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OAK RIDGE NATIONAL LABORATORY

MARTIN MARIETTA

ORNL Reactor Maintenance Personnel Training Program

R. J. Lauer

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

Printed in the United States of America. Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road, Springfield, Virginia 22161
NTIS price codes—Printed Copy: A04; Microfiche A01

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Plant and Equipment Division

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R. J. Lauer

October 1986

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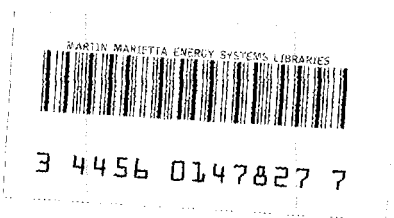
U.S. DEPARTMENT OF ENERGY
under
Contract No. DE-AC05-84OR21400



PLANT AND EQUIPMENT DIVISION

ORNL REACTOR MAINTENANCE PERSONNEL TRAINING PROGRAM

R. J. LAUER

OCTOBER 1986

APPROVED BY:

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CONTENTS

ABSTRACT

This document contains the policies and practices of the Oak Ridge National Laboratory (ORNL) regarding the selection of and the training requirements for nuclear reactor maintenance personnel at ORNL. It describes the training programs that ensure that ORNL's research reactors are maintained by qualified personnel, and its contents apply to candidates for either initial qualification or requalification. This document also contains a position task analysis of the reactor maintenance personnel and addresses the various qualification, training, testing, and requalification requirements stipulated in DOE Order 5480.1A, Chap. VI "Safety of DOE-Owned Reactors." The document is intended to be in compliance with this DOE order as it applies to ORNL nuclear reactors. Finally, this document also includes an example of the documentation which is made available to program auditors.

ACKNOWLEDGMENTS

My sincerest appreciation is extended to the following people for their involvement in the review and approval of this document: G. H. Burger, R. M. Farnham, S. Garrett, Jr., J. M. Meredith, G. W. Oliphant, D. N. Smith, and W. H. Tabor.

A very special thanks is extended to W. H. Culbert and K. H. Poteet for their recommendations and their overall contribution to the review, editing, and approval of this document; to Vickie Bunch for her secretarial and editing work; to S. E. Hamblen for his assistance in computer word processing; and to Scott Buechler for his assistance in the final editing and publication of the document.

R. J. Lauer

DEFINITIONS

Qualification	The formal process by which Oak Ridge National Laboratory's (ORNL's) upper management reviews and approves an individual's qualifications to conduct or perform maintenance activities (1) at an ORNL reactor and/or (2) on the controls of a reactor's auxiliary systems.
Reactor facility	The reactor, the reactor building, and any auxiliary buildings that provide some function in the operation of the reactor (e.g., electrical building, chemical treatment building, office building, etc.).
Nuclear reactor	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.
General Employee Training Program	A documented training program that covers training requirements for all ORNL employees, including personnel whose work does not require training in radiation hazards or the prevention of nuclear facility operating errors. This training is designed to increase employee awareness of general plant hazards and to outline procedural controls and protective measures used to combat these hazards.
Division Safety Officer	An individual who represents the Plant and Equipment (P&E) Division Director in the coordination and administration of a comprehensive and effective safety and health program. The primary objective of the position is to ensure a safe and healthy work environment for P&E employees.
Radiation Control Officer	An individual who represents the P&E Division Director in the coordination and administration of a comprehensive and effective radiation safety and control program. The primary objective of the position is to ensure the implementation of ORNL's radiation safety and control program in the P&E work environment.

ACRONYMS

ANS	American Nuclear Society
ANSI	American National Standards Institute
ALARA	As Low As Reasonably Achievable
BSR	Bulk Shielding Reactor
DOE	U.S. Department of Energy
DOE-ORO	U.S. Department of Energy–Oak Ridge Operations
FRCAS	Facility Radiation and Contamination Alarm Systems
GED	General Education Development
HFIR	High Flux Isotope Reactor
HPRR	Health Physics Research Reactor
INPO	Institute of Nuclear Power Operation
NRC	U.S. Nuclear Regulatory Commission
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Research Reactor
P&E	Plant and Equipment
PCA	Pool Critical Assembly
QA	Quality Assurance
TSF	Tower Shielding Facility

1. INTRODUCTION AND APPLICATION

The type of equipment used and the nature of the work performed at a nuclear reactor are unique and therefore subject to requirements far beyond those of more conventional industries. Of primary importance are those requirements pertaining to the qualifications and training of personnel, whether the facility is a large nuclear power plant or a small research reactor. This importance applies regardless of whether the facility is under the jurisdiction of the Nuclear Regulatory Commission (NRC) or the Department of Energy (DOE). This document deals with the selection, training, qualification, and requalification of nuclear-reactor maintenance personnel in the Research Services Department of the Plant and Equipment (P&E) Division at Oak Ridge National Laboratory (ORNL).

Oak Ridge National Laboratory, operated by Martin Marietta Energy Systems, Inc., for DOE, has six research reactors, for which the P&E Division provides maintenance and support personnel:

1. High Flux Isotope Reactor (HFIR),
2. Oak Ridge Research Reactor (ORR),
3. Bulk Shielding Reactor (BSR),
4. Tower Shielding Facility (TSF),
5. Health Physics Research Reactor (HPRR), and
6. Pool Critical Assembly (PCA).

The qualifications and training requirements for personnel involved in the actual modification, repair, and routine maintenance of reactor systems are addressed in DOE Order 5480.1A Chap. VI ("Safety of DOE-Owned Reactors") and are further outlined in ANSI/ANS Standard 3.1.[1] The training program described herein is designed to meet these requirements and to ensure that qualified maintenance personnel are available to perform the necessary work to support reactor operations at ORNL. This document supercedes the existing *ORNL Reactor Maintenance Personnel Training Program* manual co-authored by R. J. DeBakker, V.A. Emert, and P.W. Hembree, June 3, 1982.

2. OVERVIEW OF THE PLANT AND EQUIPMENT DIVISION

2.1 ORGANIZATION

ORNL is a unique DOE research facility. Over 40% of the 5500 employees have college degrees; there are nearly 900 scientists with Ph.Ds and nearly the equivalent number of visiting scientists using the ORNL research facilities.

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[1]American National Standards Institute/American Nuclear Society Standards for Selection, Qualification and Training of Nuclear Power Plant Personnel ANSI/ANS, 3.1, draft Oct. 1980.

The P&E Division, in which over 700 persons are employed, is one among 29 divisions at ORNL. (Refer to the Plant and Equipment Division Organization Charts in Appendix A.) The Research Services Department, within the P&E Division, has about 50 employees who are required to be qualified as Reactor Maintenance Personnel.

2.2. MAINTENANCE PERSONNEL AT THE ORNL REACTOR FACILITIES

2.2.1 Introduction

Category-A reactors (i.e., reactors having a steady-state power level of 20 MW or above) are operated on a 24-h/day basis; Category-B reactors (i.e., reactors operating below 20 MW) are normally operated only on the day shift. The Research Services Department has assigned to all Category-A facilities a maintenance crew that normally consists of a Field Engineer, a Maintenance Supervisor, and the appropriate craftspersons (e.g., electricians, millwrights, pipefitters, and a welder). The maintenance personnel are on duty Monday through Friday on the day shift. A full-time maintenance crew is not normally assigned to Category-B facilities; however, maintenance support is provided by Research Services Department maintenance personnel. Personnel from other P&E departments have access to the reactor buildings to perform other job-related activities. All personnel having access to a reactor building are required to undergo the General Employee Training Program.

2.2.2 Research Services Department Area Manager

The Area Manager is directly responsible for the safe performance of the P&E maintenance personnel at ORNL facilities; he/she reports to the Division Director through the Research Services Department Superintendent. This position is the highest level of upper management in which qualification through the Reactor Maintenance Personnel Training Program shall be required; the General Employee Training Program is also required.

2.2.3 Field Engineer

The Field Engineer is responsible for performing certain engineering and technical tasks and/or for serving as a technical advisor at a reactor facility. Field Engineers must be qualified through the Reactor Maintenance Personnel Training Program.

2.2.4 Maintenance Supervisor

A Maintenance Supervisor schedules and coordinates reactor maintenance work with the Operations and P&E personnel. The supervisor must be qualified as stated in the position task analysis (Appendix A). The Maintenance Supervisors—one for each facility—report to a Research Services Area Manager.

2.2.5 Maintenance Crafts Personnel

The P&E personnel are responsible for performing periodic and corrective maintenance on reactor components such as motors, electrical systems, piping, etc. This group, which includes welders, pipefitters, lead burners, millwrights, riggers, painters, carpenters, and others, reports to a P&E supervisor. All P&E personnel have their own specialized training/qualification programs and are also required to undergo General Employee Training for program reactor-facility access. The maintenance crafts personnel assigned to a nuclear reactor are qualified by successfully completing the ORNL Reactor Maintenance Personnel Training Program.

2.2.6 Training Coordinator

The Training Coordinator directs the entire P&E Reactor Maintenance Training Program and informs the Training Manager of the DOE training requirements, industry standards, and other training-related matters. He/she reports to the P&E Division Director. The Training Coordinator is not required to be qualified by the ORNL Reactor Maintenance Personnel Training Program. Training applicable to ANSI/ANS Standard 3.1 Sects. 5.3 and 5.3.2 is discussed in Sect. A.5.3 below. Holding a dual-capacity job, the Training Coordinator will normally be a P&E Division Manager, also.

2.2.7 Training Manager

The Training Manager is responsible for implementing the Reactor Maintenance Personnel Training Program. He/she may utilize staff members of other ORNL divisions to assist as instructors. Training applicable to ANSI/ANS Standard 3.1 Sects. 5.3 and 5.3.1 is discussed in Sect. A.6.3 below. In his/her dual-capacity position, the Training Manager is also a Research Services Department Area Manager.

2.2.8 Instructor/Examiner

Instructors have expertise in specialized fields and conduct classes by request of the Training Manager. All instructors are required to be qualified by formal education and experience in the subjects they are presenting. The instructor will also be the examiner for the subject presented.

3. POSITION TASK ANALYSES

Position task analyses were performed to guide the selection, qualification, and training of the reactor maintenance supervisors and the reactor maintenance mechanics. These analyses define the levels of education, experience, and training and the medical qualification required for the performance of electrical and mechanical maintenance tasks at ORNL. They also establish the basis for training. (See Appendix A.)

4. QUALIFICATION TRAINING TOPICS

Qualification training topics were selected as suggested in ANSI/ANS Standard 3.1 and were developed and outlined by specialists in each field. The seven module outlines for training included in Appendix B relate to the following subjects:

- General Description of the Plant and Facility
- Job-Related Procedures and Instructions
- Radiation Protection Training
- Station Emergency Plan
- Industrial Hygiene
- Fire Protection and Security Program
- Quality Assurance

Additional topics will be identified and developed as required.

5. RETRAINING AND REQUALIFICATION

Following completion of each training module, an examination will be given. The examination results will be used to determine the levels of comprehension and to diagnose areas in which retraining is needed.

Topics for retraining and requalification will be identified, developed, and implemented annually. The schedule will be adjusted so that all topics will be covered biennially.

6. DOCUMENTATION

Personnel records will be maintained to document the qualifications and training status of each reactor maintenance supervisor and each reactor maintenance craftsperson. The suggested form in Appendix D (Form D.1) will be used for tracking individual progress in the total program of training and retraining.

Successful completion of the programs by trainees will be indicated by signatures of the P&E training manager, the directors of the P&E and Operations divisions, and the Operations Division Reactor Operations Section Head. A copy of the document will be placed in the trainee's personnel file and in the division personnel-training file. The Operations Division maintenance managers will be provided an up-to-date list of qualified reactor maintenance supervisors and mechanics.

APPENDIX A

POSITION TASK ANALYSES

A.1 POSITION TASK ANALYSIS FOR RESEARCH SERVICES AREA MANAGER

A.1.1 Education

The Research Services Area Manager shall have a bachelor's degree in engineering or a related science.

A.1.2 Experience

The Research Services Area Manager shall have a minimum of two years' experience in managing maintenance personnel, of which one year shall be at a nuclear reactor facility.

A.1.3 Training

The Research Services Area Manager shall have specialized training for management-level personnel in the ORNL organization. This training should be in Energy Systems policies, responsibilities of management personnel, funding and manpower requirements, human relations, etc. He/she should have successfully completed the ORNL Reactor Maintenance Personnel Training Program and the General Employee Training Program applicable to employees working at the nuclear facility.

A.1.4 Responsibilities and Duties

The Research Services Area Manager shall:

1. Coordinate and direct all maintenance personnel activities at the reactor facility which is in his/her area and ensure that the maintenance is performed in a safe and reliable manner and in accordance with Energy Systems, ORNL, P&E Division, and DOE guidelines and/or procedures.
2. Maintain a practical knowledge of all Energy Systems and DOE regulations addressing nuclear reactors and the qualification requirements for maintenance personnel.
3. Evaluate manpower and funding needs and take the necessary actions to ensure continued, efficient maintenance of the facility.
4. Maintain proper communication between reactor operating personnel, experimenters, maintenance supervisors, and crafts personnel as applicable to maintenance performed on reactor systems.
5. Attend division staff meetings and conduct department meetings to keep abreast of new information, policy changes, etc. and to disseminate pertinent information to his/her staff.

6. Ensure that radiological and industrial safety standards are acknowledged and adhered to.
7. Evaluate and disseminate safety-oriented literature received from DOE or from other sources outside ORNL so that maintenance personnel at the ORNL facilities are made aware of changes in industry standards, failures at other facilities, etc.
8. Be actively involved in the selection, hiring, and qualification process of reactor maintenance personnel.
9. Review all qualification and requalification examinations prepared by the examiner for reactor maintenance personnel candidates.
10. Review any special cases involving deviations from an established policy pertaining to the selection, training, and/or qualification of reactor maintenance personnel.
11. Monitor periodically the quality of the work performed by individuals in the various groups reporting to him/her and effect changes as needed to ensure that each group is functioning in a safe and reliable manner and is accomplishing intended goals and objectives.
12. Maintain a list of maintenance personnel qualified to perform work on the reactor facility.
13. Implement the division-approved training plan for reactor maintenance personnel.
14. Implement the quality assurance program established by the Operations Division Director.

A.2 POSITION TASK ANALYSIS FOR RESEARCH REACTOR FIELD ENGINEER

A.2.1 Education

Each Field Engineer shall have a bachelor's degree in engineering or a related science or the equivalent in experience.

A.2.2 Experience

Each Field Engineer shall have one year of experience at one or more of the ORNL reactor facilities.

A.2.3 Training

Each Field Engineer shall complete the Reactor Maintenance Training Program and the General Employee Training Program.

A.2.4 Responsibilities and Duties

Each Field Engineer shall:

1. Assume responsibility for special engineering projects, as applicable to the fabrication, cost estimates, procedures, data collection, maintenance of records and prints, etc., needed to initiate and complete assigned projects.

2. Conduct, schedule, and/or attend meetings with experimenters, Reactor Operations personnel, and other ORNL personnel to plan new projects, evaluate proposed conceptual designs/modifications of experiments and reactor components from all conceivable safety standpoints, schedule work, analyze data, and resolve overall engineering problems.
3. Provide the necessary expertise needed at any of the ORNL reactor facilities that may be required to evaluate and/or mitigate core damage or minimize the possibility of excessive radiation exposure of on-site and off-site personnel.
4. Supply certain technical assistance and/or information to persons within or outside of the ORNL organization, as requested.
5. Prepare and/or edit routine technical reports resulting from special investigations and/or research projects.
6. Maintain technical surveillance over the progress of fabrication by service/craft personnel and report inadequacies to his/her supervisor.
7. Maintain proper communications with crafts personnel, experimenters, Reactor Operations personnel, and other ORNL personnel as needed to achieve the intended project goals.
8. Remain cognizant of the facility's special requirements (e.g., technical specifications, emergency/evacuation procedures, radiological and industrial safety policies, etc.).
9. Assume responsibility for QA (as designated) and perform QA reviews, inspections/audits, etc., in accordance with the Energy Systems Quality Assurance Program and ANSI/ASME NQA-1 (Quality Assurance Program for Nuclear Reactor Facilities), as applicable to ORNL operations.

A.3 POSITION TASK ANALYSIS FOR REACTOR MAINTENANCE SUPERVISOR

A.3.1 Education

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

A.3.2 Experience

At the time of appointment, a supervisor shall have a minimum of four years of experience in any one of the crafts or disciplines to be supervised, of which one year shall be nuclear reactor experience. Three months of on-site experience shall be required.

A.3.3 Training

Each Reactor Maintenance Supervisor shall complete the Reactor Maintenance Personnel Training Program and the General Employee Training Program at ORNL.

A.3.4 Documentation of Qualification

The qualification of each Reactor Maintenance Supervisor trainee shall be documented by the directors of the P&E and Operations divisions at ORNL in accordance with the requirements outlined in ANSI/ANS Standard 3.1, Sect. 4.3.2.

A.3.5 Medical

In order to minimize the probability of accidents occurring at a reactor facility as a result of maintenance personnel having health problems, the hiring process and the initial qualification process shall depend on a relatively stringent pre-employment health assessment. 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 assessment. The ORNL Health Division will perform the physical examination during the stay of the interviewee and shall report the results to the appropriate P&E Division Department Superintendent before any job offer is finalized.

Periodic health assessments are to be conducted by the ORNL Health Division to ensure continued qualification.

Health problems that may result in temporary or permanent restrictions issued by the ORNL Health Division shall be documented and submitted to the individual's supervisor. Individuals developing more serious health problems will be reviewed by the P&E Division Director or his/her representative and the Director of the Health Division to determine whether that individual should or should not be allowed to perform maintenance activities at a reactor facility. The P&E Division Safety Officer shall maintain a current file of all the P&E Division's personnel medical restrictions.

A.3.6 Responsibilities and Duties

The Reactor Maintenance Supervisor shall be responsible for supervision of his assigned crew and those support personnel loaned from other ORNL crews in performing required maintenance or alterations to ORNL reactor components and experimental equipment installed in or around an ORNL reactor. Each Reactor Maintenance Supervisor shall:

1. Arrange for all work to be conducted 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 them without proper authorization.

5. Maintain a high degree of familiarity with emergency equipment and procedures.
6. Maintain a practical knowledge of limitations imposed on maintenance activities by operating conditions and other restrictions in and around the reactor facility.
7. Keep abreast of procedural changes, facility changes, and unusual occurrences that could change operating conditions of the reactor.

A.3.7 Substitute Reactor Maintenance Supervisor Requirements

A Substitute Reactor Maintenance Supervisor shall meet the same general requirements of experience, training, and medical qualifications as outlined in Sects. A.3.1 through A.3.5 with the exception of having supervised one year at a nuclear reactor. A Substitute Reactor Maintenance Supervisor performs his/her duties under the close cooperative guidance of the Reactor Operations Supervisor and the P&E Division Area Manager. All maintenance personnel are required to have completed general employee training applicable for reactor facility access. The General Employee Training Program ensures that personnel assigned temporarily to a reactor facility will have sufficient knowledge of potential hazards at this facility and that they are trained in the reactor facility emergency procedures.

A.3.8 Waiver of Requirements

If an individual fails to meet any of the general requirements of Sect. A.3.7 but can demonstrate to the satisfaction of the P&E Division Area Manager that he/she has adequate capacity to perform the required supervisory duties, the P&E Area Manager may recommend a waiver of any portion of the requirements listed above. Final approval of the waiver must be contingent upon agreement to the waiver by the appropriate P&E Department Superintendent and the Reactor Operations Supervisor.

A.4 POSITION TASK ANALYSIS FOR REACTOR MAINTENANCE CRAFTS PERSONNEL

A.4.1 Education

Reactor Maintenance Crafts Personnel shall be qualified at the journeyman level and shall have a high school diploma or equivalent. An acceptable equivalent is successful completion of the GED test.

A.4.2 Experience

Each candidate shall have three years of work experience in one or more crafts.

A.4.3 Training

Each candidate shall complete the Reactor Maintenance Training Program and the General Employee Training Program at ORNL.

A.4.4 Documentation of Qualification

The qualification of each Reactor Maintenance Crafts trainee shall be documented by the directors of the P&E and Operations divisions at ORNL in accordance with the requirements outlined in ANSI/ANS Standard 3.1, Sect. 4.5.3.

A.4.5 Medical

In order to minimize the probability of accidents occurring at a reactor facility as a result of maintenance personnel having health problems, the hiring process shall be dependent on a relatively stringent pre-employment health assessment. 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 assessment. The ORNL Health Division shall perform the physical examination and report the results to the P&E Division Department Superintendent before any job offer is finalized.

Periodic health assessments are to be conducted by the ORNL Health Division to ensure continued qualification.

Health problems that may result in temporary or permanent restrictions issued by the ORNL Health Division shall be documented and submitted to the individual's supervisor. Individuals developing more serious health problems will be reviewed by the P&E Division Director or his/her representative and the Director of the Health Division to determine whether that individual should or should not be allowed to perform maintenance activities at a reactor facility. The P&E Division Safety Officer shall maintain a current file of all the P&E Division's personnel medical restrictions.

A.4.6 Responsibilities and Duties

Reactor Maintenance Crafts Personnel shall be responsible for performing job assignments associated with the maintenance of 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 authorization.
5. Maintain a high degree of familiarity with emergency equipment and procedures.
6. Maintain a practical knowledge of limitations imposed on maintenance activities by operating conditions and other restrictions in and around the reactor facility.

A.4.7 Substitute Reactor Maintenance Crafts Personnel Requirements

Substitute Reactor Maintenance Crafts Personnel shall meet the same general requirements of experience, training, and medical qualifications as outlined in Sects A.4.1 through A.4.5. Substitute Reactor Maintenance Crafts Personnel shall perform their duties under the close general supervision of the Reactor Maintenance Supervisor. All maintenance personnel are required to have completed general employee training applicable for reactor facility access. The General Employee Training Program ensures that personnel assigned temporarily to a reactor facility will have sufficient knowledge of potential hazards at this facility and that they are trained in the reactor facility emergency procedures.

A.4.8 Waiver of Requirements

If a candidate fails to meet any of the specified minimum requirements of Sect. A.4.7 but can demonstrate to the satisfaction of the P&E Division Area Manager that he/she has adequate capacity to perform the required maintenance activities, the P&E Area Manager may recommend a waiver of any portion of the requirements listed above. Final approval of the waiver must be contingent upon agreement to the waiver by the appropriate P&E Department Superintendent and the Reactor Operations Supervisor.

A.5 POSITION TASK ANALYSIS FOR TRAINING COORDINATOR*

A.5.1 Education

The Training Coordinator shall have a bachelor's degree in engineering or a related science or the equivalent in experience and have a practical working knowledge of federal (DOE and NRC) and ORNL requirements applicable to the qualifications of reactor maintenance personnel.

A.5.2 Experience

The Training Coordinator shall have a minimum of five years of experience in developing and coordinating P&E Division training programs. He/she should have a practical knowledge of all ORNL reactor facilities.

*This is a dual-capacity job assignment; normally the Training Coordinator is a P&E manager.

A.5.3 Training

The Training Coordinator shall become familiar with the operation and literature (descriptive material, operations manuals, etc.) for the P&E maintenance activities at each ORNL reactor facility. He/she shall successfully complete the General Employee Training Program. Training shall be provided to compensate for deficiencies identified by comparing an individual's experience and knowledge with the Position Task Analysis.

A.5.4 Responsibilities and Duties

The Training Coordinator shall:

1. Assume the responsibility of keeping the Training Managers of each of the P&E Division departments informed of the current DOE requirements applicable to the qualification and training of P&E personnel and also keep them informed of any pertinent changes in policy as they become known.
2. Review certain DOE, NRC, INPO, and ANSI/ANS documents to remain aware of current industry standards, requirements, and trends.
3. Monitor the various training programs and report deficiencies to the P&E Division Director and other concerned individuals.
4. Suggest or originate improvements to the training programs as industry standards change. (Approval from the appropriate managers listed on the approval page of this document shall be required prior to effecting any significant changes to the training plan.)
5. Attend periodic meetings, as required, to address the status of maintenance personnel training and/or to 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 relevant radiological and industrial safety programs and policies.
8. Be cognizant of QA requirements.
9. Be cognizant of and abide by established performance standards.

A.6 POSITION TASK ANALYSIS FOR TRAINING MANAGER*

A.6.1 Education

The Training Manager shall have a bachelor's degree in engineering or a related science or the equivalent in experience.

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*This is a dual-capacity job assignment; the Training Manager may also serve as a Plant and Equipment Manager.

A.6.2 Experience

The Training Manager shall have four years of professional experience and a minimum of two years of experience as a Reactor Maintenance Manager. During the two years he/she shall have participated in the maintenance or training activities at an ORNL reactor facility.

A.6.3. Training

The Training Manager shall have completed the ORNL Reactor Maintenance Personnel Training Program and the General Employee Training Program. Training shall be provided by comparing an individual's experience and knowledge to the Position Task Analysis.

A.6.4 Responsibilities and Duties

Each Training Manager shall:

1. Supervise the training of new reactor maintenance personnel assigned to an ORNL reactor facility to prepare them for the initial qualification.
2. Oversee the training activities and ensure the safety of all trainees during the initial training period.
3. Give lectures and/or schedule lectures by guest speakers on required subjects during the training program and the requalification program.
4. Monitor the progress of trainees in the program by reviewing written examinations and by reporting results to the Research Services Department Superintendent. Recommendations regarding the need for continued training or transfer from a reactor maintenance crew shall be given to the Research Services Department Superintendent.
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 a proper flow of information regarding the status of training and retraining of personnel.
7. Be cognizant of relevant radiological and industrial safety programs and policies.
8. Be cognizant of and abide by established performance standards.
9. Be cognizant of QA requirements.

A.7 POSITION TASK ANALYSIS FOR INSTRUCTOR/EXAMINER

A.7.1 Education

The Instructor/Examiner for the Reactor Maintenance Personnel Training Program shall have a bachelor's degree in the related module subject or shall have the expert knowledge of the module subject being taught.

A.7.2 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, administering, and grading examinations.

A.7.3 Training

The Instructor/Examiner shall be familiar with the literature (descriptive material, operations manual, emergency manuals, technical specificiations, etc.) for the module being taught. The Instructor/Examiner shall have completed the General Employee Training Program.

A.7.4 Responsibilities and Duties

The Instructor/Examiner shall:

1. Prepare and administer lectures on the module subject being taught, and evaluate examinations required for the qualification and requalification of reactor maintenance crafts 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 P&E Division Training Manager.
3. Remain up to date on ORNL standards and requirements applicable to the module subject being taught.
4. Assist the P&E Training Manager in preparing the schedule for the module lecture and written examinations.
5. Prepare, administer, and grade all examinations for the qualification and requalification of candidates in accordance with the requirements stipulated in this training-plan document.

A.8 Organization Charts

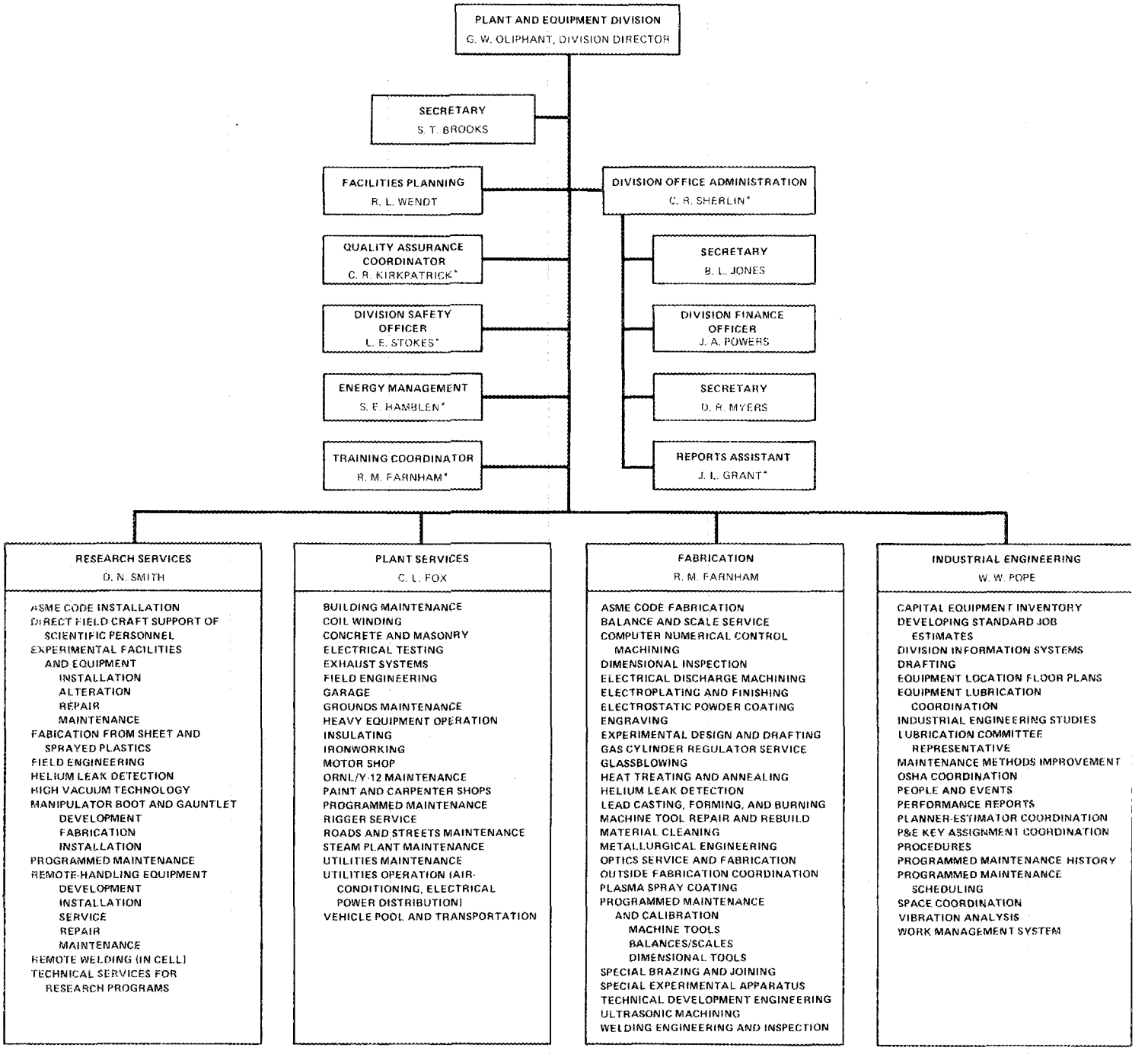

Fig. A.1. Plant and Equipment Division Organization Chart.

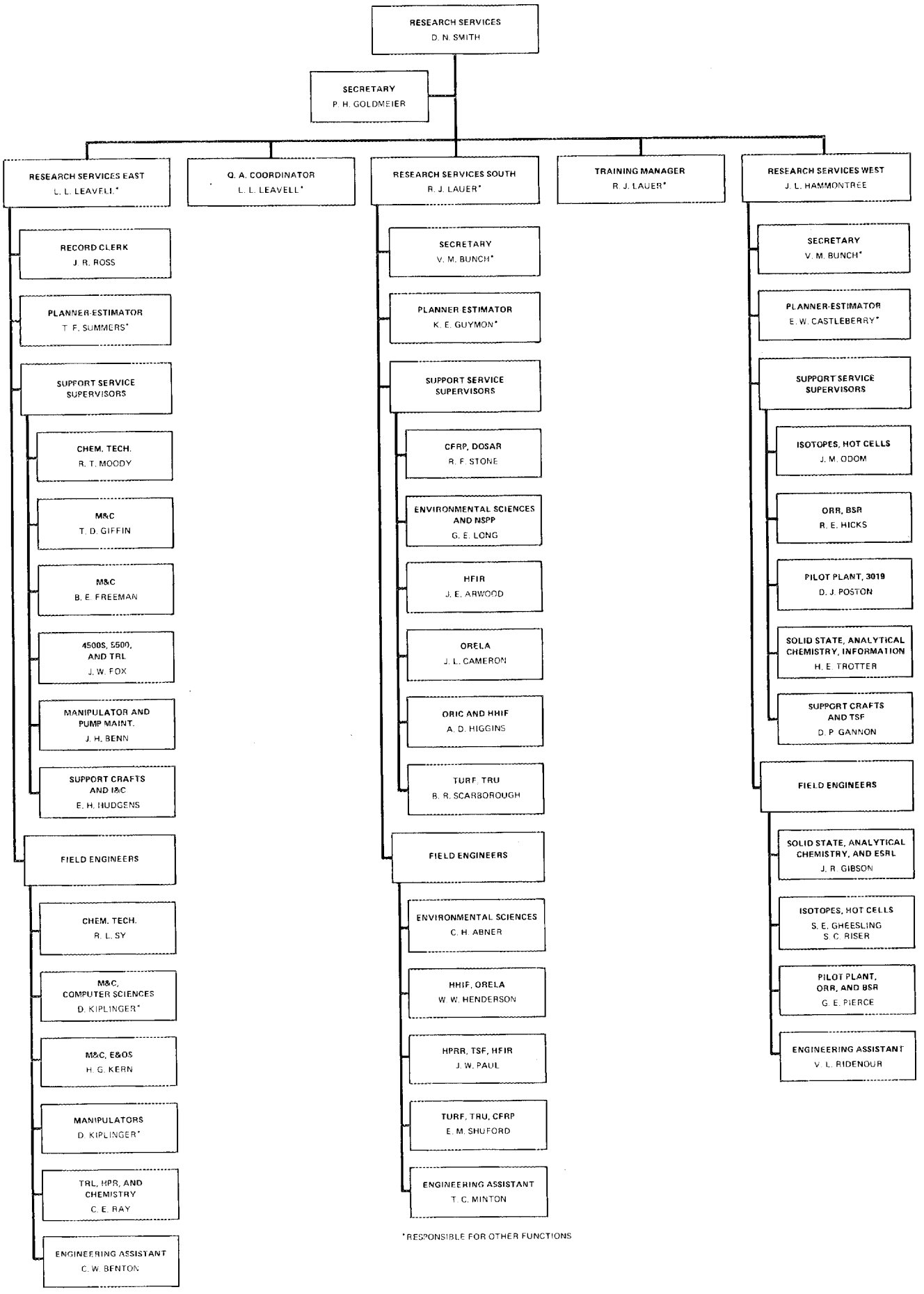

Fig. A.2. Research Services Organization Chart.

APPENDIX B

TRAINING MODULES

B.1 GENERAL DESCRIPTION OF PLANT AND FACILITY MODULE

The training module consists of a series of topics concerning the general description of the facility and all the associated systems and equipment. An Operations Division Reactor Supervisor shall conduct live lectures using visual aids to orient craftspersons of the P&E Division in a general way to the functions and purposes of the plant. Special emphasis is given to systems or equipment in which reactor safety and high levels of radiation or contamination are involved.

B.1.1 Objectives

The objective of this module is to sufficiently orient the craftsperson to perform his/her work safely, with a sense of mission and purpose, and without direct supervision.

B.1.2 Module Content by Topics

Modules will include the following topics:

- Purpose of the facility
- Core components
- Primary coolant system
- Secondary coolant system
- Pool coolant system
- Reactor control system
- Experimental facilities
- Building utility systems

B.2 JOB-RELATED PROCEDURES AND INSTRUCTIONS MODULE

This training section comprises a series of topics dealing with P&E Division procedures. Other topics include special skills required for maintenance of specific types of equipment located in the reactor facility.

B.2.1 Objectives

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

B.2.2 Module Content by Topics

Modules will include the following topics related to division procedures:

- Lockout procedures
- Programmed maintenance
- Controlled work (quality assurance)
- Asbestos
- Liquid waste handling and disposal
- Inspecting and testing electrical safety equipment
- Safety work permits
- Reactor rod drives
- Primary and secondary water pumps
- Reactor pool cleanliness
- Reactor cooling towers

B.3 RADIATION PROTECTION TRAINING MODULE

This training module is composed of a series of radiation protection topics presented through live lectures, demonstrations, and visual aids. It will be presented to P&E Division craftspersons who are required to perform maintenance on reactor and reactor-associated components. Topics may contain fundamental and regulatory information related to radiation safety. Time allotted will be limited to one training day (in fragmented sessions).

B.3.1 Objectives

This module will provide fundamental information that will increase the understanding of radiation protection in crafts personnel who are required to perform work in radiation and contamination zones. An understanding of regulations (zoning and radiation dose limits) will also be achieved.

B.3.2 Module Content by Topics

Modules will include the following topics:

- Radiation types
- Radiation units
- Zoning
- Radiation dose limits
- Radiation detection instruments
- Facility-specific information
- ALARA program
- Risk factors

B.4 STATION EMERGENCY PLAN MODULE

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

B.4.1 Objectives

The objective of this module is to make crafts personnel aware of their responsibilities during emergencies and the functions of various other groups for which craftspersons have primary responsibility.

B.4.2 Module Content by Topics

Modules will include the following topics:

- Facility radiation-contamination alarm system
- Building evacuation alarms
- Fire alarms
- Evacuation procedures

B.5 INDUSTRIAL HYGIENE MODULE

This module contains a series of topics appropriate to training programs for maintenance personnel required to do specific tasks and to work on equipment in which they may encounter various chemical and physical stresses. The fundamental information provided will apply generally to all employees, and specific information will apply to special situations.

B.5.1 Objectives

The training program is integral to our overall employee health objective. Employee training and indoctrination are necessary to ensure that all operations are conducted in a manner that ensures a working environment that is free from excessive levels of health hazards.

B.5.2 Module Content by Topics

Modules will include the following topics:

- Basic health hazard awareness (risk factors)
- Hearing conservation
- Respiratory protection equipment

- Handling of solvents, lubricants, etc.
- Personal protective equipment
- ORNL industrial hygiene procedures

B.6 FIRE PROTECTION AND SECURITY PROGRAM MODULE

This training module is composed of a series of lecture topics, demonstrations, and hands-on training sessions. Fire protection and security have been combined in this module. Presentation will require about 2 h.

B.6.1 Objectives

The goals of this module are to train reactor maintenance personnel in the basic procedures of handling a fire or related emergencies and to familiarize them with security procedures pertinent to normal and emergency conditions.

B.6.2 Module Content by Topics

Modules will include the following topics:

Fire prevention

- Reporting a fire (using fire alarm box, telephoning 911, etc.)
- Fire extinguishers and standpipe hose
- Emergency egress (search and rescue)
- Self-contained breathing apparatus

Security

- Access restrictions
- Secure areas
- Security incident reporting
- Response force interactions

B.7 QUALITY ASSURANCE MODULE

This module comprises a series of topics for training P&E Division personnel in quality assurance. The number of topics covered will depend on specific job assignments.

B.7.1 Objectives

The goal of this module is to ensure that on each work assignment to the P&E Division specific materials are obtained and work is performed in accordance with the quality, safety, and reliability considerations established for reactor facilities.

B.7.2 Module Content by Topics

Modules will include the following topics:

- Organization
- Quality assurance program
- Design control
- Procurement document control
- Instructions, procedures, and drawings
- Document control
- Control of purchased items and services
- Identification and control of items
- Control of special processes
- Inspection
- Test control
- Control of measuring and test equipment
- Handling, storage, and shipping
- Inspection, test, and operating status
- Control of nonconforming items
- Corrective action
- Quality assurance records
- Audits

APPENDIX C

TRAINING SCHEDULES*

*Total training time = 83.5 h.

Table C.1. General description of plant and facility

Subject	Duration (h)
Purpose of the facility	1
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
Heat power	
Neutron detection	
Servo system	
Safety system	
Start-up system	
Experiment facilities	0.5
Beam tubes	
Hydraulic tube facility	
Material irradiation facilities	
Examination	0.25
Total	4.75

Table C.2. Job-related procedures and instructions

Subject	Duration (h)
Lockout procedures	1
Programmed maintenance	0.5
Controlled work	1
Asbestos	0.25
Liquid and solid waste handling and disposal	0.5
Inspection and testing electrical safety equipment	0.25
Safety work permits	0.25
Primary and secondary water pumps	1
Reactor pool cleanliness	0.25
Reactor cooling towers	1.5
Reactor rod drives	
Orientation	2
Hands-on changeout with trained craftsman	40
Examination	0.25
Total	48.75

Table C.3. Radiation protection

Subject	Duration (h)
Radiation types	0.75
Radiation units	0.75
Zoning	0.25
Radiation limits	0.75
Radiation detection instruments	1
Facility-specific information	2
ALARA program	0.25
Risk factors	0.5
Examination	0.25
Total	6.5

Table C.4. Station emergency plan

Subject	Duration (h)
Facility radiation-contamination alarm system	1
Constant air monitors	
Monitrons	
Control room monitoring	
Coincidence alarm and evacuation	
Building evacuation alarms	0.5
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	0.25
Total	2.75

Table C.5. Industrial hygiene

Subject	Duration (h)
Basic health hazard awareness (risk factors)	0.5
Hearing conservation	0.25
Respiratory protection equipment	0.5
Handling of solvents, lubricants, etc.	0.25
Personal protective equipment	0.25
ORNL industrial hygiene procedures	0.25
Examination	0.25
Total	2.25

Table C.6. Fire protection and security program

Subject	Duration (h)
Fire protection	
Reporting a fire (fire alarm box, telephone 911, etc.)	0.25
Fire extinguishers and standpipe hose	0.5
Emergency egress (search and rescue)	0.25
Self-contained breathing apparatus	0.5
Security	
Access restrictions	0.25
Secure areas	0.25
Security incident reporting	0.25
Response force interactions	0.25
Examination	0.25
Total	2.75

Table C.7. Quality assurance

Subject	Duration (h)
QA program	
QA procedures	0.5
QA program planning	0.5
Training and motivation	0.25
Reports and appraisals	0.25
Organization and responsibilities	
QA program organization	0.5
QA coordinators	0.25
Quality assurance and inspection	0.25
Controls system, instrumentation, and calibration	0.25
Chemical analyses	0.25
Special nondestructive examination and welding techniques	0.25
Metrology	0.5
Welding engineering and inspection	0.5
Fabrication department metallurgical support	0.25
Laboratory Director's review	0.25
Designated pressure reviewers	0.25
High-pressure review committee	0.25
Design control	0.25
Procurement document control	0.5
Instructions, procedures, and drawings	
Design, procurement, manufacturing, and construction phases	0.5
Operations phase	0.5
Maintenance phase	0.5
Document control	0.5
Control of purchased materials, equipment, and services	0.5
Identification and control of materials, parts, and components	0.5
Control of special processes	0.5
Inspection	
Procurement, manufacturing, and construction phases	0.5
Operation and maintenance phases	0.5
Test control	
Manufacturing and construction phases	0.25
Operation and maintenance phases	0.25
Control of measuring and test equipment	
Manufacturing and construction phases	0.25
Operations phase	0.25

continued

Table C.7 (continued)

Subject	Duration (h)
Handling, storage, and shipping	0.25
Inspection, test, and operating status	
Manufacturing and construction phases	0.25
Operation and maintenance phases	0.25
Nonconforming items	0.5
Failure analysis and corrective action	0.5
Quality records	
Procurement manufacturing and construction phases	0.25
Operation and maintenance phases	0.25
Audits, reviews, and appraisals	
ORNL internal audits	0.25
Division internal audits	0.25
Controlled-manufacturing program audits	0.25
Audits of nuclear reactor operations	0.25
Supplier audits	0.25
DOE-ORO appraisals	0.25
Examination	0.5
Total	15.75

APPENDIX D

TRAINING DOCUMENTATION FORM

ORNL–DWG 82-13795AR

NAME OF EMPLOYEE _____

TRAINING SUBJECT	DATE COMPLETED and INSTRUCTOR'S INITIALS							
General Description of Plant Facilities								
Job-Related Procedures & Instructions								
Radiation Protection								
Station Emergency Plan								
Industrial Safety								
Fire Protection								
Security Program								
Quality Assurance Program								

The above-named person has successfully completed the Reactor Maintenance Training Program at ORNL

_____ P&E Division Training Manager

_____ P&E Division Director

_____ Operations Division Reactor Operations Section Head

_____ Operations Division Director

Fig. D.1. Training Record for Employees Working at Reactor Facility.

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