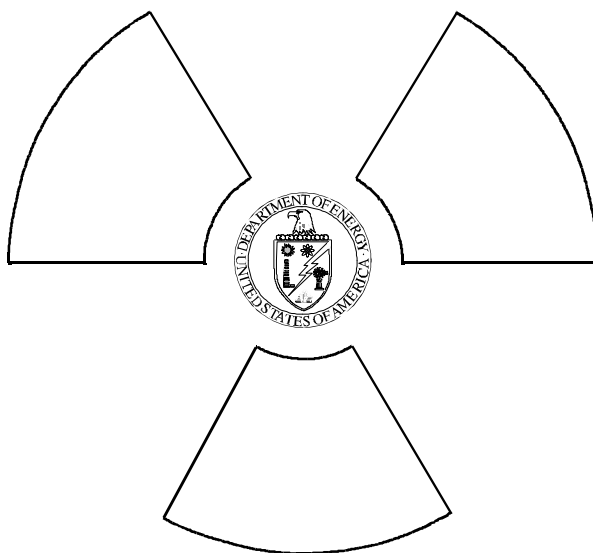


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RADIATION SAFETY TRAINING GUIDE

for use with
**Title 10, Code of Federal Regulations, Part 835,
Occupational Radiation Protection**



**Assistant Secretary for Environment,
Safety and Health**

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ACRONYMS

AEC	U.S. Atomic Energy Commission
ALARA	as low as is reasonably achievable
ANS	American Nuclear Society
ANSI	American National Standards Institute
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
DOE G	DOE Guide
DOE O	DOE Order
DOE-STD	DOE Standard
FR	Federal Register
GERT	General Employee Radiological Training
NCRP	National Council on Radiation Protection and Measurement
NRC	Nuclear Regulatory Commission
PNL	Pacific Northwest Laboratory
RCS	DOE-STD-1098.99, RADIOLOGICAL CONTROL
RCT	radiological control technician
RPP	radiation protection program
RWT	Radiological Worker Training
SLAC	Stanford Linear Accelerator Center

RADIATION SAFETY TRAINING

1. PURPOSE AND APPLICABILITY

This Guide provides an acceptable methodology for establishing and operating a radiation safety training program that will comply with U.S. Department of Energy (DOE) requirements specified in Title 10 of the Code of Federal Regulations (CFR), Part 835, Occupational Radiation Protection (DOE 1998a), hereinafter referred to as 10 CFR 835. In particular, this Guide provides guidance for achieving compliance with subpart J of 10 CFR 835. For completeness, this Guide also identifies applicable requirements and recommendations contained in DOE 5480.20A, PERSONNEL SELECTION, QUALIFICATION, AND TRAINING REQUIREMENTS FOR DOE NUCLEAR FACILITIES (DOE 1994a); DOE-STD-1098-99, RADIOLOGICAL CONTROL (DOE 1999a), hereinafter referred to as the RCS; and secondary documents (American National Standards Institute (ANSI) standards, etc.) invoked by the above documents.

This Guide amplifies the regulatory requirements of 10 CFR 835, which are enforceable under the provisions of Sections 223(c) and 234A of the Atomic Energy Act of 1954, as amended (AEC 1954). The requirements and recommendations of other DOE documents are enforceable through contractual or administrative means.

Except for requirements established by a regulation, a contract, or by administrative means, the provisions in this Guide are DOE's views on acceptable methods of program implementation and are not mandatory. Conformance with this Guide will, however, create an inference of compliance with the related requirements. Alternate methods that are demonstrated to provide an equivalent or better level of protection are acceptable. DOE encourages its contractors to go beyond the minimum requirements and to pursue excellence in their programs.

The word "shall" is used in this Guide to designate requirements from 10 CFR 835. Compliance with 10 CFR 835 is mandatory except to the extent an exemption has been granted pursuant to 10 CFR 820, Procedural Rules for DOE Nuclear Activities (DOE 1997). The words "should" and "may" are used to denote optional program recommendations and allowable alternatives, respectively.

This Guide is applicable to all DOE activities that are subject to the requirements of 10 CFR 835.

2. DEFINITIONS

Terms defined in 10 CFR 835 are used in this Guide consistent with their regulatory definitions.

Challenge examination: An examination administered to ascertain the knowledge of a worker with respect to radiation safety and provide an exception to the required training.

Contaminated area: Any area meeting the definition of “contamination area,” “high contamination area,” or “airborne radioactivity area” provided in 10 CFR 835.2(a).

Escort: An individual with the prerequisite training necessary for unescorted access to the area(s) where the escort activities will be performed and who is authorized to accompany and ensure the safety of individuals who lack such training.

Performance demonstration: A demonstration by a student of the skills required to perform certain designated activities.

Refresher training: Periodic (usually annual) training that provides current information on changes to radiation protection policies and procedures or changes in facility conditions, or to promote awareness of infrequently encountered radiological safety matters.

3. DISCUSSION

While there are significant differences in the missions of various DOE and DOE-contractor operations, and thus significant differences in the content of radiation safety training programs necessary for adequate protection of employees, the basics of radiation safety for DOE activities can be taught using core course material augmented by site-specific material.

Different levels of radiation safety training are used to ensure the safe and efficient conduct of work. Training courses, such as Radiological Worker Training (RWT), take into account different levels of risk associated with various job functions and duty locations. Training shall be commensurate with the level of potential radiological hazards (10 CFR 835.901(c)).

A training program that evaluates the knowledge and skills that a worker needs for safe job performance, in conjunction with core course material for teaching the fundamentals of radiation safety, should be implemented to ensure that individuals can perform their assigned duties safely and respond appropriately to both normal and abnormal situations they may encounter.

4. IMPLEMENTATION GUIDANCE

4.1 GENERAL INFORMATION

Radiation safety training shall be provided to all individuals before being:

- permitted unescorted access to controlled areas; or
- occupationally exposed to ionizing radiation during access to controlled areas, whether escorted or not (10 CFR 835.901(a)).

10 CFR 835 requires that radiation safety training shall include certain topics (discussed in detail in Section 4.3) to the extent appropriate to the individual's prior training, work assignments, and degree of exposure to potential radiological hazards (10 CFR 835.901(c)). Radiation safety training program requirements should be established in specific procedures that address, at a minimum, the issues discussed in this Guide.

In addition to the radiation safety training requirements discussed in this Guide, 10 CFR 835.103 establishes requirements for the education, training, and skills of individuals who are responsible for developing and implementing measures required to ensure compliance with 10 CFR 835. DOE G 441.1-1, MANAGEMENT AND ADMINISTRATION OF RADIATION PROTECTION PROGRAMS GUIDE (DOE 1999b), provides guidance for achieving compliance with these requirements.

To ensure that appropriate radiation safety training is provided to all individuals entering controlled areas, DOE has sponsored development of radiation safety training core course material for General Employee Radiological Training (GERT) (DOE 1998c) and Radiological Worker Training (RWT) (DOE 1998d). RWT has been developed in a modular format to support two distinct core courses, RWT-I and RWT-II. RWT-II includes the material provided in RWT-I, augmented by additional modules on more complex radiation protection issues, such as high radiation area and contaminated area entry and exit controls. Detailed guidance for use of the DOE core course material is provided in the associated Program Management Guides.

DOE developed and implemented the core course material to enhance the content of radiation safety and other training programs across the DOE complex and to bring these training programs up to a standard consistent with similar programs implemented in the commercial nuclear industry. DOE recommends the use of the radiation safety training core course material, updated as necessary to reflect recent changes in regulatory requirements and other applicable standards, to satisfy the corresponding requirements of 10 CFR 835. Use of the radiation safety training core course material is no longer mandatory; however, the core course material for GERT and RWT should be strongly considered as a basis for developing and implementing radiation safety training programs.

A radiation safety training program sufficient to meet the requirements of 10 CFR 835.901 should include:

- course materials from the DOE core training materials applicable to the radiological hazards and controls associated with the specific DOE activity;
- site- and activity-specific content and instruction;

- performance demonstrations and examinations as appropriate to demonstrate understanding of key concepts and practices; and
- an evaluation of other applicable DOE requirements.

A satisfactory training program for radiation safety should also include training evaluations and provisions for maintaining training records. Detailed requirements and guidance for maintenance of radiation safety training records are provided in Subpart H of 10 CFR 835 and DOE G 441.1-11, OCCUPATIONAL RADIATION PROTECTION RECORD-KEEPING AND REPORTING GUIDE (DOE 1999b).

4.2 DETERMINATION OF REQUIRED TRAINING

10 CFR 835.901(a) and (b) establish requirements for distinct levels of radiation safety training. If an individual will be permitted unescorted access to controlled areas or receive occupational exposure to ionizing radiation during escorted or unescorted access to controlled areas, a determination must be made regarding the appropriate level of knowledge and the type of training to be provided. This determination should be based on:

- the nature of the radiological hazards in area(s) to which the individual will be granted access and the nature of the work to be performed. This determination may be made on an individual basis, but is most commonly made in accordance with standardized procedures on a group basis, such as work group affiliation, level of access to certain areas, or type of work to be performed. If an individual determination is needed to meet special needs (such as for a dignitary or technical representative), the supervisor responsible for the individual's activities should establish and document this information. Based upon the information provided by the cognizant supervisor, the radiological control organization, training organization, or other cognizant organization should determine the appropriate level of training;
- the type and complexity of protective actions that the individual might be expected to undertake in the areas to be entered. This should include an assessment of both routine and emergency actions;
- a determination with regard to whether or not the individual will be under constant escort or supervision; and
- the individual's previous education, training, and experience in working with radioactive materials and in the vicinity of radiological hazards. This determination may be made by review of available training records, provision of a challenge examination, knowledge of individual experience and capabilities, personal documented interviews conducted by cognizant radiation protection or training personnel, documented working agreements with the individual's sponsoring organization (e.g., International Atomic Energy Agency or Defense Nuclear Facilities Safety Board), or a combination of these activities.

Challenge examinations may be given based on the individual's prior experience, education, and/or training. The radiological control organization should determine appropriate criteria for allowing challenge examinations. Challenge examinations should be based on the objectives stated for the training program, and are an approved form of proficiency testing. Challenge examinations should cover the entire applicable core training program.

Challenge examinations should address learning objectives from each topic or subject area of the training to ensure that workers not benefitting from classroom instruction have the requisite knowledge. With successful completion of the challenge examination, the student should be granted an exemption from the appropriate core training

course or lesson. DOE 5480.20A requires DOE nuclear facilities to prepare and submit for approval procedures governing the processes used to grant exceptions from training or qualification requirements. Such procedures should be developed to govern radiation safety training for all DOE activities.

DOE encourages the establishment of reciprocity agreements to facilitate the acceptance of training provided at other sites. It is particularly beneficial to implement a practice of accepting training provided by other sites and facilities having similar hazards, processes, and facilities. Such agreements require some assurance that the training provided by the member sites provide a level of training acceptable to all signatory parties. In general, completion of the applicable sections of the DOE core course material within the past two years in accordance with the Program Management Guides should be considered reasonable grounds for acceptance of previously completed core training (see Section 4.6.). In addition, consideration may be given for completion of training from other (non-DOE) nuclear facilities, formal education applicable to radiation safety, and previous experience working in facilities with similar hazards and controls. Whenever the full radiation safety training core course is not provided, the justification for any omissions (i.e., identification of any previous education, training, or experience accepted in lieu of providing radiation safety training) should be documented.

4.3 TRAINING COURSE CONTENT

GERT provides the appropriate level of training for individuals who:

- enter controlled areas unescorted; or
- receive occupational exposure during controlled area entry (whether escorted or not).

These are the individuals addressed in 10 CFR 835.901(a). GERT does not provide the appropriate level of training for individuals who enter radiological areas unescorted or for those individuals who perform unescorted duties as a radiological worker.

RWT-I provides the appropriate level of training for individuals who:

- enter non-contaminated radiation areas (but not high or very high radiation areas) or areas in which they are likely to receive doses exceeding 0.1 rem in a year (e.g., certain radioactive material areas and areas surrounding radiological areas);
- work with sealed or fixed radioactive material that does not produce high radiation fields (i.e., fields exceeding 0.1 rem in an hour); or
- work with radiation producing devices that do not produce high radiation fields (i.e., fields exceeding 0.1 rem in an hour).

RWT-I is not appropriate for individuals who enter contaminated areas or high radiation areas unescorted. However, RWT-I may be augmented by the specific High/Very High Radiation Area Entry Training module to prepare RWT-I trained individuals for safe entry into high or very high radiation areas.

RWT-II has been developed to provide the appropriate level of training for individuals who, in addition to the above criteria:

- are expected to enter high radiation areas;
- are expected to enter contaminated areas; or
- are otherwise expected to work with unsealed quantities of radioactive materials.

10 CFR 835 establishes provisions allowing the use of escorts in lieu of providing radiation safety training. Guidance on implementing these provisions is provided in Section 4.8 of this Guide.

RWT uses a modular format to allow training to be customized to be commensurate with the hazard present in the area. This format facilitates upgrading of an individuals' status from RWT-I to RWT-I with High/Very High Radiation Area Training or RWT-II by simply completing the necessary additional modules.

Employment status (i.e., permanent, contract, temporary) should not be used to determine the appropriate level of training. As stated above, the type and level of training may be adjusted to be commensurate with the individual's level of access, assigned duties, and type of previous training and experience.

Radiation safety training shall include the following topics, to the extent appropriate to each individual's prior training, work assignments, and degree of exposure to potential radiological hazards (10 CFR 835.901(c)):

- basic radiological fundamentals and radiation protection concepts;
- risks of exposure to radiation and radioactive materials, including prenatal radiation exposure;
- physical design features, administrative controls, limits, policies, procedures, alarms, and other measures implemented to control exposures to radiation and radioactive materials, including both routine and emergency actions;
- individual rights and responsibilities as related to implementation of the radiation protection program;
- individual responsibilities for implementing as low as is reasonably achievable (ALARA) measures required by 10 CFR 835.101; and
- individual exposure reports that may be requested in accordance with 10 CFR 835.801.

The DOE core course material provides this type of information to the level of detail that is broadly applicable to all DOE activities, but do not address site-specific information that individuals may need to conduct work safely.

4.4 FACILITY-SPECIFIC MATERIALS

To implement an effective radiation safety training program, the core courses should be augmented with facility-specific information as necessary to adequately address the course content requirements of 10 CFR 835.901(c). The following information should be considered in developing facility-specific training materials:

- procedures for entering and exiting the authorized areas, including use of work authorizations;
- controls on radiation exposures, including administrative control levels and fetal exposure control;
- measures for use of protective equipment, including protective clothing and respiratory protective devices;
- alarms, warning signals, and response actions;
- ALARA measures implemented at the facility;
- requirements for interfacing with the radiation protection organization;
- skills required by the worker to execute his radiation safety responsibilities;
- worker responsibilities for self and coworker protection, including exercise of stop work authority; and
- measures for requesting personal dose records and reports.

Following assessment of all of the necessary facility-specific information, the facility-specific portion of the training courses should be developed to augment the DOE core course material. The final radiation safety training materials should receive the concurrence of the Radiological Control Manager or his designee.

Although a systematic approach to training is currently required only at DOE facilities under the requirements of DOE 5480.20A, all DOE activities should, as much as practicable, use this approach in developing specific training. Suggested learning objectives and examples for different target audiences and types of facilities, such as accelerators, radiation generating devices, plutonium, uranium, and tritium facilities, are provided in the additional radiation safety courses developed by DOE. DOE encourages use of these materials, revised as appropriate to reflect recent changes in applicable requirements and standards, to identify learning objectives appropriate for the specific target audiences and facilities. (See the Section 6 of this Guide for a listing of materials.)

4.5 CONDUCT OF RADIATION SAFETY TRAINING

Radiation safety training should be conducted in an appropriate training facility, such as a classroom or computer-based training facility, augmented by suitable mock-up and/or laboratory facilities and on-the-job training and evaluation for RWT. Training media, such as handouts, slides, and video presentations, should be appropriate to the subject matter and the audience. Computer-based training may be used as appropriate to ensure consistent and reliable presentation of the course materials. Chapter 6 of the RCS and the Program Management Guides provide detailed guidance regarding instructor qualifications and recommended performance demonstrations.

4.6 COMPLETION OF RADIATION SAFETY TRAINING

Due to the limited access granted to individuals who complete only GERT, examinations are not required.

Successful completion of RWT shall be demonstrated by completion of an examination (10 CFR 835.901(b)). Examinations should be written, but other measures may be implemented to accommodate those with special needs. When measures other than written examinations are used, an evaluation should be made to ensure that all

individuals will be able to execute their responsibilities safely. For example, individuals with reading comprehension impairments may take an oral examination, but an evaluation should be performed to ensure that the student:

- can read and understand any radiological warning signs and labels, work authorizations, and procedures affecting their work; or
- will always be provided the same level of assistance during area access and work performance as was provided during the examination.

Computer-based examinations, using automated examination composition and scoring, may be used as appropriate. The minimum passing score for examinations, including challenge examinations, should be established at or above 80 percent. Chapter 6 of the RCS and the core course Program Management Guides provide detailed guidance for conducting examinations.

In addition to an examination, students in RWT classes shall be required to complete performance demonstrations commensurate with their duties (10 CFR 835.901(b)). Performance demonstrations typically involve such activities as safely entering and exiting simulated radiological areas, donning and removing protective clothing, and performing whole body frisking. Chapter 6 of the RCS and the RWT core course material provide detailed guidance for conducting performance demonstrations.

Proof of successful course completion, such as a certificate, wallet-sized card or access control or other database entry, should be provided to indicate the successful completion of DOE core radiation safety training. To be acceptable as proof of training at other DOE activities, the proof of completion should include the:

- individual's name;
- date of training;
- modules covered; and
- name of certifying official (such as the instructor or examination evaluator).

To allow reciprocity for completion of the core courses, the proof of completion should provide the course title (i.e., GERT, RW I, RW II) and, if the entire core course was completed, a statement to that effect.

For sites planning frequent use of training reciprocity, DOE encourages close prior coordination to establish inter-facility (or inter-site) working agreements that define mutually-acceptable standards for acceptable training program implementation. Regardless of such agreements, each site should retain the discretion to evaluate incoming workers individually and, to require challenge examinations or retraining as necessary to ensure compliance. Consideration must still be given to the provisions for facility-specific training discussed above.

Individuals who do not pass all required examinations and performance demonstration requirements should not be allowed to proceed with unescorted tasks involving exposure to radioactive materials or radiation until they have completed remedial actions. Remedial actions for failure to pass a written examination or meet performance demonstration requirements should include remedial instruction and re-examination, repetition of the training

program, or restriction from job duties. Because challenge examinations are designed to provide credit toward required training, the remedial action for failure of a challenge examination should be to deny credit for that examination toward the required training. The choice and extent of remedial actions should be determined based upon the extent of the knowledge or skill deficiencies demonstrated by the individual.

4.7 PERIODIC RADIATION SAFETY TRAINING

In addition to the initial training provided before an individual is granted access to the specified areas, radiation safety training shall be conducted at least once every 24 months and whenever significant changes are implemented that might affect the individual (10 CFR 835.901(e)). This periodic training should not simply repeat the initial training, but should review key principles, provide more detailed knowledge of the subject matter required in 10 CFR 835.901(c), and stress new program requirements and seldom-used knowledge and skills. Periodic radiation safety training should be conducted in accordance with the guidance provided in Section 4.5 of this Guide.

Although many possible program changes may affect individual workers, the assessment of their need for periodic radiation safety training at intervals of less than 24 months should at least consider the factors discussed in Section 4.4 of this Guide. If the program change is judged to be significant, then training should be completed either before the change is implemented or the individuals should be restricted from their duties until training has been completed.

The requirements for periodic radiation safety training are not intended to deter cognizant management from providing routine updates to workers on radiation safety requirements. Updates may be necessary to alert workers to radiation protection program changes that are judged to be non-significant and whose impact does not warrant formal training or examinations. These updates are typically provided in the form of memoranda or posted notices. DOE encourages the use of such communication devices.

Periodic radiation safety training for RWT shall include successful completion of an examination (10 CFR 835.901(e)). Examinations should be conducted in accordance with the guidance provided in Section 4.6 of this Guide. If challenge examinations are used to satisfy all or part of the requirements for periodic radiation safety training, those examinations should be developed and conducted in accordance with Section 4.6 of this Guide.

4.8 USE OF ESCORTS IN LIEU OF TRAINING

As indicated in Section 4.2, constant escort of an individual may affect the extent of required training. The use of constant escort may obviate the need for certain types of training by making the escort responsible for the protection and actions of the affected individual. This approach should only be used when:

- the individual will enter the area for a short period of time (i.e., a few hours);
- provision of an escort will provide for an adequate level of safety; and
- provision of an escort will not result in significant adverse dose effects (ALARA considerations). This determination should be based upon consideration of the resources (including collective dose) that must be expended to escort the individual versus those necessary to provide the appropriate training.

Use of an escort is also helpful when an individual has completed portions of the required training and would benefit from on-the-job experience. In these cases, a fully qualified individual should directly oversee the trainee's performance of tasks for which the appropriate training, examinations, and performance demonstrations have not been completed.

The assigned escort shall have completed the requisite training and shall ensure that the untrained individual complies with the documented radiation protection program (10 CFR 835.901(d)). For instance, an individual assigned to escort an untrained individual in a contaminated area shall have completed RWT-II or equivalent training. In addition, the untrained individual, if occupationally exposed in a controlled area at a DOE site or facility, shall complete at least those portions of the training related to the risks of exposure to radiation and radioactive materials, including prenatal radiation exposure and individual exposure reports that may be requested (10 CFR 835.901(a)).

For individuals who are expected to remain in the controlled area for an extended period (i.e., more than a few hours) or to make repeated entries, the full training course should be completed, as appropriate to the individual's prior training, experience, and potential exposure risks.

4.9 REFRESHER TRAINING

The RCS recommends and provides guidance for the conduct of radiation safety refresher training every other year when biennial radiation safety training is not required.

4.10 OTHER TRAINING PROGRAMS

In addition to the radiation safety training requirements discussed in this Guide, 10 CFR 835.103 establishes requirements for the education, training, and skills of individuals who are responsible for developing and implementing measures required to ensure compliance with 10 CFR 835. DOE G 441.1-1 provides guidance for achieving compliance with these requirements.

4.11 TRAINING EFFECTIVENESS EVALUATIONS

Training effectiveness evaluations are quality assurance measures used to determine whether qualified workers have retained all the required knowledge and skills and that are applying them properly. Feedback is an important form of evaluation that encourages improvements and upgrades to the training programs. Comments from supervisors, instructors, and trainees should be used to enhance course effectiveness. Although other means of evaluating training programs are currently in place (such as industry and facility exchanges, instructor evaluations, and routine assessments), they are not addressed in this Guide.

The effectiveness of radiation safety training should be verified in accordance with the applicable training course program management guide. DOE has issued guidance for evaluating the effectiveness of radiation safety training in *Evaluating the Effectiveness of Radiological Training* (DOE 1994b). This document is also included as an attachment to the DOE-developed Radiological Worker Training and General Employee Radiological Training Handbooks. In addition, DOE 5480.20A requires that evaluations of training and qualification programs be conducted in accordance with DOE-STD-1070-94, GUIDELINES FOR EVALUATION OF NUCLEAR FACILITY TRAINING PROGRAMS (DOE1994c).

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Request for Changes to
RADIATION SAFETY TRAINING GUIDE
(Use Multiple Pages as Necessary)

Page No. _____

Section No. _____

Paragraph No. _____

Facility Requesting Change

Contact Person

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Description of Change Request:

Suggested Specific Word Changes:

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