not require either radiation work or training to prevent nuclear facility operating errors.

C.3 GENERAL DESCRIPTION OF PLANT AND FACILITY

C.3.1 OVERVIEW

This training module provides a general description of the facility and all associated systems and equipment. Live lectures using visual aids provide I&C Division craftsmen with a general orientation of the functions and purposes of the plant. Special emphasis is given those systems or equipment in which reactor safety and high levels of radiation or contamination are involved.

C.3.2 OBJECTIVES

The objective of this module is to provide the craftsman with sufficient orientation to perform his/her work safely and with a sense of mission and purpose, without direct supervision, but within the limitations of documented procedures.

C.3.3 OUTLINE

This outline of the general description of the plant and facility covers the following topics:

Subject	Duration (h)
Purpose of the facility	1.0
Radioisotope production	
Neutron diffraction	
Materials studies	
Medical isotope production	
Core components	0.5
Fuel	
Reflector	
Moderator	
Control rods	
Structural components	
Primary coolant system	0.5
Flow paths	
Heat removal	
Cleanup systems	
Secondary coolant system	0.5
Heat exchangers	
Cooling tower	
Flow paths	
Water treatment	
Pool coolant system	0.5
Flow paths	
Heat removal	
Cleanup system	
Shielding	
Reactor control system	1.0
Heat power	
Neutron detection	
Servo system	
Safety system	
Start-up system	
Experiment facilities	0.5
Beam tubes	
Hydraulic tube facility	
Material irradiation facilities	
Examination	0.5
Total	5.0

C.3.4 REQUIREMENTS

This module is site-specific and is required for each facility as a separate module. Actual duration may be adjusted to match the expertise of the participants. The instructor should represent the I&C or Operations division and be from the site to be covered.

C.4 JOB-RELATED PROCEDURES AND INSTRUCTIONS

C.4.1 OVERVIEW

This training module covers a series of topics dealing with I&C Division procedures. Other topics include special skills required for maintenance of specific types of equipment located in the reactor facility. Additional training in workmanship standards, soldering qualification, and instrument repair shall be performed and documented.

C.4.2 OBJECTIVES

This module will provide specific procedural direction and information about hands-on skills that will aid maintenance personnel in the performance of work on specific types of equipment located in the reactor facility.

C.4.3 OUTLINE

This outline of job-related procedures and instructions covers the following topics:

Subject	Duration (h)
Lockout procedures	1.0
Programmed maintenance	0.5
Controlled work	1.0
Programmable controllers	6.0
Work permits	0.25
Reactor principals, general design concepts and features of ORNL reactors	6.0
Detectors, controls, safety, and shutdown system concepts	6.0
Nuclear electronics, circuits, and operational description	6.0
AC power and coolant emergency system	6.0
Control logic	6.0
Wiring diagrams	6.0
Solid-state devices	6.0
Examination	1.5
Total	52.25

C.4.4 REQUIREMENTS

This module is site-specific and is required for each facility as a separate module. Actual duration may be adjusted to match the expertise of the participants. The instructor should be selected from the site to be covered by the training manager.

C.5 FACILITY EMERGENCY PLAN

C.5.1 OVERVIEW

This training module covers a series of topics concerning those systems and procedures that make up the specific facility emergency plan. Live lectures, including visual aids, will describe systems and procedures used to protect personnel and equipment.

C.5.3 OUTLINE

This outline of the facility emergency plan covers the following topics:

Subject	Duration (h)
Facility radiation-contamination alarm system	1.0
Constant air monitors	
Monitrons	
Control room monitoring	
Coincidence alarm and evacuation	
Building evacuation alarms	0.5
Facility Radiation and Contamination Alarm System (FRCAS) air horns	
Public address evacuation system	
Plant-wide alarms	
Evacuation procedures	0.5
Plant-wide evacuation	
Full-building evacuation	
Partial-building evacuation	
Area evacuation	
Fire alarm	0.5
Reactor building	
Cooling tower area	
Office building	
Trouble alarm	
Examination	0.5
Total	3.0

C.5.4 REQUIREMENTS

This module is site-specific and is required for each facility as a separate module. Actual duration may be adjusted to match the expertise of the participants. The instructor should represent the I&C or Operations division and be from the site to be covered.

C.6 INDUSTRIAL HYGIENE

C.6.1 OVERVIEW

This module includes a series of topics that comprise a training program for personnel required to do specific tasks and perform work on equipment that may result in various chemical and physical stresses. The basic information provided will apply generally to all employees, and specific information will apply to special situations.

C.6.2 OBJECTIVES

The training program is an integral aspect of the overall employee health objective. Employee training and indoctrination are necessary to ensure that all operations are conducted so as to maintain a working environment free from excessive levels of health hazards.

C.6.3 OUTLINE

This outline concerning industrial hygiene covers the following topics:

Subject	Duration (h)
Basic health hazard awareness (risk factors)	0.5
Hearing conservation	0.3
Respiratory protection equipment	0.5
Handling of solvents, lubricants, etc.	0.2
Personal protective equipment	0.3
ORNL industrial hygiene standard practice procedure	0.2
Examination	0.5
Total	2.5

C.6.4 REQUIREMENTS

This module applies generically to all reactors. Completion of this module for any facility fulfills the requirements for additional facilities. Actual duration may be adjusted to match the expertise of the participants. The instructor should represent the Industrial Hygiene Department, Health Division.

C.7 RADIATION PROTECTION

C.7.1 OVERVIEW

This training is composed of a series of radiation protection topics covered in live lectures and by demonstrations and visual aids. It will be presented to I&C Division craftsmen who are required to perform maintenance on nuclear reactor instrumentation. Topics include fundamental and regulatory information related to radiation safety.

C.7.2 OBJECTIVES

This module will provide basic information that will increase the understanding of radiation protection for craftsmen who are required to perform work in radiation and contamination zones. Information about regulations (zoning and dose limits) will also be provided.

C.7.3 OUTLINE

This outline on radiation protection covers the following topics:

Subject	Duration (h)
Radiation types	0.75
Radiation units	0.75
Zoning	0.25
Radiation limits	0.75
Radiation detection instruments	1.00
Facility-specific information	2.00
ALARA program	0.25
Risk factors	0.50
Examination	0.50
Total	6.75

C.7.4 REQUIREMENTS

This module applies generically to all reactors. Completion of this module for any facility fulfills the requirements for additional facilities. Actual duration may be adjusted to match the expertise of the participants. Instructors should be representatives of the Environmental and Occupational Safety Division.

C.8 FIRE PROTECTION

C.8.1 OVERVIEW

This training module covers a series of lecture topics and includes demonstrations and hands-on training sessions.

C.8.2 OBJECTIVES

The goal of this module is to train reactor maintenance personnel in the basic procedures to handle a fire or a related emergency.

C.8.3 OUTLINE

This outline on fire protection covers the following topics:

Subject	Duration (h)
Reporting a fire (fire alarm box, telephone 911, etc.)	.25
Fire extinguishers and standpipe hose	.50
Emergency egress (search and rescue)	.25
Self-contained breathing apparatus	.50
Examination	.50
Total	2.00

C.8.4 REQUIREMENTS

This module applies generically to all reactors. Completion of this module for any facility fulfills the requirements for additional facilities. Actual duration may be adjusted to match the expertise of the participants. Instructors should be representatives of the Laboratory Protection Division.

C.9 REACTOR SECURITY

C.9.1 OVERVIEW

This module covers a series of lecture topics and includes demonstrations and hands-on training sessions dealing with the security of reactor facilities.

C.9.2 OBJECTIVES

The goal of this module is to familiarize maintenance personnel with security procedures for the protection of nuclear reactor facilities.

C.9.3 OUTLINE

This outline on reactor security covers the following topics:

Subject	Duration (h)
Security	
Access restrictions	.25
Secure areas	.25
Security incident reporting	.25
Response force interactions	.25
Examination	.50
Total	1.50

C.9.4 REQUIREMENTS

This module applies generically to all reactors. Completion of this module for any facility fulfills the requirements for additional facilities. Actual duration may be adjusted to match the expertise of the participants. Variations for each site are included. Instructors should be representatives of the Laboratory Protection Division.

C.10 QUALITY ASSURANCE

C.10.1 OVERVIEW

This module consists of a series of topics for training I&C Division maintenance personnel in QA. The number of topics covered will depend on specific job assignments, determined by the training coordinator.

C.10.2 OBJECTIVES

The goal of this module is to ensure that, on each work assignment to the I&C Division MMD, specific materials are obtained and work is performed in accordance with specified QA procedures.

C.10.3 OUTLINE

This outline on QA covers the following topics:

Subject	Duration (h)
QA program	.50
QA procedures	.50
QA program planning	.50
Training and motivation	.25
Reports and appraisals	.25
Organization and responsibilities	
QA program organization	.50
QA coordinators	.25
Quality assurance and inspection controls system, instrumentation, and calibration	.25
Design control	.25
Procurement document control	.50
Instruction, procedures, and drawings	
Design, procurement, manufacturing, and construction phases	.50
Operations phase	.50
Maintenance phase	
Document control	.50
Control of purchased materials, equipment, and services	.50
Identification and control of materials, parts, and components	.50
Control of special processes	.50
Inspection	.50
Test control	.50
Control of measuring and test equipment	.50
Handling, storage, and shipping	.25
Inspection, test, and operating status	.25
Nonconforming items	.50
Failure analysis and corrective action	.50
Quality records	.50
Audits, reviews, and appraisals	
ORNL internal audits	.25
Division internal audits	.25
Controlled-manufacturing program audits	.25
Audits of nuclear reactor operations	.25
Supplier audits	.25
DOE-ORO appraisals	.25
Examination	1.00
Total	12.75

C.10.4 REQUIREMENTS

This module applies generically to all reactors. Completion of this module for any facility fulfills the requirements for additional facilities. Actual duration may be adjusted to match the expertise of the participants. The instructor is selected from QA coordinators.

APPENDIX D

QUALIFICATION FORMS

D.1 QUALIFICATION FORM

Instrumentation and Controls Division
Maintenance Management Department
for
Reactor Maintenance

NAME _____ EMPLOYEE NO. _____

FACILITY _____ JOB CLASSIFICATION _____

TRAINING SUMMARY

Subject	Date Completed
General Description of Plant and Facility[1]	
Job-Related Procedures and Instructions[1]	
Facility Emergency Plan[1]	
Radiation Protection[1]	
Industrial Hygiene[2]	
Fire Protection[2]	
Security Program[2]	
Quality Assurance[2]	
Reactor Access Training[3]	
ORNL General Employee Training[4]	

[1]Site-specific - Specifically for the above named facility.
[2]Generic - Applicable to any facility.
[3]As required for facility access.
[4]Required by all employees.

The above named person has met education and experience requirements and has completed the required training for this facility.

_____ _____ _____ _____
MMD Training Coordinator Date MMD Department Head Date

_____ _____
I&C Division Operations Division Director

D.2 REACTOR ACCESS TRAINING FORM
(Supplied by the Operations Division)

(This applies to all personnel, i.e., secretaries, technicians, engineers, maintenance personnel, etc., working at any ORNL reactor complex, as applicable to the particular facility.)

Please follow these simple "DOs" and "DON'Ts" when working in any security and/or regulated areas at a reactor complex.

DOs

1. Wear badges in plain view.
2. Hand badges to the guard for check when entering a security area.
3. Wear all required radiation detectors
4. Call the supervisor in the control building on off shifts (4-12, 12-8, weekends, and/or holidays).
5. Be aware of those operational procedures requiring Health Physics coverage and/or assistance.
6. Be aware of the requirements and/or procedures for Contamination Zones, Radiation Zones, Radiation Work Permits, and Do Not Operate Tags.
7. Be aware of the Health Physics requirements for transferring, shipping, and/or disposing of radioactive materials.
8. Be observant of arrows on the walls or floor indicating building evacuation routes and know the evacuation procedure, assembly areas, and signals (call 4-4462).
9. If any loud, continuous alarm should sound while in a reactor building, evacuate the building to the outside assembly area and/or follow the instructions given over the public-address system.

DOs (continued)

11. Inform the supervisor in the control room if you accidentally drop something into a reactor pool or accidentally touch some of the equipment in a contamination zone.
12. Report all spills of contaminated materials to the Reactor Supervisor.

DONT's

1. Don't allow anyone but yourself to use your badge for building access. (Everyone is required to run his/her badge through the reader, even if the door is open.)
2. Don't hold automatic security doors open for anyone unless you remain an escort.
3. Don't enter a building if the magenta lights on the building are flashing.
4. Don't go into any roped-off or barricaded areas.
5. Don't enter the reactor control room if not on official business.
6. Don't walk in any water/wet areas.
7. Don't step on any paper, plastic, or any other items on the floor.
8. Don't handle any tools, equipment, casks, etc., that should be used only by the reactor operators.

DOs	DOs (continued)
10. Be aware of the location of certain emergency equipment and/or alarm actuators.	9. Don't drop anything into the pool or put your hand in the water.

This material has been covered by the Training Coordinator, his designated alternate, or escort.

Training Coordinator, Supervisor, or Escort	Date	Person to be working at reactor (print and sign name)	Date
Division, if other than Operations	Badge No.	Division	Badge No.
Reason for access	Facility	Access approved by:	Date

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