



NOT MEASUREMENT
SENSITIVE

DOE-HDBK-1110-97
October 1997

CHANGE NOTICE NO. 1
March 2002

Reaffirmation with Errata
July 2002

DOE HANDBOOK

ALARA TRAINING FOR TECHNICAL SUPPORT PERSONNEL



U.S. Department of Energy
Washington, D.C. 20585

FSC 6910

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

This document has been reproduced from the best available copy.

Available to DOE and DOE contractors from ES&H Technical Information Services, U.S. Department of Energy, (800) 473-4375, fax: (301) 903-9823.

Available to the public from the U.S. Department of Commerce, Technology Administration, National Technical Information Service, Springfield, VA 22161; (703) 605-6000.

ALARA Training for Technical Support Personnel

Note: The page numbers refer to Change Notice 1 of the standard which was issued in March 2002. The changes have been incorporated in the Adobe PDF file posted on the DOE Technical Standards Web Site.

Page	Change
Instructor Guide - Module 106 pg 66, 5.C	Add to end of section: Consider whether flooding due to leakage or backup may cause contamination of equipment.
Instructor Guide - Module 107 pg 72, 3.C.1	Add to end of section: Place inspection, control and readout instrumentation in low dose areas.
Instructor Guide - Module 108 pg 79, 2.B.7	Replace "radiactive" with "radioactive".
Student Guide - Module 106 pg 38, 5.C	Add to end of section: Consider whether flooding due to leakage or backup may cause contamination of equipment.
Student Guide - Module 107 pg 41, 3.C.1	Add to end of section: Place inspection, control and readout instrumentation in low dose areas.
Student Guide - Module 108 pg 46, 2.B.7	Replace "radiactive" with "radioactive".
Appendix A pg 3, D.5	Replace "passign" with "passing".

ALARA Training for Technical Support Personnel

Intentionally Blank

ALARA Training for Technical Support Personnel

Note: The page numbers refer to the standard that was published in February 1997. The changes have been incorporated in the Adobe PDF file posted on the DOE Technical Standards Web Site.

Page	Change
Cover	Change Metric to Not Measurement Sensitive.
iii	Change Radiological Control Manual to Radiological Control Standard. Change RadCon Manual to RadCon Standard. Correct website addresses. Change "were produced in WordPerfect 6.1 and Harvard Graphics 3.0" to "are available in WordPerfect 8.0 and PowerPoint 9.0."
v of Program Management Guide	Delete "Request for Changes to Training Materials."
1 of Program Management Guide	Change Radiological Control Manual to Radiological Control Standard. Change RadCon Manual to RadCon Standard. Change Worker Protection Programs and Hazards Management to Worker Protection Policy and Programs.
12 of Program Management Guide	Delete "sent to DOE EH-52 using the form 'Request for Changes to Training Materials' provided with each program management guide." Replace with "should use the form 'Document Improvement Proposal' provided at the end of this document." Change reference to DOE/EH-0258T-1 to DOE-HDBK-1130-98 and DOE-HDBK-1131-98.
13 of Program Management Guide	Change RadCon Manual to RadCon Standard.
15 of Program Management Guide	Change WordPerfect 6.1 to WordPerfect 8.0 and change Harvard Graphics 3.0 to PowerPoint 9.0.
17 of Program Management Guide	Change Radiological Control Manual to Radiological Control Standard. Update ALARA Implementation Guide date to 1999. Update date of 10 CFR 835 to 1998. Delete reference to N 441.2.
19 of Program Management Guide	Delete page.
TOC of Instructor's Guide	Change Radiological Control Manual to Radiological Control Standard. Re-number table of contents pages.
1 of Instructor's Guide	Change Radiological Control Manual to Radiological Control Standard.
5 of Instructor's Guide	Delete "Classroom exercise information is available on the internet at http://tis-nt.eh.doe.gov/wpphm/rst/rst.html ." Replace "Bibliography Next" with "Lesson Summary Next."
3 of Instructor's Guide	Delete reference to Notice 441.2. Change Radiological Control Manual to Radiological Control Standard.
6 and 7 of Instructor's Guide	Delete pages, replace with blank pages.

ALARA Training for Technical Support Personnel

Page	Change
11 of Instructor's Guide	Change Radiological Control Manual to Radiological Control Standard. Change RadCon Manual to RadCon Standard.
12 of Instructor's Guide	Change RadCon Manual to RadCon Standard.
15 of Instructor's Guide	Delete "DOE N 441.2 <i>Radiological Protection for DOE Activities</i> , establishes additional requirements for ensuring exposures are maintained ALARA, including DOE and facility administrative control levels (ACLs)." Change RadCon Manual to RadCon Standard.
16 of Instructor's Guide	Delete note "In September 1995, the RadCon Manual was eliminated as a requirements document. The RadCon Manual is being converted to a Standard. These recommendations will be updated and provided as guidance in Chapter 3 of the RadCon Manual." Change RadCon Manual to RadCon Standard.
31 of Instructor's Guide	Delete "10 percent of the DAC"; replace with "the DAC or where an individual present in the area without respiratory protection could receive an intake exceeding 12 DAC-hours in a week." Change "contro" to "control."
36 of Instructor's Guide	Delete "Individuals who enter only the controlled areas without entering radiological areas are not expected to receive a total effective dose equivalent of more than 100 mrem (0.001 sievert) in a year."
37 of Instructor's Guide	Replace 6 criteria with text from 10 CFR 835.604.
39 of Instructor's Guide	Change RadCon Manual to RadCon Standard. Replace definitions of contamination, high contamination, and airborne areas with text from 10 CFR 835.
70 of Instructor's Guide	Change RadCon Manual to RadCon Standard.
89 of Instructor's Guide	Change "design features and administrative controls shall ensure that the total effective dose equivalent does not exceed 5 rem in a year and that dose levels are ALARA." to "physical design features and administrative controls shall ensure that the total effective dose equivalent does not exceed 5 rem in a year and that the ALARA process is used."
90 of Instructor's Guide	Change RadCon Manual to RadCon Standard.
95 of Instructor's Guide	Change RCM to RCS.
TOC of Student's Guide	Change Radiological Control Manual to Radiological Control Standard. Renumber table of contents pages.
1 of Student's Guide	Change RadCon Manual to RadCon Standard.
2 of Student's Guide	Change RadCon Manual to RadCon Standard.
4 of Student's Guide	Change RadCon Manual to RadCon Standard. Delete reference to Notice 441.2.

ALARA Training for Technical Support Personnel

Page	Change
15 of Student's Guide	Delete "10 percent of the DAC"; replace with "the DAC or where an individual present in the area without respiratory protection could receive an intake exceeding 12 DAC-hours in a week."
16 of Student's Guide	Change "contro" to "control."
19 and 20 of Student's Guide	Delete "Individuals who enter only the controlled areas without entering radiological areas are not expected to receive a total effective dose equivalent of more than 100 mrem (0.001 sievert) in a year." Replace 6 criteria with text from 10 CFR 835.604.
21 of Student's Guide	Replace definitions of contamination, high contamination, and airborne areas with text from 10 CFR 835.
57 of Student's Guide	Change "design features and administrative controls shall ensure that the total effective dose equivalent does not exceed 5 rem in a year and that dose levels are ALARA." to "physical design features and administrative controls shall ensure that the total effective dose equivalent does not exceed 5 rem in a year and that the ALARA process is used." Change RadCon Manual to RadCon Standard.
61 of Student's Guide	Change RCM to RCS.
101-6 of Overheads	Change RadCon Manual to RadCon Standard.
103-34 of Overheads	Change > 10% to > DAC or 12 DAC-hours in a week.
109-2 of Overheads	Change to "physical design features" and conclude "that the ALARA process is used."
110-2 of Overheads	Revise to "Optimization methods shall."
110-4 of Overheads	Change RadCon Manual to RadCon Standard.
Overheads - All	Insert header and number each page.

ALARA Training for Technical Support Personnel

This page intentionally left blank.

Foreword

This Handbook describes a recommended implementation process for training as outlined in the *DOE Radiological Control Standard (RadCon Standard)*. The Handbook is to assist those individuals within Department of Energy (DOE), Managing and Operating (M&O) contractors, and Managing and Integrating (M&I) contractors, identified as having responsibility for implementing the training recommended by the *RadCon Standard*. This training may also be given to technical support personnel to assist in meeting their job-specific training requirements of 10 CFR 835.

This Handbook contains recommended training materials consistent with other DOE radiological training material. The training material consists of the following documents:

Program Management Guide - This document contains detailed information on how to use the Handbook material.

Instructor's Guide - This document contains a lesson plan for instructor use, including notation of key points for inclusion of facility-specific information.

Student's Guide - This document contains student handout material and also should be augmented by facility-specific information.

Appendices - This document contains appendices that augment the Instructor's and Student's Guides.

Overhead Transparencies - This document contains recommended overhead transparencies that may be used to augment classroom presentation.

This Handbook is available in WordPerfect 8.0 and has been formatted for printing on an HP IV (or higher) LaserJet printer. The overheads are available in Powerpoint 9.0. Copies of this Handbook may be obtained from either the DOE Radiation Safety Training Home Page Internet site (<http://tis.eh.doe.gov/whs/rhmwp/RST/rstmater.htm>) or the DOE Technical Standards Program Internet site (<http://tis.eh.doe.gov/techstds/standard/standfrm.html>). Documents downloaded from the DOE Radiation Safety Training Home Page Internet site may be manipulated using the software noted above (current revision or higher).

This page intentionally left blank.

(Part 1 of 5)

**ALARA Training for
Technical Support Personnel
Program Management Guide**



**Coordinated and Conducted
for
Office of Environment, Safety & Health
U.S. Department of Energy**

This page intentionally left blank.

Course Developers

Robert Alexander	The Alexander Corporation
John Connelly	DOE Department of Health and Industrial Hygiene
Bruce Dionne	Brookhaven National Laboratory
Thom Hogg	Westinghouse Hanford Company
Larry McKay	RadWorks
Doug Serpa	Lawrence Livermore National Laboratory
Paula Trinoskey	Lawrence Livermore National Laboratory
Janet Westbrook	Oak Ridge National Laboratory

Course Reviewers

Donald Brady	DOE Health Protection Division, Albuquerque
Brian Brumley	EG&G Mound Applied Technologies
Joe R. Devore	Oak Ridge National Laboratory
Nannette Fairrow	Battelle Pantex
Steve Keller	Pacific Northwest National Laboratories
Eva Lauber	West Valley Nuclear Services Company, Inc.
Chris Lesperance	Westinghouse Hanford Company
Charles Lewis	Westinghouse Savannah River Company
Peter O'Connell	U.S. Department of Energy
Danny Rice, Sr.	DOE, Idaho Operations Office
Randy Sullivan	ATL International, Inc.
Charley Watts	REECo, Inc.
DOE Technical Standards Managers	U.S. Department of Energy

This page intentionally left blank.

Table of Contents

	Page
Introduction	1
Purpose and Scope	1
Management Guide Content	1
Training Goal	1
Organizational Relationships and Reporting Structure	1
Instructional Materials Development	3
Target Audience	3
Prerequisites	3
Training Materials	4
Exemptions	4
Training Program Standards and Policies	5
Qualification of Instructors	5
Technical Qualifications	5
Instructional Capability and Qualifications	7
Selection of Instructors	9
Test Administration	10
Program Records and Administration	12
Training Program Development/Change Requests	12
Audit (Internal and External)	12
Evaluating Training Program Effectiveness	12
Course-Specific Information	13
Purpose	13
Course Goal	13
Target Audience	13
Course Description	13
Prerequisites	13
Length	14
Test Bank	14
Retraining	14
Instructor Qualifications	14
Materials Checklist	15
Equipment Checklist	16
Bibliography	17

This page intentionally left blank.

Introduction

Purpose and Scope

This program management guide provides guidance for proper implementation of training as outlined in the *DOE Radiological Control Standard (RadCon Standard)*. The guide is meant to assist those individuals within the Department of Energy (DOE), Managing and Operating (M&O) contractors, and Managing and Integrating (M&I) contractors identified as having responsibility for implementing the training recommended by the *RadCon Standard*. Facilities should determine the applicability of this material to support existing programs meant to comply with the training required by 10 CFR 835. Facilities are encouraged to revise these materials as appropriate.

Management Guide Content

The management manual is divided into the following sections:

- Introduction
- Instructional Materials Development
- Training Program Standards and Policies
- Course-Specific Information

Training Goal

The goal of the training program is to provide a baseline knowledge for those individuals completing the training. Implementation of the training provides personnel with the information necessary to perform their assigned duties at a predetermined level of expertise.

Organizational Relationships and Reporting Structure

The DOE Office of Worker Protection Policy and Programs (EH-52) is responsible for approving and maintaining the training materials.

Introduction (continued)

Organizational Relationships and Reporting Structure (continued)

The establishment of a comprehensive and effective contractor site radiological safety training program is the responsibility of line management and their subordinates. The training function can be performed by a separate training organization, but the responsibility for quality and effectiveness rests with the line management.

Instructional Materials Development Next

Instructional Materials Development

Target Audience

Course instructional materials were developed for specific employees who are responsible for knowing or using the knowledge or skills for each course. With this in mind, the participant should never ask the question, “Why do I need to learn this?” However, this question is often asked when the participant cannot apply the content of the program. It is the responsibility of management to select and send workers to training who need the content of the program. When workers can benefit from the course, they can be motivated to learn the content and apply it on their jobs. Care should be taken to read the course descriptions along with the information about who should attend. Participants and DOE facilities alike will not benefit from workers attending training programs unsuitable for their needs.

Prerequisites

A background and foundation of knowledge facilitates the trainee in learning new knowledge or skills. It is much easier to learn new material if it can be connected or associated to what was previously learned or experienced. Curriculum developers who have been involved in preparing instructional materials for the additional standardized training know this and have established what is referred to as “prerequisites” for each course.

Certain competencies or experiences of participants were also identified as necessary prior to participants attending a course. Without these competencies or experiences, the participants would be at a great disadvantage and could be easily discouraged and possibly fail the course. It is not fair to the other participants, the unprepared participant, and the instructor to have this misunderstanding.

Continued on Next Page

Instructional Materials Development (continued)

Training Materials

Training materials for this training program consist of a program management guide, an instructor's guide, a student's guide, appendices, and overhead transparencies. This material is designed to be supplemented with facility-specific information.

Supplemental material and training aids may be developed to address facility-specific radiological concerns and to suit individual training styles. References are cited in each lesson plan and may be used as a resource in preparing facility-specific information and training aids.

Each site is responsible for establishing a method to differentiate the facility-specific information from the standardized lesson plan material. When additional or facility-specific information is added to the text of the lesson plan material, a method should be used to differentiate site information from standardized material.

Exemptions

Qualified personnel can be exempted from training if they have satisfactorily completed training programs (i.e., facility, college or university, military, or vendor programs) comparable in instructional objectives, content, and performance criteria. Documentation of the applicable and exempted portions of training should be maintained.

Training Program Standards and Policies Next

Training Program Standards and Policies

Qualification of Instructors

The technical instructor plays a key role in the safe and efficient operation of DOE facilities. Workers must be well qualified and have a thorough understanding of the facility's operation, such as processing, handling, and storage of materials, and maintenance of equipment. Workers must know how to correctly perform their duties and why they are doing them. They must know how their actions influence other worker's responsibilities. Because workers' actions are so critical to their own safety and the safety of others, their trainers must be of the highest caliber. The technical instructor must understand thoroughly all aspects of the subjects being taught and the relationship of the subject content to the total facility. Additionally, the instructor must have the skills and knowledge to employ the instructional methods and techniques that will enhance learning and successful job performance. While the required technical and instructional qualifications are listed separately, it is the combination of these two factors that produces a qualified technical instructor.

The qualifications are based on the best industry practices that employ performance-based instruction and quality assurances. These qualifications are not intended to be restrictive, but to help ensure that workers receive the highest quality training possible. This is only possible when technical instructors possess the technical competence and instructional skills to perform assigned instructional duties in a manner that promotes safe and reliable DOE facility operations.

Technical Qualifications

Instructors must possess technical competence (theoretical and practical knowledge along with work experience) in the subject areas in which they conduct training. The foundation for determining the instructor's technical qualifications is based on two factors:

Continued on Next Page

Training Program Standards and Policies (continued)

- Technical Qualifications (continued)**
- the trainees being instructed and
 - the subject being presented.

The following is an example of a target audience, subject to be taught, and instructor technical qualifications.

TARGET AUDIENCE	SUBJECT BEING TAUGHT	INSTRUCTOR TECHNICAL QUALIFICATIONS
<p>Personnel with job assignments that include or support the design of nuclear facilities, the planning of radiological work, or the production of procedures that govern radiological work.</p>	<p>ALARA Principles</p>	<p>Demonstrated knowledge and skills in radiation protection, above the level to be achieved by the trainees, as evidenced by previous training/education and through job performance.</p>

Methods for verifying the appropriate level of technical competence may include the review of prior training and education, observation, and evaluation of recent related job performance, and oral or written examination. Other factors that may be appropriate for consideration include DOE, NRC, or other government license or certification, vendor or facility certification, and most importantly, job experience. To maintain technical competence, a technical instructor should continue to perform satisfactorily on the job and participate in continuing technical training.

Continued on Next Page

Training Program Standards and Policies (continued)

Instructional Capability and Qualifications

Qualifications of instructional capability should be based on demonstrated performance of the instructional tasks for the specific course requirements and the instructor's position. Successful completion of instructor training and education programs as well as an evaluation of on-the-job performance is necessary for verification of instructional capability. Instructional capability qualification should be granted as the successful completion of an approved professional development program for training instructors. The program should contain theory and practice of instructional skills and techniques; adult learning; and planning, conducting, and evaluating classroom, simulator, laboratory, and on-the-job training activities.

Illustrated talks, demonstrations, discussions, role playing, case studies, coaching, and individual projects and presentations should be used as the principal instructional methods for presenting the instructional training program. Each instructional method should incorporate the applicable performance-based principles and practices. Every effort should be made to apply the content to actual on-the-job experience or to simulate the content in the classroom/laboratory. The appropriate methodology required to present the instructional content will indicate a required level of instructional qualification and skill.

Current instructors' training, education, and job performance should be reviewed to determine their training needs for particular courses. Based on this review, management may provide exemptions based on demonstrated proficiency in performing technical instructor's tasks.

Continued on Next Page

Training Program Standards and Policies (continued)

Instructional Capability and Qualifications (continued)

Through training or experience, technical instructors should be able to*:

- Review instructional materials and modify to fully meet the needs of the training group.
- Arrange the training facility (classroom/laboratory or other instructional setting) to meet the requirements for the training sessions.
- Effectively communicate (verbally and non-verbally) lessons to enhance learning.
- Invoke student interaction through questions and student activity.
- Respond to students' questions.
- Provide positive feedback to students.
- Use appropriate instructional materials and visual aids to meet the lesson objectives.
- Administer performance and written tests.
- Ensure evaluation materials and class rosters are maintained and forwarded to the appropriate administrative personnel.
- Evaluate training program effectiveness.

Continued on Next Page

Training Program Standards and Policies (continued)

Instructional Capability and Qualifications (continued)

- Modify training materials based on evaluation of training program.

*Stein, F., *Instructor Competencies: The Standards*.

International Board of Standards for Training, Performance and Instruction, 1992.

Selection of Instructors

Selection of instructors should be based on the technical and instructional qualifications specified in the Course-Specific Information section of this guide. In addition to technical and instructional qualifications, oral and written communication skills and interpersonal skills should be included in the process of selecting and approving instructors.

Since selection of instructors is an important task, those who share in the responsibility for ensuring program effectiveness should:

- Interview possible instructors to ensure they understand the importance of the roles and responsibilities of technical instructors and are willing to accept and fulfill their responsibilities in a professional manner.
- Maintain records of previous training, education, and work experience.

Procedures for program evaluation will include documentation of providing qualified instructors for generic and facility-specific training programs.

Continued on Next Page

Training Program Standards and Policies (continued)

Test Administration

A test bank of questions for each course that has an exam should be developed and its content validated. As the test banks are used, statistical validation of the test banks should be performed to fully refine the questions and make the tests as effective as possible. The questions contained in the test banks are linked directly to the objectives for each course. In this way, trainee weaknesses can be readily identified, and remedial procedures can be put into place. The test outcomes can also be used to document competence and the acquisition of knowledge.

The test banks should also be used by the instructors to identify possible weaknesses in the instruction. If numerous trainees fail to correctly answer a valid set of questions for an objective, the instruction for that objective needs to be reviewed for deficiencies.

Written examinations may be used to demonstrate satisfactory completion of theoretical classroom instruction. The following are some recommended minimal requirements for the test banks and tests:

- Randomly generate tests from the test bank.
- Represent all course objectives.
- Validate the content of all test bank items by a subject matter expert.
- Secure test banks and do not release them either before or after the test is administered.

Continued on Next Page

Training Program Standards and Policies (continued)

- Test Administration (continued)**
- Provide feedback to trainees on their test performance.
 - For the first administrations of tests, require a minimum of 80 percent correct for a passing score. As statistical analyses of test results are performed, a more accurate percentage for a passing score may be identified.

Test administration is critical in accurately assessing the trainee's acquisition of knowledge being tested. The following rules should be followed:

- Announce tests at the beginning of the training sessions.
- Instructors should continuously monitor trainees during examinations.
- Collect all tests and answers at the conclusion of each examination.
- No notes can be made by trainees concerning the test items.
- Efforts should be made to eliminate all noise during the test.
- Allow no talking, aside from questions.
- Provide answers to trainees' questions during a test, but not answers to test items.
- Where possible, produce multiple versions of each test from the test bank for each test administration.

Continued on Next Page

Training Program Standards and Policies (continued)

- Test Administration (continued)**
- After test completion, trainees may turn in their materials and leave the room while other trainees complete their tests.

 - Trainee scores on the tests are confidential.

Program Records and Administration

Training records and documentation shall meet the requirements of 10 CFR 835.704.

Training Program Development/Change Requests

All requests for program changes and revisions should use the form “Document Improvement Proposal” provided at the end of this document.

Audit (Internal and External)

Internal verification of training effectiveness should be accomplished through senior instructor or supervisor observation of practical applications and discussions of course material. All results should be documented and maintained by the organization responsible for Radiological Control training.

The training materials and processes should be evaluated on a periodic basis by DOE-HQ. The evaluation should include a comparison of program elements with applicable industry standards and requirements.

Evaluating Training Program Effectiveness

Verification of the effectiveness of Radiological Control training should be accomplished per DOE-HDBK-1131-98, “General Employee Radiological Training,” and DOE-HDBK-1130-98, “Radiological Worker Training.” In addition, DOE/EH has issued guidelines for evaluating the effectiveness of radiological training through the DOE Operations Offices and DOE Field Offices. For additional guidance, refer to DOE-STD-1070-94, “Guide for Evaluation of Nuclear Facility Training Programs.”

Course-Specific Information Next

Course-Specific Information

Purpose This section of the program management guide is to assist those individuals assigned responsibility for implementing the *ALARA Training for Technical Support Personnel*.

Course Goal Upon completion of this training, the student will have a basic understanding of the philosophy and principles of ALARA and their application to the facility and to facility and equipment design.

Target Audience Personnel with job assignments that include or support the design of nuclear facilities, the planning of radiological work, or the production of procedures that govern radiological work. This training, or portions of it, may be appropriate for managers and supervisors of people in these categories.

Course Description This course reinforces the skills and knowledge needed to apply ALARA principles (including optimization) to facility and operational designs and reviews. This course emphasizes application of ALARA principles by participation in group exercises. It also provides an overview of radiological fundamentals that may be presented by alternative methods. This course is developed in accordance with Articles 652/653 of the RadCon Standard.

Prerequisites This training material is designed to augment the DOE Radiological Worker training. As a refresher, this course includes Radiological Worker training material, but is not intended to replace Radiological Worker training. The first three modules may be issued as a self-study. It is a general overview of Radiological Worker topics. The presentation of the remainder of the course may be adjusted accordingly.

Continued on Next Page

Course Specific Information (continued)

Prerequisites (continued) The facility training program should determine the appropriate prerequisites. However, it is recommended that students complete Radiological Worker training prior to taking this course.

Length The suggested course length is two days; however, the scope and amount of training should be evaluated by each site based on probable average dose savings.

Test Bank On a site-by-site basis.

Retraining Retraining is not required for this course unless it is used to meet 10 CFR 835 training requirements. In that case, retraining every two years is required. Since some of the content is based on facility-specific information, retraining should also be provided as facility-specific information changes.

Instructor Qualifications Instructors of this course have a major role in making it successful and meeting the specified objectives. Instructors must have related experience and be technically competent. In this course it is imperative that the instructor have the background and experience of working in radiological facilities. Instructors must be able to relate their own work experience to the facility workers. Instructors must be able to answer specific questions and use a variety of instructional material to meet the objectives.

Education: Minimum of B.S. degree in Health Physics or related discipline is preferred.

Certification: Certification by American Board of Health Physics (ABHP) or National Registry of Radiation Protection Technologists (NRRPT) is preferred.

Continued on Next Page

Course Specific Information (continued)

**Instructor Qualifications
(continued)**

Experience: At least five years of applied radiological protection experience in an operating radiological facility including experience in radiological protection and the applicable ALARA principles is preferred. The areas of experience should include:

- Radiological Systems
- ALARA Principles
- ALARA Optimization Processes

The instructor must also be knowledgeable in Federal regulations and guidance, and best nuclear industry practices pertaining to radiological protection.

Materials Checklist

The following checklist should be used to ensure all training materials are available. The Program Management Guide, Instructors Guide, and Student Guide are provided in WordPerfect 8.0 format. The Overheads and Student Handouts are provided in PowerPoint 9.0 format.

- Program Management Guide
- Instructor's Guide
- Student's Guide
- Appendices
- Overheads/Student Handouts

Continued on Next Page

Course Specific Information (continued)

Equipment Checklist

The following checklist should be used before training is provided to ensure equipment is available and working.

- Overhead projector
- Screen
- Flip chart, chalkboard, or white board
- Markers or chalk

Bibliography Next

Bibliography: DOE standards, handbooks, and technical standards lists (TSLs). The following DOE standards, handbooks, and TSLs form a part of this document to the extent specified herein.

U.S. Department of Energy, *Guide to Good Practices for Training and Qualification of Instructors*, DOE-NE-STD-1001-91, Washington, D.C., 1991.

U.S. Department of Energy, *Proceedings of the Department of Energy ALARA Workshop, Held at Brookhaven National Laboratory, Upton, NY 11973, April 1992*, Conf-920468, Brookhaven National Laboratory, Upton, NY.

U.S. Department of Energy, Training Resource and Data Exchange, TRADE, *ALARA for Design and Operations Engineers*, Oak Ridge Institute for Science and Education, Oak Ridge, TN, April 1993.

U.S. Department of Energy, *Radiological Control Standard*, DOE-STD-1098-99, Washington, D.C., July 1999.

U.S. Department of Energy, *Occupational ALARA Program Guide for Use with Title 10, Code of Federal Regulations, Part 835, Occupational Radiation Protection*, DOE G-441.1-2, March 1999.

U.S. Department of Energy, *Health Physics Manual of Good Practices for Reducing Radiation Exposure to As Low As Reasonably Achievable (ALARA)*. PNL-6577, Pacific Northwest Laboratory, Richland, WA.

U.S. Department of Energy, DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, Washington, D.C.

Continued on Next Page

Bibliography (continued)

Other government documents, drawings, and publications. The following government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise indicated, the issues of these documents are those cited in the contracting document.

U.S. Environmental Protection Agency, Federal Guidance Report No. 11.

Non-Government documents

Baum, John W., Health Physics Society, *Proceedings of the Twenty-Fourth Midyear Topical meeting of the Health Physics Society, Raleigh, NC*, "ALARA at Nuclear Power Plants," January 1991.

International Commission on Radiation Protection, ICRP Publication 37, *Cost-Benefit Analysis in the Optimization of Radiation Protection*. Pergamon Press, New York, NY, 1982.

International Commission on Radiation Protection, ICRP Publication 55, *Optimization and Decision-Making in Radiological Protection*, Pergamon Press, New York, NY, 1990.

Jorgensen, David B., et al., editors, Health Physics Society, *Proceedings of the Twenty Fouth Midyear Topical meeting of the Health Physics Society, Raleigh, NC*, "Implementation of Current NCRP and ICRP Guidance and Revised 10 CFR Part 20," January 1991.