Part 4 of 5

Radiological Control Training for Supervisors
DOE-HDBK-1143-2001

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)

- Conduct oversight to ensure Departmental requirements are being complied with and appropriate radiological work practices are being implemented.
- Ensure radiological measurements, analyses, worker monitoring results, and estimates of public exposures are accurate and appropriately made.
- 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.
- Establish and maintain, from the lowest to the highest levels, line management involvement and accountability for Departmental radiological performance.
- 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 and their technical competence.
- 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).

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

Rules are codified in the Code of Federal Regulations (CFR) and may be subject to enforcement action including civil and criminal penalties. DOE Orders are contractually implemented and enforced through an award/fee contractual arrangement between DOE and the contractor.

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.

10 CFR 830 governs the conduct of DOE contractors, DOE personnel, and other persons conducting activities (including providing items and services) that affect, or may affect, the safety of DOE nuclear facilities. It includes quality assurance requirements and Technical Safety Requirements.

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.

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Notes

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

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.

Notes

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.

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:

Notes

- Prescriptive language
- 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 to DOE a written Radiation Protection Program (RPP). The cognizant DOE program office reviews submitted RPPs for approval.

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*

A. *Radiological Control*

In January 1992, a memorandum was sent to the heads of DOE elements involved in managing radiological control 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 Control*. 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 the DOE Radiological Control Standard and DOE orders. It is unlikely that there will be a conflict between the two documents, although one document may contain provisions that are 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.

E. Other Safety Policy and Orders

In addition to the occupational radiation protection requirements and recommendations previously discussed, DOE has established requirements for worker protection from other hazards. Some of these include:

- DOE P 411.1 Safety Management Functions, Responsibilities, and Authorities Policy
- DOE O 440.1A Worker Protection Management for DOE Federal and Contractor Employees
- 10 CFR 850 Chronic Beryllium Disease Prevention Program

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 of 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
- Concentrations of radioactive material in air

Notes

1. Summary of dose limits

   10 CFR Part 835 employs the rem unit for several different physical quantities (i.e. absorbed dose, effective dose equivalent, total effective dose equivalent, dose equivalent, committed dose equivalent, committed effective dose equivalent). For information about these quantities refer to 10 CFR Part 835 definitions. This training will use the term "dose" as a general term for all the above terms.

   These are the Federal limits. DOE encourages sites to adopt more restrictive Administrative Control Levels (ACLs). For most facilities an ACL of 500 mrem or less will be challenging for radiological workers.

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 limit

2. Planned special exposures (PSEs)

   It is acknowledged that unusual conditions can arise in which well documented 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 exposures exceeding the occupational limit.

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

D. Subpart D - Reserved

Notes

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 in 10 CFR 835.206(a).

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 limit in 10 CFR 835 Subpart C.

- 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 stated in 10 CFR 835.206(a).

   - 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 applicable limit in 10 CFR 835 Subpart C 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.

Notes

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.

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.

Notes

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 source or from any surface that the radiation penetrates.

   If an individual could 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.

Notes

- 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.

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 and are not addressed in this training. Some of the provisions of 10 CFR 835 Subpart L:

   - 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 by isotope and Curie content 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

Notes

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Notes

I. Introduction

II. A. The RadCon Standard (DOE-STD-1098-99) is a guidance document that describes DOE's policy and expectations for an excellent radiological control program, including radiation safety training for general employees, radiological workers and Radiological Control Technicians (RCTs).

Radiological safety training

General Employee Radiological Training

Personnel who may routinely enter controlled areas unescorted or receive occupational exposure during access to controlled areas should receive General Employee Radiological Training (GERT). GERT is generally recommended for all employees.

Radiological Worker I and II

- Workers whose job assignments require access to radiological buffer areas and radiation areas should complete Radiological Worker I training.

Notes

- Workers whose job assignments involve entry to the following areas should complete Radiological Worker II training:
  - Radiological buffer areas
  - Radiation areas
  - High and very high radiation areas
  - Contamination and high contamination areas
  - Soil contamination areas
  - Airborne radioactivity areas

- Radiological Worker I training is not a prerequisite for Radiological Worker II training.

- The following apply to specialized radiological worker training:
  - Completed for nonroutine operations or work in areas with changing radiological conditions
  - Taken in addition to Radiological Worker II training
  - Recommended for personnel planning, preparing, and performing jobs that have the potential for high radiological consequences

- RCTs – Chapter 6 of the Radiological Control Standard provides guidance on training of RCTs.

B. Radiological Controls Program

Line managers who manage, supervise or provide oversight of a Radiological Controls Program should receive training that is helpful in dealing with workers who have anxiety about radiation. This training should include the following:

- Guidance on handling such personnel interactions

- Emphasis on being factual

- Fundamentals of communicating risks

Notes

- Importance of keeping management informed

C. Radiological operations

Conduct radiological operations in a manner that controls the spread of radioactive materials, reduces exposure of the work force and the general public, and utilizes a process that seeks exposure levels that are as low as reasonably achievable.

Responsibilities

1. Supervisors should ensure that orientation, training, and indoctrination reinforce rules and guidelines for each worker to minimize radiation exposure and control radioactivity.

2. Prevention of the spread of radioactivity is less costly than remediation. Management should be willing to accept changes that will improve radiological control and should foster this mindset throughout the organization.

3. Supervisors and managers should encourage the work force to identify radiological control deficiencies and concerns. Prompt action should be taken to address and eliminate identified issues and prevent recurrence.

4. In cases where the work force does not have the required level of sensitivity for radiological work practices, additional management attention is needed to ensure the proper outcome. Actions should include the following:

   - More direct line supervision
   - Curtailment of work schedules
   - Deferral of work

Notes

- Addition of extra radiological control personnel
- Conduct of additional training

5. As part of their normal work review, work supervisors should periodically review ongoing jobs to ensure prescribed radiological controls are being implemented and periodically monitor those work areas.

6. Identify conditions that could lead to or promote the spread of contamination, or unsafe work and ensure corrections are implemented on a priority basis

7. "Stop Radiological Work" authority

   - "Stop Radiological Work" authority may be initiated for the following reasons:
     - Radiological controls are inadequate.
     - Radiological controls not being implemented.
     - Radiological control hold points not being satisfied.
     - Job scope changed.
     - Area conditions changed.
   - Once stopped, work should not be resumed until proper radiological controls have been established.
   - Resumption of radiological work should have the approval of the manager responsible for the work and the Radiological Control Manager.

D. Radiological measurements

Ensure radiological measurements, analyses, worker monitoring results, and estimates of public exposure are accurately and appropriately made and documented.

Notes

1. Personnel radiological records include the following:

   - Records of doses received by individuals monitored
   - Records containing information to identify individuals
   - External dose records shall include the following:
     – Applicable extremity, skin, eye, and whole body dose results
     – Evaluations resulting from anomalous dose results
     – Dose reconstruction
     – Evaluation of nonuniform doses
   - Internal dose records shall include the following:
     – Applicable whole body and lung counting results
     – Applicable bioassay results
     – Dose assessment
   - Records of dose equivalent to any organ
   - Total effective dose equivalent on annual bases
   - Dose equivalent to embryo/fetus of declared pregnant worker
   - Lifetime occupational dose, including cumulative total
   - Documented counseling of persons about radiological concerns
   - Records for authorization to exceed administrative control levels

Notes

- Emergency dose (shall be accounted for separately, but maintained with individual's record)
- Records of dose to skin caused by contamination
- Radiological incidents
- Radiological safety concerns, formally investigated
- Records of formal written declaration of pregnancy

2. Internal monitoring

- Baseline bioassay monitoring of personnel who are likely to receive intakes resulting in a committed effective dose equivalent of 100 mrem or more shall be conducted. This must be done before beginning any work that may expose them to internal radiation exposure.
- Management should require termination bioassay monitoring when a person who participated in the bioassay program terminates employment or concludes work that involves the potential for internal exposure.
- Bioassay analyses (routine bioassay) are performed at site specified frequencies following certain work activities
- Bioassay analyses (special bioassay) should be performed when any of the following occur:
  – Facial or nasal contamination is detected that indicates the potential for internal contamination.
  – Airborne monitoring indicates the potential for intakes exceeding 100 mrem committed effective dose equivalent.

Notes

- Any contaminated wound.
- Contamination on protective clothing, skin or facial area or unplanned spread of contamination on accessible areas above site specified thresholds.
- Detectable contamination inside a respirator after its removal.
- The Radiological Control Organization directs that bioassay analyses be performed when an intake is suspected.

E. Reducing exposure

Incorporate dose reduction, contamination reduction, and waste minimization features into the design of new facilities, or modification of existing facilities.

1. Maintenance and modification plans and procedures should be reviewed to identify and incorporate radiological requirements, such as the following:

   - Engineered controls
   - Dose reduction considerations
   - Contamination reduction considerations

F. Radiological performance

Establish and maintain, from the lowest to the highest levels, line management involvement and accountability for Departmental radiological performance.

Notes

1. Radiological performance goals

   - Goals are intended as a measure of and a motivation for improvement, and not an end in themselves.

   - Performance goals should have these characteristics:
     – Measurable
     – Achievable
     – Auditable
     – Challenging
     – Meaningful in promoting improvement

   - Goals need to be developed primarily by those responsible for performing the work.

   - Site-specific goals need to be developed.

2. Performance indicators

   - Performance indicators should be used as tools to assist management in focusing their priorities and attention.

   - Performance indicators should be tracked and trended for the prior 12-month period.

   - To promote worker awareness of their radiation exposure status, selected indicators related to their work group should be posted in the workplace.

   - Site-specific indicator status reports should be tracked.

Notes

I. Introduction

II. Overview

The workers participate in the organization radiation protection program and have some responsibility to protect themselves, however, they must rely upon the organization to provide a safe work environment, minimize exposure, and provide adequate training.

The first line supervisor has the final responsibility that supervised workers are fit and prepared for their work in radiological areas. Supervisors should not assume that the organization has assured that the worker is adequately trained and physically and mentally ready for the work. This responsibility, in addition to seeing that the job or task is completed properly, is placed upon the supervisor.

III. Work force

To maintain a healthy work force, it is imperative that individual employees arrive at the workplace mentally and physically prepared to act in a safe and effective manner. Problems that raise doubt regarding an employee's ability to act in a safe manner must be dealt with in a straightforward process that encourages the employee to seek the help needed and ensure that the safety of all workers is maintained. Such problems may include alcoholism, drug abuse, mental health disorders, and personal crises.

Notes

For the radiological workers, there are additional considerations that may also affect a worker's fitness for duty. These may include the ability to wear respiratory protection, pregnancies, exceeding exposure limits, and heat stress during work in protective clothing. Supervisors of radiological workers must be conscious of these considerations to ensure that their employees are able to perform radiological work in a safe and effective manner.

IV. Training/qualification

Radiological workers should be sufficiently qualified to recognize the symptoms of deteriorating radiological conditions and seek advice from Radiological Control Technicians and their supervisors.

Training requirements have been established to ensure that personnel have the training to work safely in and around radiological areas and to maintain exposure as low as reasonably achievable.

Examinations for Radiological Worker I and II training, and Radiological Control Technician Qualification shall be used to demonstrate satisfactory completion of theoretical and classroom material. Examinations should be written. However, alternatives may be used to accommodate special needs.

In addition, workers may need job-specific radiological training including specific procedure and hands-on tools/equipment training.

Formal records of training and qualification shall be readily available to first line supervisors of involved personnel to aid in making work assignments.

Notes

V. Dose limits and control levels

A. General

Dose limits provided in Subpart C of 10 CFR 835 shall not be exceeded. Administrative control levels are established to maintain personnel radiation exposure well below regulatory dose limits. These levels are multitiered. Increasing levels of authority are required to approve higher administrative control levels. Special consideration must be taken for radiological workers who are approaching administrative control levels.

B. Lifetime control levels

To administratively control a worker's lifetime occupational radiation exposure, a lifetime control level of N rem should be established where N is the age of the person in years. Special control levels (see Article 216 of RadCon Standard) should be established for personnel who have doses exceeding N rem.

A special control level for annual occupational exposure shall be established for each person with a lifetime occupational dose exceeding N rem. The special control level should not exceed 1 rem in a year and should allow the person's lifetime occupational dose to approach N rem as additional occupational exposure is received.

Notes

C. Medical exposures

An employer should be attentive to special circumstances of employees, such as those undergoing radiation therapy, and should establish an appropriate special control level.

D. Off-site exposures

Workers are responsible for notifying radiological control personnel of off-site occupational exposures so that individual dosimetry records can be updated.

VI. Declared pregnant employee

A. Notification of employer

After a female radiological worker voluntarily notifies her employer in writing that she is pregnant, for the purposes of embryo/fetal dose protection, she shall be considered a declared pregnant worker. Declarations of pregnancy may be revoked, in writing, by the declared pregnant employee at any time.

1. The employer should provide the option of a mutually agreeable reassignment of work tasks, without loss of pay or promotional opportunity, so that further occupational radiation exposure is unlikely.

Notes

2. For a declared pregnant worker who chooses to continue working as a radiological worker the following apply:

   - The dose limit for the embryo/fetus for the entire gestation period shall be no greater than 500 mrem.

   - Substantial variation above a uniform exposure rate that would satisfy the limits shall be avoided (e.g. 50 mrem/month).

3. If the dose to the embryo/fetus is determined to have already exceeded 500 mrem when a worker notifies her employer of her pregnancy, the worker shall not be assigned to tasks where additional occupational radiation exposure is likely during the remainder of the gestation period.

VII. Respirator protection

There are three main requirements that must be met by personnel prior to being issued a respirator. Personnel must be trained, fitted, and medically qualified to wear that specific type of respirator. Training and qualification testing shall be performed annually.

A. Respirator use

While using respiratory protection, personnel are expected to:

1. Perform fit checks of their respirators to ensure a proper seal before entering areas requiring respirator use.

Notes

2. Be clean shaven in the area of the fit.

3. Use corrective lenses, if needed, that are approved for respirators.

4. Be instructed to leave the work area when experiencing respirator failure.

5. Be instructed to remove their respirators to avoid life-threatening situations when exiting an area after respirator failure.

B. Exposure to airborne radioactive materials

10 CFR 835 establishes dose limits which includes internal dose from inhaling radioactive material. Use of engineering and administrative controls and proper use of personal protective equipment results in most planned internal doses being very low.

In cases of unplanned internal doses, potential intakes of radioactive material are suspected when personnel without respiratory protection are exposed to airborne radioactive materials or when respiratory protection has been compromised. If unplanned intakes of radioactive material are indicated that could result in a committed effective dose equivalent of 100 mrem or more, the following actions should be taken:

1. Identify personnel potentially exposed.

2. Determine the duration of potential exposure to airborne radioactivity.

3. Have dose evaluated prior to permitting the worker to return to radiological work.

Notes

VIII. Adverse work conditions

A. Heat stress

Heat stress may result from working in areas of high temperature, humidity, and radiant heat; working in protective clothing; and using respirators, particularly where other protective equipment is required. Heat stress has occurred at ambient temperatures less than 70°F when multiple sets of protective clothing or plastic suits were in use or strenuous work was involved.

1. Heat stress controls should be addressed in the planning stages for work.

2. Recommended work time limits and use of body cooling devices should be considered to reduce heat stress.

3. Job supervisors should inform their personnel of heat stress precautions prior to work on job assignments where heat stress may be a factor.

4. If a person begins to feel symptoms of heat stress, the person should immediately notify the nearest coworker, exit the area, remove personal protective equipment, notify the supervisor, and rest in a cool area. In such cases, medical assistance should be provided.

Notes

B. Other adverse physical conditions

Medical treatment of injuries takes precedence over radiological considerations. A worker with a contaminated injury should receive treatment by medically qualified personnel. An assessment should be made on the need for bioassay monitoring or further medical treatment. Until this assessment is completed, work restrictions may be needed. The worker should be counseled promptly on the medical and radiological implications resulting from the contaminated wound.

IX. Group activity

Notes

I. Introduction

II. Communication

A. Communicating is one of the basic functions human beings must perform. Since it is basic, often it is assumed that everyone communicates proficiently. That is not always the case. Often, everyday problems can be traced back to communication as a primary or contributing cause.

III. Interpersonal communication

A. Communication styles

Studies show that people tend to communicate in a style that best suits their given personality. There are many personality trait assessments available that give us a better understanding of who we are. Some examples are Myers-Briggs, Herman's Brain Dominance, and Birkman Methods.

B. The communication process

1. Sender's filters

- The sender has an idea that must be transmitted to a receiver.

- Perceptions, assumptions, attitudes, and past experiences are filters through which the sender's messages must travel. These can distort the idea.

Notes

- The sender's message is the focus of the process. It must have an objective (i.e., deliver information, motivate, stimulate, get/provide feedback). It must be concise, logical, and clear.

2. Receiver's filters

   - Similar to the sender, the receiver has his/her own filters that can also distort the message.

3. Understanding the message

   - It is not the logic of the sender's message that is important, but the logic of the received message. The sender must consider *how his message will sound to the receiver.*

   - The accuracy of message interpretation depends upon how well the sender projects the intent, motivation, values, and emotions of the message.

4. Medium

   - The medium used for communication can definitely distort the message.

Notes

C. Barriers/filters

1. Five types of communication barriers/filters

- There are two categories of social barriers:
  – Verbal - The use of words with emotional content can interfere with the reception of the intended message (e.g., politics, religion, race).
  – Nonverbal - Nonverbal barriers are usually involuntary or symbolic (e.g., clothes, grooming, or office setup).

- Physical barriers include elements such as noise, distance, data overload, time, media, handicaps, etc.

- Psychological barriers include elements such as tendency to smother information, difference in opinion, lack of trust, assumptions, attitudes, stress, and attention level.

- Individual barriers include elements such as needs, beliefs, education, religion, socioeconomics, culture, values, and self-concept.

- Neurological barriers occur as a result of the way the nervous system filters, distorts, deletes, and interprets information.

Notes

D. Listening skills

1. What is the role of the receiver in regard to listening?

2. Types of listening

Notes

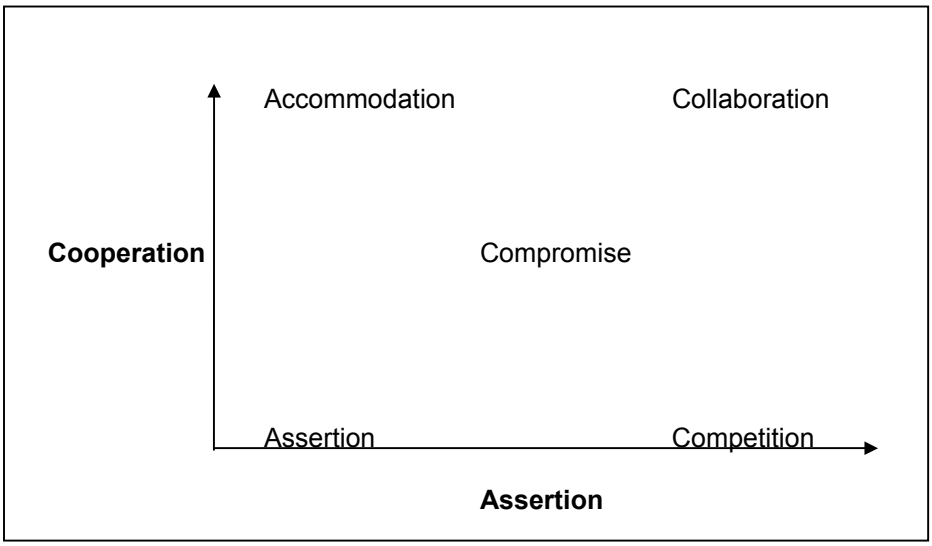
3. Deterrents to effective listening

4. Elements of active listening

Notes

E. Dealing with confrontation

Whenever people come together in any environment, there will be opportunities for confrontation. Confrontation can either stimulate or demoralize individuals. As a supervisor, it is essential that you learn how to deal with these situations appropriately. Following is a model that illustrates the various approaches to deal with conflict.



Notes

1. There are many styles of conflict management:

   - Avoidance - This style is considered the least cooperative and the least assertive. In this situation, conflict is not addressed. As a short-term strategy, it may work, but as a permanent strategy, problems may never get solved.

   - Accommodation - This style is characterized by cooperative, unassertive behavior. It means to place the needs and concerns of others above your own needs and concerns.

   - Competition - This style is considered the most assertive. It reflects one's desire to meet his or her needs at the expense of others.

   - Compromise - This style is between competition and collaboration and avoidance and accommodation. The objective is partial fulfillment of the needs, concerns, and goals of all parties concerned. The solution should be mutually acceptable and partially satisfying to everyone involved. Nobody wins and nobody loses.

   - Collaboration - This style uses both cooperation and assertiveness in an effort to satisfy the needs of all parties concerned. Collaboration includes the following:
     – Acknowledgment that conflict exists
     – Identification and acknowledgment of others' needs, concerns, and goals
     – Identification of alternative resolutions and consequences for each party involved

Notes

- Selection of the alternative that meets the needs and concerns of all parties
- Implementation of the alternative selected

2. Effective conflict resolution

For effective conflict resolution, establish rules in advance. Rules might include the following:

- When controversy arises, have one party who is not directly involved state the issues before further discussion is allowed.
- All parties must agree on the problem and specifically identify the common goal or solution.
- Each party must be able to restate the other's position to the satisfaction of the individual before any evaluation discussion is allowed.
- All parties will identify and agree upon the criteria to be used in resolving the controversy.

In conflict resolution, it is important to focus on issues--not people. When conflicts arise, keep the focus on the issues and not on the personalities involved.

The key to reaching collaboration is effective communication. The key to communication is trust, and the key to trust is honesty.

Notes

IV. Risk communication

A. Communicating risk

Due to the continuing concerns related to low-level radiation exposure and health effects, managers should be trained to deal with the perceptions that personnel have concerning radiation risks. Managers and first line supervisors should ensure that workers understand the fundamentals of radiation, its risks, and their role in minimizing exposure.

It is not sufficient to rely solely on regulatory limits for establishing or defining acceptable work practices and work environments.

Some personnel, such as those who may have internal deposition of radionuclides from prior years, are concerned about future exposures. Such instances warrant special attention on the part of the manager. Counseling with such personnel should be the preferred way to consider relevant factors. In some cases, special control levels should be applied.

B. Motivation to achieve excellence in radiological control

1. No one should be exposed to radiation unless an overall benefit from the associated activity is expected to be realized. As a corollary, the benefit should be maximized and the risk (exposure) minimized.

2. Some workers and members of the public perceive any radiation exposure as an unduly hazardous risk. Making an effort to reduce doses and documenting the actual doses received can reassure these people and reduce the prospects of litigation.

Notes

3. A side effect of trying to reduce doses is often an increase in efficiency and a decrease in incidents in performing radiological jobs, since greater planning is required. Records of past similar jobs can assist in planning future jobs and reduce dose further.

C. Fostering positive worker attitudes toward achieving excellence

Worker attitudes are key to radiological performance. A positive attitude makes a person take that one extra step. When everyone's attitude embraces radiological excellence, and the performance is excellent, the program will reduce exposure and environmental burdens.

Notes

D. Reducing risk

The following are elements of a radiological control program that help reduce risk:

1. Training must be aimed at what the worker should know in order to do his/her job rather than passing a quiz. The training needs to be documented and recorded accurately.

2. Records and reports are needed for every aspect of the program. Records must be accurate and understandable because they may be used to recreate events that are questioned in the future. Those who fill out, file, review, or otherwise handle records must understand their use and importance.

3. Radiological deficiencies and improvements must be used to develop plans that will further promote radiological excellence. Self-assessments, use of critiques, thorough investigations, and a willingness to be self-critical and accept responsibility are needed. When a radiological deficiency is identified, there should be an honest effort to understand, correct, document, and follow it to closure. Trending deficiencies aids in planning where resources are to be spent to make improvements.

Notes

V. Meetings/briefings/critiques

A. Running an effective meeting

In today's business environment, meetings have become a way of life. Today's work force spends a great deal of time "stuck" in meetings. It is essential for those people leading these meetings to become proficient in chairing a meeting. The following are considerations when conducting a meeting:

1. Objective(s)

   - Is a meeting the best way to handle this? If not, don't have a meeting.

   - What do you want to achieve by the end of the meeting? Ensure that participants are aware of your expectations.

2. Persons attending?

   - Who needs the information?
   - Who can contribute?
   - Who would expect to be involved?

3. Amount of prior notice

   - How much preparation time is required?

   - Should any pre-work be sent? Pre-work (i.e., history, data, graphs, etc.) can cut down on the time spent in the meeting.

Notes

4. Agenda

   - Establish a reasonable amount of work that you expect can be accomplished in the specified time.
   - Provide the agenda to participants prior to the meeting.
   - Have enough information in the agenda so that people understand what discussion topics are going to be covered.
   - Establish time limits for each item and attempt to meet them.

5. During the meeting

   - Determine who will be responsible for the meeting minutes.
   - Review the agenda and emphasize time limits.
   - Keep discussions focused on the topics associated with the meeting.
   - If action items are established, ensure individuals understand what is to be accomplished and when it is required to be done.
   - Summarize upon completion of the meeting.
   - Prepare and distribute the meeting results

Notes

B. Pre-job briefings

"Planning the work" is an essential part of an effective Integrated Safety Management program. During pre-job work planning meetings, all appropriate safety disciplines must be engaged to ensure that all work hazards are adequately addressed. The following addresses pre-job briefings for radiological controls. Other work hazards should be integrated using a similar approach.

Article 324 of the RadCon Standard recommends pre-job briefings be held prior to the conduct of work anticipated to exceed the site ALARA trigger levels. (This practice further establishes excellence in regard to radiological operations.)

1. The pre-job briefing should be conducted by the cognizant work supervisor. Workers and supervisors directly participating in the job, cognizant radiological control personnel, and representatives from involved support organizations should attend the briefing. A summary of the topics discussed and attendance at the pre-job briefing should be documented.

Notes

2. As a minimum, the pre-job briefing should include the following:

   - Scope of the work to be performed
   - Radiological conditions of the work place
   - Procedural and Radiological Work Permit requirements
   - Special radiological control requirements
   - Radiologically limiting conditions, such as contamination or radiation levels that may void the RWP
   - Radiological control hold points
   - Communication and coordination activities with other groups
   - Provisions for housekeeping and final cleanup
   - Emergency response provisions

Notes

C. Post-job evaluations

During the conduct of radiological work and the handling of radioactive materials, abnormal events may occur that could indicate a weakness or area of programmatic breakdown of radiological controls. Prompt, consistent gathering of facts related to such events is required to satisfy reporting and investigation requirements and to formulate corrective actions to prevent recurrence.

In addition, successful performance or completion of unique activities should be evaluated to identify and incorporate appropriate lessons learned. Analysis of the facts should reveal areas where improvements can be made or identify methods to prevent the recurrence of undesired results.

1. Critiques are meetings that document a chronological listing of the facts of an event. The purpose of the critique is not to assign blame. The following guidelines should be followed regarding critiques/occurrence investigations:

   - Critique meetings should be conducted for successes and abnormal events.
   - Properly trained critique leaders should facilitate the critique process.
   - Critique meetings should be conducted as soon as practical after the event or situation is stabilized or completed.
   - Minutes of the meeting must be kept.
   - All who can contribute should attend.
   - Supporting materials should be brought to the critique.

   Refer to RadCon Standard Article 351 for a complete list.

Notes

2. Post-job ALARA reviews may take the form of a debriefing or may be a review by one or more designated individuals and should be performed in the following cases:

   - After completion of a nonroutine radiological job or operation
   - After completion of a nonroutine or complex radiological job or operation if a pre-job formal radiological review was required or if an ALARA trigger level was exceeded in the course of the work

3. Lessons learned are available from post-job reviews, critique minutes, and occurrence reports (using the Occurrence Reporting and Processing System [ORPS]). Organizations responsible for radiological work and line management should evaluate lessons learned, provide prompt distribution, and incorporate the lessons into the Radiological Control Program.

Notes

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