Part 4 of 5

Radiological Assessor Training
DOE-HDBK-1141-2001

Student's Guide

Office of Environment, Safety & Health
U.S. Department of Energy

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I. Introduction

II. DOE radiological health and safety

A. Policy (some key points in summary)

- Establish and maintain a system of regulatory policy and guidance.
- Ensure appropriate training is developed and delivered and the technical competence of the DOE workforce.
- Establish and maintain, from the lowest to the highest levels, line management involvement and accountability for Departmental radiological performance.
- Ensure radiological measurements, analyses, worker monitoring results, and estimates of public exposures are accurate and appropriately made.
- Conduct radiological operations in a manner that controls the spread of radioactive materials and reduces exposure to the work force and the general public and utilizes a process that seeks exposure level as low as reasonably achievable (ALARA).
- Incorporate dose reduction, contamination reduction, and waste minimization features into the design of new facilities and significant modifications to existing facilities in the earliest planning stages.
- Conduct oversight to ensure Departmental requirements are being complied with and appropriate radiological work practices are being implemented.

Notes

B. History

DOE has provided numerous written standards for on-site radiological protection, the most recent regulation being 10 CFR Part 835, *Occupational Radiation Protection*. This regulation was preceded by:

- DOE Notice 5480.6 of June 17, 1992, *Radiological Control*, which specified that the *DOE Radiological Control Manual* (DOE/EH-0256T) would supersede DOE Order 5480.11.

- DOE Order 5480.11, *Radiation Protection for Occupational Workers* (effective December, 1988). The purpose was to establish radiation protection standards and program requirements for DOE and DOE contractors for the protection of workers from ionizing radiation.

The establishment of DOE radiological protection standards did not start with these documents. A chronology of dose limits of DOE and its predecessor agencies, the Atomic Energy Commission (1946-1975) and the Energy Research and Development Administration (1975-1977), demonstrate a lowering of whole body dose limits over the last 50 years.

In the establishment of these dose limits, DOE has followed recommendations of national and international radiological protection groups, notably the International Commission on Radiological Protection (ICRP) and the National Council on Radiation Protection and Measurements (NCRP).

Notes

C. Hierarchy of requirements

Currently within DOE there are two parallel hierarchies of requirements:

- Rules and/or regulations (these terms are used interchangeably in this training)
- DOE Orders

III. Rules and regulations

In response to the enforcement authority in the Price-Anderson Amendments Act (PAAA) of 1988, DOE is converting its contractual requirement in orders to enforceable rules to enhance contractor accountability for safety.

A. DOE enforcement of rules under PAAA

10 CFR Part 820 (effective on September 16, 1993) sets forth the procedures to implement the provisions of the PAAA. Part 820 requires contractors to comply with DOE Nuclear Safety Requirements.

PAAA demands a "large stick" to enhance contractor accountability for safety. Rules provide authority for the assessment of civil and criminal penalties and thus provide the large stick.

Notes

B. Penalties under Part 820

1. Civil penalties

   DOE may assess civil penalties against any person subject to Part 820, for violations of:

   - Codified rules in the CFR
   - Compliance orders
   - Any program or plan required by a rule or compliance order

   Note: Certain nonprofit educational institutions and other listed institutions are exempt from assessment of civil penalties.

2. Criminal penalties

   If a person subject to the Atomic Energy Act of 1954, as amended, or Nuclear Safety Requirements, has by action or omission knowingly and willfully violated, caused to be violated, attempted to violate, or conspired to violate any section of the Atomic Energy Act of 1954, as amended, or applicable DOE Nuclear Safety Requirements, the person shall be subject to criminal sanctions.

3. The "carrot and stick" approach

   DOE may provide monetary incentives in its management and operating (M&O) contracts for actions consistent with or exceeding requirements, and to penalize actions and activities that were not in compliance with requirements.

   Noncompliance with the Radiation Protection Program can subject a contractor to PAAA enforcement. There are provisions to mitigate penalties for self identifying and reporting violations.

Notes

C. DOE Nuclear Safety Requirements

DOE Nuclear Safety Requirements are the set of enforceable rules, regulations, or orders relating to nuclear safety that have been adopted by DOE (or by another agency if DOE specifically identifies it).

Compliance orders are issued by the Secretary. They identify a situation that violates, potentially violates, or otherwise is inconsistent with the:

- Atomic Energy Act of 1954, as amended
- Nuclear statutes
- Nuclear Safety Requirements

Compliance orders:

- Mandate a remedy or other action
- States the reason for the remedy or other action

D. 10 CFR Part 835

On December 14, 1993, DOE published a final rule in the *Federal Register* (58 FR 65458) Title 10 Code of Federal Regulations Part 835, *Occupational Radiation Protection* (10 CFR 835). On November 4, 1998 an amendment to 10 CFR 835 was published in the *Federal Register* (63 FR 59663).

The purpose of 10 CFR 835 is the codification of radiological protection requirements. It contains "shall" statements, which are legally binding. It also contains:

- Prescriptive language

Notes

- Added emphasis on ALARA
- Requirements for a Radiation Protection Program (RPP)
- Federal law
- Criminal and civil penalties for violations

E. Radiation Protection Program (10 CFR Part 835)

Each site, under Part 835, must submit a written Radiation Protection Program (RPP).

The RPP requires careful consideration because noncompliance may subject a contractor to PAAA enforcement

F. Guidance documents for 10 CFR Part 835

Two types of regulatory guidance documents have been developed:

- Guidance for implementing the provisions of 10 CFR Part 835.
- Guidance providing technical positions.

The above are available through the DOE EH-52 website at:

http://tis.eh.doe.gov/whs/rhmwp/regs.html

Unlike the requirements specifically set forth in 10 CFR Part 835, the provisions in guidance documents are not mandatory. They are intended solely to describe the rationale for, and the objectives of, regulatory requirements and/or to identify acceptable methods for implementing regulatory requirements.

Notes

Failure to follow a guidance document does not in itself indicate noncompliance with a specific requirement of the rule. A finding of noncompliance is found for a failure to satisfy the regulatory requirement.

Following a guidance document in the prescribed manner will ordinarily create a presumption of compliance with a related regulatory requirement.

1. Technical guidance

   Technical guidance describes and disseminates technical methods and techniques for fulfilling implementation and, in turn, the requirements in 10 CFR Part 835. Examples of these guidance are DOE Technical Standards and DOE Radiological Control Technical Positions (RCTPs).

2. Implementation guides (IGs)

   Implementation guidance is intended to identify and make available to DOE contractors basic program elements and acceptable methods for implementing specific provisions of the final rule. Thirteen implementation guides have been developed for 10 CFR Part 835.

G. Relationship between 10 CFR Part 835 and 10 CFR Part 20

10 CFR Part 20 is the occupational radiological regulation issued by the Nuclear Regulatory Commission (NRC).

The question of consistency among federal agencies in their occupational radiological protection regulations became a major point of discussion during the rule making process.

Notes

While agreeing with the goal of consistency, DOE believes that it must promulgate its own regulations because of the unique nature and diversity of radiological activities within the DOE complex. The final rule allows DOE to establish more rigorous requirements in areas of particular concern. Overall 10 CFR Part 835 has many similarities as 10 CFR Part 20.

IV. DOE STD *Radiological Control* and Orders

A. *Radiological Control*

In January 1992, a memorandum was sent to the heads of DOE elements involved in managing radiological programs. In the memorandum, the Secretary directed a series of initiatives to enhance the conduct of radiological operations within the Department of Energy. Also in this memo, the Assistant Secretary of Environment, Safety and Health was directed to develop a comprehensive and definitive radiological control manual. The *DOE Radiological Control Manual* was developed to meet that directive and was approved by the Secretary and promulgated with DOE Notice 5480.6, *Radiological Control*, in July 1992.

After the issuance of 10 CFR 835 as a final rule in December 1993, DOE Notice N441.1, *Radiological Protection for DOE Activities*, was issued on 9-30-95. This cancelled the notice which made the Radiological Control Manual a requirements document. However, the notice stated that "cancelled orders that are incorporated by reference in a contract shall remain in effect until the contract is modified to delete the reference.

N441.1 also retained some of the radiation protection requirements from the Radiological Control Manual that were not included in 10 CFR 835.

Notes

In July, 1999, the Radiological Control Manual was replaced by the standard, DOE-STD-1098-99, *Radiological Contro*l. Many DOE sites contractually must still adhere to the provisions of either the Radiological Control Manual or the Radiological Control Standard. Subsequent to the 1998 amendment to 10 CFR 835, the effective date of N441.1 has passed.

The DOE Radiological Control Standard is not regulatory in nature. It is a guidance document that describes DOE's policy and expectations for an excellent radiological control program**.**

1. Implementation

   If a site fully implements a provision of the DOE Radiological Control Standard, the user will have most likely complied with any related statutory, regulatory, or contractual requirements. Users are cautioned that they must review the source document (10 CFR 835) to ensure compliance.

2. Enforceability

   When incorporated into contracts, the provisions of the DOE Radiological Control Standard or Manual are binding requirements.

   If portions of the Site-Specific Radiological Control Manual are incorporated in the RPP under Part 835 and approved by DOE, they are also binding.

B. The Site-Specific Radiological Control Manual

- The DOE Radiological Control Standard states that a Site-Specific Radiological Control Manual should be written and followed.

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Notes

C. Relationship between 10 CFR Part 835 and the DOE Radiological Control Standard

1. Compliance

   - The Office of Enforcement and Investigation (EH-10) will enforce 10 CFR Part 835. It can assess fines and penalties.

   - The Program Offices will audit for both compliance with 10 CFR 835 and contractual agreements including the DOE Radiological Control Standard or Manual, Orders, etc. Results of these audits can affect the contractor's award fee.

2. What if there are conflicts?

   10 CFR Part 835 takes precedence over requirements of the DOE Radiological Control Standard and orders. It is unlikely that there will be a conflicting requirement between the two documents, although one document may have a requirement that is not addressed in the other.

Notes

It is planned that all requirements for nuclear safety will be incorporated into rules.

3. "Shall" and "should" statements

   - 10 CFR Part 835 contains "shall" statements. "Shall" statements in Part 835 are legally binding.

     Processes for exemption relief from Part 835 are set forth in Subpart E to Part 820. If relief is requested from provisions of Part 835, the exemption must be considered and granted, if appropriate, by the Assistant Secretary for Environment, Safety and Health (EH-1).

   - The use of "should" in the DOE Radiological Control Standard recognizes that there may be site- or facility-specific attributes that warrant special treatment. It also recognizes that literal compliance with the elements and requirements of the provision may not achieve the desired level of radiological control performance.

Notes

D. DOE Standards

DOE has developed several technical standards for occupational radiation protection. Depending on the site specific application, some standards are required to be followed. For example, sites which need to monitor individual external exposures to ionizing radiation need to follow the DOE Laboratory Accreditation Program (DOELAP) standards. Other standards may be incorporated by reference in the site RPP.

Other standards provide technical guidance on specific applications, but adherence to the standard may not be required.

Prior to conducting an assessment, the site requirements documents must be reviewed to determine applicable requirements.

Notes

V. Defense Nuclear Facilities Safety Board

A. Establishment

The Atomic Energy Act of 1954 was amended by adding Chapter 21, Defense Nuclear Facilities Safety Board (DNFSB). This amendment established an independent board in the executive branch to provide oversight of some DOE operations at DOE facilities and sites.

B. Members

The DNFSB consists of five members appointed by the President with consent of the Senate.

The Board shall:

- Review and evaluate standards
- Investigate any event or practice at a DOE defense nuclear facility that the Board determines has adversely affected or may adversely affect public health and safety.

The Board may:

- Establish reporting requirements for the Secretary of Energy

By evaluating how well DOE meets its objectives, the DNFSB helps DOE achieve and maintain excellence in radiological protection.

C. Secretary of Energy

The Secretary of Energy shall fully cooperate with the Board.

Notes

D. DNFSB Recommendations

DNFSB provides DOE with recommendations for improving safety at DOE defense nuclear facilities. Examples include:

DNFSB Recommendation 91-6 dealt with radiological protection concerns throughout the DOE defense nuclear facilities complex, and identified several actions to be taken by the Department to improve radiological protection performance.

DNFSB Recommendation 92-7 dealt with training and qualification at DOE sites and facilities.

DNFSB Recommendation 98-1 dealt with resolution of internal audit findings.

DNFSB Recommendation 99-1 dealt with safe storage of fissionable materials.

Implementation of DOE and site commitments made in response to DNFSB recommendations are areas to review during an assessment.

Notes

I. Introduction

This module provides an overview of many of the provisions of 10 CFR 835. For completeness, individuals should always reference back to 10 CFR 835 for the complete text.

II. Outline of 10 CFR Part 835

Part 835 is the codification of radiological protection requirements. Part 835 contains 14 subparts and five appendices. The outline consists of the following subparts:

A — General Provisions
B — Management and Administrative Requirements
C — Standards for Internal and External Exposure
D — Reserved
E — Monitoring of Individuals and Areas
F — Entry Control Program
G — Posting and Labeling
H — Records
I — Reports to Individuals
J — Radiation Safety Training
K — Design and Control
L — Radioactive Contamination Control
M — Sealed Radioactive Source Control
N — Emergency Exposure Situations

Under 10 CFR Part 835, each site must submit a Radiation Protection Program (RPP).

Part 835 helps to ensure that DOE facilities are operated in a manner such that occupational radiological exposure to workers is maintained within acceptable limits and as low as is reasonably achievable (ALARA).

Notes

A. Subpart A - General Provisions

Subpart A contains the scope of the rule. The rule in this part establishes radiological protection standards, limits, and program requirements for protecting individuals from ionizing radiation resulting from the conduct of DOE activities.

It also includes activities excluded from the provisions of the rule. Activities that are excluded include the following (summarized):

- Activities regulated through a license by the Nuclear Regulatory Commission (NRC) or a state under an agreement with the NRC.
- Activities conducted under the authority of the Director, Naval Nuclear Propulsion Program.
- Specified activities conducted under the Nuclear Explosives and Weapons Surety Program.
- Radioactive material transportation.
- DOE activities in other countries with acceptable radiation protection program.
- Background radiation.

Occupational doses received as a result of excluded activities and radioactive material transportation, as listed above, shall be considered when determining compliance with the occupational dose limits (835.202 and 835.207), and with the limits for the embryo/fetus (835.206).

Subpart A also addresses:

- Definitions
- Radiological units (Curie, rad, roentgen, rem, and multiples)

Notes

B. Subpart B - Management and Administrative Requirements

The RPP shall:

- Include formal plans and measures for applying the ALARA process to occupational exposures.
- Specify the existing and/or anticipated operational task.
- Address, but not be limited to, each requirement in Part 835.
- Include plans, schedules, and other measures for achieving compliance.

DOE may direct or make modifications to an RPP. An initial RPP or update shall be considered approved 180 days after its submission unless rejected by DOE at an earlier date.

Compliance with 835.402(d) for radiobioassay program accreditation shall be achieved no later than January 1, 2002.

Internal Audits (10 CFR 835.102)

Internal audits of the radiation protection program, including examination of program content and implementation, shall be conducted through a process that ensures that all functional elements are reviewed no less frequently than every 36 months. This training material and DOE G 441.1, *Management and Administration of Radiation Protection Programs Guide*, provide guidance on DOE's expectations.

Notes

Education, Training and Skills (10 CFR 835.103)

Individuals responsible for developing and implementing measures necessary for ensuring compliance with the requirements of this part shall have the appropriate education, training, and skills to discharge these responsibilities. DOE STD-1107-97 *Knowledge, Skills, and Abilities for Key Radiation Protection Positions at DOE Facilities,* provides guidance on DOE's expectations.

Written Procedures (10 CFR 835.104)

Written procedures are required, as necessary, to ensure compliance with 835, commensurate with radiological hazards and education, training and skills of exposed individuals.

C. Subpart C - Standards for Internal and External Exposure

This subpart addresses limits for:

- General employees (occupational)
- Embryos/fetus of declared pregnant worker (i.e., A woman who has voluntarily declared to her employer, in writing, her pregnancy for the purpose of being subject to the occupational dose limits to the embryo/fetus. This declaration may be revoked, in writing, at any time by the declared pregnant worker.)
- Occupationally exposed minors
- General public in a controlled area

It also addresses:

- Planned special exposures
- Nonuniform exposures of the skin

Notes

- Concentrations of radioactive material in air

1. Summary of dose limits

10 CFR Part 835 employs the rem unit for several different physical quantities. For information about these quantities refer participants to page 1 of handouts, "Dosimetric Quantities in 10 CFR Part 835."

Exposed Individual	Annual Limit
General Employee: Whole Body (internal and external) (TEDE)	5.0 rem
General Employee: Lens of Eye (DE)	15.0 rem
General Employee: Extremity (below elbow and knees) and skin (SDE)	50.0 rem
General Employee: Any Organ or Tissue (other than lens of eye) (DDE + CDE)	50.0 rem
Declared Pregnant Worker: Embryo/Fetus (gestation period) (DE)	0.5 rem
Occupationally Exposed Minors (under age 18): (TEDE)	0.1 rem *
Members of the Public in Controlled Areas: (TEDE)	0.1 rem

- And 10% of other general employee limits.

2. Planned special exposures (PSEs)

It is acknowledged that unusual conditions can arise in which higher-than-normal doses can be justified. In these well-planned, well-controlled, and highly infrequent and unusual conditions operating management would be permitted to allow specified individual doses exceeding the occupational limit, such as 5 rem per year.

Notes

The term "unusual conditions" is made clear by specifying that alternatives which would preclude exposures higher than the prescribed dose limits must be either unavailable or impractical.

10 CFR 835.204 specifies requirements for annual and lifetime dose from PSEs. It also specifies requirements for determining previous individual exposures prior to allowing a PSE.

Every PSE must be approved in advance by DOE and requires the informed consent of the employee involved.

3. Concentration of radioactive material in air

   Appendices A and C contain the derived air concentration (DAC) values used in the control of occupational exposure to airborne radioactive material.

   DACs are listed in appendices A and C of 10 CFR 835. For intakes (appendix A), they are the airborne concentration that equals the annual limit on intake (ALI) divided by the volume of air breathed by an average worker for a working year of 2000 hours (assuming a breathing volume of 2400 m^3).

   The ALI is the smaller value of intake of a given radionuclide in a year by a standardized man that would result in a CEDE of 5 rems or a CDE of 50 rems to any individual organ or tissue.

Notes

Appendix C contains DACs for controlling external dose from being immersed in a cloud of airborne radioactive material.

Estimation of internal dose shall be based on bioassay data rather than air concentration values unless bioassay data are:

- Unavailable (e.g., radon or very short lived radioisotopes)
- Less accurate than internal dose estimates based on representative air concentration values
- Inadequate

E. Subpart D - Reserved

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E. Subpart E - Monitoring of Individuals and Areas

This subpart addresses:

- General requirements
- Instrumentation
- Individual monitoring - external
- Individual monitoring - internal
- Air monitoring
- Receipt of packages containing radioactive material

1. General requirements (10 CFR 835.401)

   Monitoring of individuals and areas shall be performed to:

   - Demonstrate compliance with Part 835.
   - Document radiological conditions.
   - Detect changes in the radiological conditions.
   - Detect the gradual buildup of radioactive material.
   - Verify the effectiveness of engineering and process controls in containing radioactive material and reducing radiation exposure.
   - Identify and control potential sources of individual exposure to radiation and/or radioactive material.

Notes

2. Instrumentation

   Instruments and equipment used for monitoring and contamination control shall be:

   - Periodically maintained and calibrated on an established frequency.
   - Appropriate for the type(s), levels, and energies of the radiation(s) encountered.
   - Appropriate for existing environmental conditions.
   - Routinely tested for operability.

3. Individual monitoring - external (10 CFR 835.402)

   For the purpose of monitoring individual exposure to external radiation, personnel dosimetry shall be provided to and used by:

   - Radiological Workers likely to receive:
     – An effective dose equivalent to the whole body of 0.1 rem (100 mrem) or more in a year
     – A shallow dose equivalent to the skin or to any extremity of 5 rem or more in a year
     – A lens of the eye dose equivalent of 1.5 rem or more in a year
   - Declared Pregnant Workers who are likely to receive from external sources a dose equivalent to the embryo/fetus in excess of 10 percent of the applicable limit.

Notes

- Members of the public in a controlled area and occupationally exposed minors likely to receive, in one year, from external sources, a dose in excess of 50 percent of the applicable limits.

- Individuals entering a High or Very High Radiation Area.

DOE Laboratory Accreditation for Personnel Dosimetry is required for external dose monitoring programs implemented to demonstrate compliance with 10 CFR 835.

4. Individual monitoring - internal (10 CFR 835.402)

   Internal dose evaluation programs (including routine bioassay programs) shall be conducted for:

   - Radiological Workers who, under typical conditions, are likely to receive 0.1 rem or more committed effective dose equivalent from all occupational radionuclide intakes in a year.

   - Declared Pregnant Workers likely to receive an intake or intakes resulting in a dose equivalent to the embryo/fetus in excess of 10 percent of the limit.

   - Members of the public in a controlled area and occupationally exposed minors who are likely to receive a committed effective dose equivalent in excess of 50 percent of the limit from all intakes in a year.

Notes

DOE Laboratory Accreditation for Radiobioassay is required for internal dose monitoring programs implemented to demonstrate compliance with 10 CFR 835.

5. Air monitoring (10 CFR 835.403)

   Measurements of radioactivity concentrations in the ambient air of the workplace shall be performed as follows:

   - Air sampling shall be performed in occupied areas where an individual is likely to receive an exposure of 40 DAC-hrs or more in a year (i.e. an annual intake of 2 percent or more of the specific ALI value) for the mixture of isotopes.

   - Samples shall be taken as necessary to characterize the levels or concentration of airborne radioactive material when respirators are worn for radiation protection purposes.

   - Real-time air monitoring shall be performed when there is a need to alert potentially exposed individuals to unexpected increases in airborne radioactivity levels such that immediate action is necessary in order to minimize or stop inhalation exposures.

6. Receipt of Packages Containing Radioactive Material (10 CFR 835.405)

   Establishes requirements to monitor certain types of packages and sets a time limit of not later than 8 hours after the beginning of the working day following receipt of the package.

Notes

F. Subpart F - Entry Control Program (10 CFR 835.501)

Subpart F addresses entry into:

- Radiological Areas
- High Radiation Areas
- Very High Radiation Areas

1. Radiological Areas

   The degree of control shall be commensurate with existing and potential radiological hazards within the area.

   One or more of the following methods shall be used to ensure control:

   - Signs and barricades
   - Control devices on entrances
   - Conspicuous visual and/or audible alarms
   - Locked entrance ways
   - Administrative controls

   "No control(s) shall be installed at any radiological area exit that would prevent rapid evacuation of personnel under emergency conditions."

2. High Radiation Areas

   A High Radiation Area is an area where radiation levels exist such that an individual could exceed a deep dose equivalent to the whole body of 0.1 rem in any one hour at 30 centimeters from the

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source or from any surface that the radiation penetrates.

If an individual receive a deep dose equivalent exceeding 1.0 rem in an hour (at 30 cm), a High Radiation Area shall have one or more of the following:

- A control device that prevents entry to the area when high radiation levels exist or that, upon entry, causes the radiation level to be reduced below that level that defines a High Radiation Area.

- A device that functions automatically to prevent use or operation of the radiation source or field while individuals are in the area.

- A control device that energizes a conspicuous visible or audible alarm signal so that the individual entering the High Radiation Area and the supervisor of the activity are made aware of the entry.

- Entryways that are locked. During periods when access to the area is required, positive control over each entry is maintained.

- Continuous direct or electronic surveillance that is capable of preventing unauthorized entry.

- A control device generating audible and visual alarm signals to alert personnel in the area before use or operation of the radiation source and in sufficient time to permit evacuation of the are or activation of a secondary control device that will prevent use or operation of the source.

Notes

3. Very High Radiation Areas

   A Very High Radiation Area is an area in which an individual could receive a dose in excess of 500 rad in one hour at 1 meter from the radiation source or from any surface that the radiation penetrates.

   In addition to the requirements for a High Radiation Area, additional measures shall be implemented to ensure individuals are not able to gain unauthorized access to Very High Radiation Areas.

   "No control(s) shall be established in a High or Very High Radiation Area that would prevent rapid evacuation of personnel."

Notes

G. Subpart G - Posting and Labeling

Subpart G addresses the general requirements for signs:

- Yellow background
- Black or magenta radiation symbol
- Clear and conspicuous signs

In addition, Subpart G addresses specific posting requirements for:

- Controlled Areas
- Radiation Areas
- High Radiation Areas
- Very High Radiation Areas
- Airborne Radioactivity Areas
- Contamination Areas
- High Contamination Areas
- Radioactive Material Areas

This subpart also addresses exceptions to posting and labeling.

H. Subpart H - Records

Subpart H addresses requirements for records documenting compliance with Part 835 and with the Radiation Protection Program.

Records that are specifically required include those necessary to demonstrate compliance with the ALARA provisions of the rule.

Notes

10 CFR 835 also requires that certain records be maintained, including records of:

- Individual monitoring
- Sealed source inventory and control
- Results of surveys for the release of material and equipment
- Results of specified monitoring for radiation and radioactive material
- Maintenance and calibration of radiation monitoring instruments
- Internal audits

Each individual's training as a general employee and as a Radiological Worker must be recorded. Where appropriate, demonstration and documentation of proficiency is required.

Refer to 10 CFR 835 Subpart H for a complete listing of required records.

DOE G 441.1-11, *Occupational Radiation Protection Record-Keeping and Reporting Guide*, provides additional guidance on record-keeping requirements, including reference to DOE O 231.1, Change 2, *Environment, Safety and Health Reporting*, and DOE M 231.1-1, Change 2, *Environment, Safety and Health Reporting Manual*. This order and manual specify radiation protection reporting requirements that may be applicable to the site or facility being assessed.

I. Subpart I - Reports to Individuals (10 CFR 835.801)

Subpart I addresses reports to individuals and their accessibility to reports, including:

Notes

On an annual basis, each DOE or DOE contractor-operated site or facility must provide each individual monitored for occupational exposure a radiation dose report of his/her occupational exposure at that site or facility.

Upon the request from an individual terminating employment, records of exposure shall be provided to that individual as soon as the data are available, but not later than 90 days after termination. A written estimate of the radiation dose received by that employee based on available information shall be provided at the time of termination, if requested.

J. Subpart J - Radiation Safety Training

This subpart addresses radiation safety training. The tailored approach to training requirements are based on:

- Unescorted access to or receiving occupational dose in controlled areas (e.g., General Employees)
- Unescorted access to radiological areas or unescorted assignment as Radiological Workers

Requirements of Part 835 include:

- Verification by examination for certain training (e.g., Radiological Worker Training)
- Intervals of training not to exceed twenty four months
- List of topics which must be included in training
- Provisions for limited use of escorts in lieu of training

Notes

DOE G 441.1-12, *Radiation Safety Training Guide*, provides additional guidance on DOE's expectations on radiation safety training.

K. Subpart K - Design and Control

Subpart K addresses added emphasis on facility and equipment design and administrative controls to maintain radiological exposures ALARA.

1. Facility design and modifications (10 CFR 835.1001)

   During the design of new facilities or modification of old facilities, the following objectives shall be adopted:

   - Optimal methods shall be used to assure ALARA
   - Maintain exposure levels below an average of 0.5 mrem/hr
   - Avoid release of radioactivity to the workplace atmosphere
   - The design or modification of a facility and the selection of materials shall include features that facilitate operations, maintenance, decontamination, and decommissioning

Notes

2. Workplace controls (10 CFR 835.1003)

   During routine operations, the combination of physical design features and administrative control shall provide that:

   - The anticipated occupational dose to general employees shall not exceed the limits
   - The ALARA process is utilized for personnel exposures to ionizing radiation

L. Subpart L - Radioactive Contamination Control

1. Control of material and equipment

   This section addresses the requirements for release of materials and equipment from radiological areas to controlled areas. Releases to uncontrolled areas are addressed in DOE O 5400.5. Some of the provisions:

   - Specifies conditions for material and equipment in contamination areas (CAs), high contamination areas (HCAs), and airborne radioactivity areas (ARAs) to be released to a controlled area
   - Addresses movement of material and equipment with removable surface contamination, on-site from one radiological area for immediate placement in another radiological area
   - Specifies conditions for material and equipment with fixed contamination to be released for use in controlled areas outside of radiological areas

Notes

Control of Areas (10 CFR 835.1102) addresses

- Prevention of inadvertent transfer or removal of contamination to locations outside radiological areas under normal conditions
- Where contamination levels exceed values in Appendix D, the area is controlled commensurate with hazards
- Areas with fixed contamination exceeding radioactivity values may be located outside radiological areas, provided certain controls, conditions, or provisions are met
- Personnel monitoring for contamination upon exiting CAs, HCAs, or ARAs
- Use of protective clothing in CAs and HCAs

M. Subpart M - Sealed Radioactive Source Control

Sealed radioactive sources shall be used, handled and stored in a manner commensurate with the hazard.

Specifies values (Appendix E) for sources which must be inventoried and leak tested at intervals not to exceed six months.

N. Subpart N - Emergency Exposure Situations

This subpart addresses:

- Employees who have exceeded dose limits as result of authorized emergency exposure
- Nuclear accident dosimetry

Notes

Individuals whose occupational exposures have exceeded any limits as a result of an authorized emergency exposure may be permitted to return to work provided that certain conditions are met.

Nuclear accident dosimetry

Nuclear accident dosimetry involves installations possessing sufficient quantities of fissile material to constitute a critical mass, and shall include;

- Method to conduct initial screening of personnel involved
- Method and equipment for analysis of biological materials
- A system of fixed nuclear accident dosimeter units
- Personal nuclear accident dosimeters

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Notes

I. Introduction

II. *DOE Radiological Control Standard*

The DOE Radiological Control Standard is written for line management. It is designed to assist line managers in fulfilling their duties and responsibilities for implementing an occupational radiation protection program.

It is also designed to assist site/facility workers in having the information they need to be responsible for their own radiological exposures and to help ensure that the controls are in place to eliminate any releases, unplanned exposures or uptake, and to apply ALARA principles. The emphasis is on teamwork and support from line management.

The Radiological Control Standard may be considered as an occupational radiation protection good practices document. Individual sites may have contractual commitments to implement sections of the standard.

III. Chapter 1, Excellence in Radiological Control

This chapter defines the roles of DOE and the contractors in achieving the goal of radiological control excellence. It consists of the following five sections:

- *DOE Radiological Control Standard*
- Leadership in Radiological Control
- Improving Radiological Control Performance
- Contractor Radiological Control Organization
- DOE Management

Notes

A. *DOE Radiological Control Standard*

The contractor is responsible for implementing an occupational radiation protection program. To assist this effort, they may develop a Site Radiological Control Standard Implementation Plan. The Site-Specific Radiological Control Standard, which is developed from the Implementation Plan, does not require DOE approval.

B. Leadership in Radiological Control

Commitment of senior management to radiological control is defined in this section of the Standard.

The responsibilities and accountability of each individual for ALARA and radiological excellence is emphasized.

Worker responsibilities and the concepts of conduct of radiological operations are clearly defined.

C. Improving Radiological Control Performance

The use of critiques as a management tool, rather than as a method to "fix blame" or "shoot the messenger," and the importance of real root cause identification are emphasized. Over 20 radiological performance indicators are identified that are tools designed to assist managers in focusing their priorities and attention on radiological control performance.

D. Contractor Radiological Control Organization

This section discusses the contractor's radiological control organization and the qualifications of the Radiological Control Manager.

Notes

E. DOE Management

This section discusses the roles and responsibilities of DOE management for providing guidance and performance evaluation of radiological control programs.

IV. Chapter 2, Radiological Standards

This chapter deals with administrative control dose limits, contamination control and control levels, and posting.

A. Administrative Control Levels (ACLs) and Dose Limits

Lifetime control levels and dose limits for Radiological Workers, members of the public, embryos/fetuses, and special control levels are discussed in this section.

For most facilities an ACL of 500 millirem or less will be challenging for Radiological Workers. Individual occupational doses, in rem, should be kept below the individual's age in years.

B. Contamination Control and Control Levels

In this section, personnel contamination control, removable and fixed contamination control levels, and airborne radioactivity control levels are given.

C. Posting

Posting requirements are presented in this section and include several non-regulatory areas including: Radiological Buffer Areas, Underground Radioactive Material Areas, and Soil Contamination Areas.

Notes

V. Chapter 3, Conduct of Radiological Work

The planning of radiological work, work preparation (e.g., Radiological Work Permits), and the requirements for the entry to and exit from the various types of controlled areas are contained in this chapter. Also covered are: radiological work performance, the aspects of radiological work in different operations with radiation-generating equipment, and construction and restoration projects.

A. Planning Radiological Work

This section emphasizes that the conduct of radiological work is a line responsibility. Worker responsibility, along with systematic planning, provides the necessary information for safe radiological work. Of fundamental importance is the requirement to plan work with an emphasis on ALARA principles.

B. Work Preparation

In this section, the Radiological Work Permit (RWP) is discussed. This chapter states that the RWP is the key to any particular radiological operation, and preplanning is essential.

C. Entry and Exit Requirements

The minimum requirements for entry into and exit from defined radiological areas and other non-regulatory areas are discussed in this section.

Notes

D. Radiological Work Controls

This section discusses radiological work as a team effort involving the Radiological Workers, their supervisors, and Radiological Control personnel. The DOE Radiological Control Standard discusses stop-radiological work authority for Radiological Control Technicians (RCTs), their supervisors, line supervision, and workers through their supervisors because of:

- Inadequate radiological controls
- Radiological controls not being implemented
- A radiological control hold point not being satisfied

DOE O 440.1A*, Worker Protection Program for DOE Federal and Contractor Employees*, March, 1998, specifies that individuals have the authority to stop work due to hazardous conditions.

This stop work authority is not limited to just radiological hazards. Workers may "stop work when they discover employee exposures to imminent danger conditions or other serious hazards." Contractors are required to have procedures addressing stop work authority.

E. Evaluation of Performance

Evaluation of performance, critiques, post job reviews, and lessons learned are discussed in this section.

Notes

F. Special Applications

This section examines the special aspects for the control of radiological work when working with the following:

- Plutonium
- Uranium
- Tritium
- Accelerators
- Radiation Generating Devices

G. Radiological Design Criteria

This section addresses design objectives for design of new facilities and modification of existing facilities.

VI. Chapter 4, Radioactive Materials

The requirements for labeling, storage, control, release, and transportation of radioactive materials, and the control of radioactive sources, are discussed in this chapter. This chapter also deals with the management of solid and liquid radioactive wastes, and airborne radioactivity. Support activities such as personnel protective clothing and equipment, laundry, decontamination and vacuum cleaners, and portable air-handling equipment are also discussed.

VII. Chapter 5, Radiological Health Support Operations

This chapter discusses the requirements for external dosimetry, internal dosimetry, a respiratory protection program, the handling of contaminated personnel, radiological monitoring and surveys, and instrumentation and calibration.

Notes

VIII. Chapter 6, Training and Qualification

The requirements that ensure personnel have the training and qualifications needed to safely work in and around radiological areas and to maintain their own doses and those of others (ALARA) are discussed in this chapter.

A. General Radiological Training

Within these sections, training and qualification standards are discussed for:

- General Employees
- Radiological Workers I and II
- Radiological Control Technicians and Supervisors

B. Other Radiological Training

This section addresses training and qualification for:

- Managers/supervisors
- ALARA training for:
  - Engineers
  - Schedulers
  - Procedure writers
- Radiological control personnel
  - Dosimetry technicians
  - Instrument technicians
  - Medical personnel
  - Records clerk
  - Whole body counter technicians
  - Laboratory personnel
- Radiographers

Notes

- Radiation-generating device operators
- Emergency response personnel

C. Training for Special Applications

This section addresses training for the following facilities:

- Plutonium
- Uranium
- Tritium
- Accelerators

IV. Chapter 7, Radiological Records

The requirements for employee and visitor records, radiological control procedures (policies, procedures, Radiological Work Permits (RWPs), ALARA, and quality assurance records), radiological surveys, instrumentation and calibration records, records management, and radiological reporting are presented in this section.