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High-Level Waste Storage Tank Farms/242-A Evaporator Standards/Requirements Identification Document (S/RID), Vol. 4

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**Westinghouse
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REQUIREMENTS

IDENTIFICATION

DOCUMENT

FACILITY:

**HIGH LEVEL WASTE STORAGE
TANK FARMS/242-A
EVAPORATOR**

FUNCTIONAL AREA:

Radiological Protection

REVISION 0

REQUIREMENTS IDENTIFICATION DOCUMENT
HIGH LEVEL WASTE STORAGE TANK FARMS
Radiological Protection
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11.0 RADIOLOGICAL PROTECTION

INTRODUCTION

SCOPE

The Radiological Protection (RP) Functional Area Requirements Identification Document includes both regulatory requirements and industry recommendations/ good practices which define the elements of a complete and proper RP Program.

Radiation protection of personnel and the public is accomplished by establishing a well defined Radiation Protection Organization to ensure that appropriate controls on radioactive materials and radiation sources are implemented and documented. The Radiation Protection Organization operates via both clearly defined procedures and by ensuring the personnel are properly trained to apply good radiation protection practices and appropriate limits for all work activities performed at the facility. Verification of the effectiveness of these controls, procedures and limits is established through a network of monitoring and sampling of personnel, the workplace, and the adjacent environment. Record management and controls are required to demonstrate compliance with regulations, to establish personnel exposure trends and histories, and to respond to reporting requirements.

This RID applies to the activities, personnel, structures, systems, components, and programs involved in executing the mission of the Tank Farms. The physical boundaries within which the requirements of this RID apply are the Single Shell Tank Farms, Double Shell Tank Farms, 242-A Evaporator-Crystallizer, 242-S, T Evaporators, Liquid Effluent Retention Facility (LERF), Purgewater Storage Facility (PWSF), and all interconnecting piping, valves, instrumentation, and controls. Also included is all piping, valves, instrumentation, and controls up to and including the most remote valve under Tank Farms control at any other Hanford Facility having an interconnection with Tank Farms. The boundary of the structures, systems, components, and programs to which this RID applies, is defined by those that are dedicated to and/or under the control of the Tank Farms Operations Department and are specifically implemented at the Tank Farms.

The Nuclear Safety functional area describes when nuclear accident dosimetry must be used and thus interfaces with the Radiation Protection functional area. Radiation Protection personnel will assure that the nuclear accident dosimetry is acceptable under the dosimetry program which they administer. The Radiation Protection (RP) functional area interfaces with all other functional areas in the sense the personnel must interface with the Radiation Protection Organization in order to perform work and must also adhere to the requirements established the Radiation Protection Personnel to ensure protection of plant workers and the public.

Additionally, RP has numerous direct interfaces with other functional areas including training, Quality Assurance and Management Systems.

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11.1

PROGRAM MANAGEMENT

This element addresses the requirements for management and organization of an effective RP Program. Formal organization of an RP Program is necessary to ensure that a well defined and controlled approach to management of the program and execution of the program is achieved. Establishment of a formal organization which meets or exceeds both requirements and industry guidelines/ good practices enhances the potential for achieving a quality program and for attaining optimum levels of safety performance and efficiency. This element describes the extent of the formal RP Program organization structure necessary to define and communicate where personnel are assigned, what tasks they are expected to accomplish, methods for accomplishment, and management's expectations for performance. Expectations for performance include requirements related to establishing and tracking goals specific to Radiation Protection.

This element also defines specific management requirements and commitments related specifically to Radiation Protection programs and the policy for response to abnormal radiological situations.

The Management and Organization element for Radiation Protection includes requirements which are specific to Radiation Protection and likely do not apply to other functional areas. The Management Systems functional area interfaces with Radiation Protection Functional Area by providing requirements which are essential to the conduct of Radiation Protection, but which also are essential to the conduct of operations within other functional areas.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 141.1

**"Contractor Radiological Control Organization
Radiological Control Organization**

A Radiological Control Organization should be established to provide relevant support to line managers and workers. To effectively function, the Radiological Control Organization should be independent of the line organizational element responsible for production, operation or research activities and should have an equivalent reporting level. A single, dedicated Radiological Control Organization for the site should be sufficient. At larger DOE sites where facilities, buildings or work areas are dispersed, an approach that provides site-wide consistency and individual facility radiological control support is recommended. The senior line manager responsible for operations at a facility should have assigned radiological control personnel dedicated to the facility. Consistency of radiological control is critical. It is not the intent of this Manual to duplicate organizations but to use personnel in a more effective manner in workplace situations."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 141.2

"Radiological control personnel shall ensure adherence to the Site-Specific Radiological Control Manual and be available to the facility line manager for radiological support to the work force. To effectively function in this capacity, they should receive their day-to-day priorities from facility managers. To ensure independence in making

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correct radiological decisions, the Radiological Control Organization should be accountable to the Radiological Control Manager."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 141.3

"The Radiological Control Manager heads the Radiological Control Organization and is responsible for and should establish a high quality Radiological Control Program."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 141.4

"The Radiological Control Manager shall have access to the senior site executive for radiological control matters."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.1.2

"2. Organizational responsibilities for radiological protection are well defined and understood."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.1.5

"Responsibilities and authorities for each radiological protection technician position on the site/facility are clearly defined and sufficient to control work activities to protect employees."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.1.6

"Personnel clearly understand their authority, responsibilities, accountabilities, and interfaces with supporting groups."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.1.8

"The radiation protection manager has direct access to the operations managers and has sufficient authority to perform his duties effectively."

11.1.1

RP Staffing

This element includes requirements related to ensuring adequate staffing for Radiation Protection support during facility operations is maintained and ensured.

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.1.3

"3. Staffing and resources are sufficient to accomplish assigned tasks."

SITE REQUIREMENT SOURCE: NUREG-0761 Section 3.b(3)

"The minimum staffing by shift, for each component in the radiation protection organization, specifying the numbers in terms of professionals, foreman, senior and junior technicians, and technicians in qualification. Enough radiation protection personnel should

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be present at the station to ensure that all routine radiation protection functions can be completed in a timely manner and that all radiation protection requirements can be met during normal operations, anticipated operational occurrences, unanticipated radiological events, and major accidents. Guidelines for minimum ratios of controlled area workers to radiation protection technicians should be established. Plans for augmented staffing during outages and accidents should be described. As a minimum, there must be an individual with the qualifications specified in Regulatory Guide 1.8 for RPM assigned to the site. There should be a qualified substitute for the RPM available to the site when the RPM is not available for extended periods due to illness, travel, or vacation. For short-term absences, a substitute qualified to carry out the RPM's emergency duties should be designated. In addition, an individual qualified as a radiation protection technician (senior technician), as specified in Regulatory Guide 1.8, or a technician qualified in accordance with a qualification program specified in technical specifications shall be onsite when there is fuel onsite after initial operation. The ratio of supervisors/foremen to technicians should be established and described."

11.1.2

RP Selection and Qualification

This element includes requirements for the appropriate selection and qualification of personnel to perform specific RP related jobs.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 142.1

"Radiological Control Manager Qualifications

The Radiological Control Manager should be an experienced professional in radiological control and be familiar with the design features and operations of the facility that affect the potential for exposures of persons to radiation."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 142.2

"The Radiological Control Manager should have the technical competence and experience to establish radiological control programs and the supervisory capability to direct the implementation and maintenance of radiological control programs."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 142.3

"The Radiological Control Manager should have a minimum of a bachelor's degree or the equivalent in science or engineering, including some formal training in radiological control. Advanced academic degrees can count as experience where course work related to radiological control is involved. At least three years of professional experience should be in applied radiological control work. Certification by the American Board of Health Physics provides equivalency to the above."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 142.4

"In situations where the most effective manager for this position does not satisfy the above qualifications, special arrangements should be made. In these situations, the assignment of a deputy with the requisite expertise and qualifications can satisfy the requirement."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 142.5

"Management should provide persons assigned to or being considered for the Radiological Control Manager a structured program leading to certification by the American Board of Health Physics."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 143.1

"Radiological Control Organization Functions and Staffing
The senior staff of the Radiological Control Organization should include health physicists and other professionals with four-year degrees in science or engineering. A continuing training program shall be established. Pursuit of certification by the American Board of Health Physics for senior and professional staff members is encouraged."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 143.2

"Radiological support personnel provide health physics and radiological engineering, dosimetry, bioassay, independent oversight, instrumentation and calibration functions. These personnel should have technical qualifications pertinent to their assigned duties."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 144.1

"Relationship Between Radiological Control Technicians and Workers Radiological Control Technicians and their supervisors perform the functions of assisting and guiding workers in the radiological aspects of the job. Radiological workers should be sufficiently qualified to recognize the symptoms of deteriorating radiological conditions and seek advice from Radiological Control Technicians and their supervisors."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 146.3

"Radiological Assessor
This position should be staffed by a professional who is adept at identifying technical and management problems. This person should participate in continuing training to develop professional and management skills."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 614.1

"Qualification Standards for Radiological Control Technicians Qualification Standards define the requirements for demonstrating completion of training. Signatures on the forms in Qualification Standards shall document satisfactory proficiency."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 614.2

"Qualification Standards from the standardized core course shall be used."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 614.3

"The qualification Standards from the standardized core course shall be supplemented to include site-specific elements."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 614.4

"Qualification Standards for the Radiological Control Technician position shall include on-the-job training to provide hands-on experience directly applicable to the job."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 614.5

"On-the-job trainees shall be under the control of qualified personnel. Before performing a job function without direct supervision, a trainee with partially completed qualifications shall have completed the qualifications for that task."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 615.1

"Oral Examination Boards

An Oral Examination Board shall determine the qualification of candidates for Radiological Control Technician and Supervisor positions."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 615.2

"The Radiological Control Manager shall designate the Board members and appoint a Chairperson."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 615.3

"The Board constituted to evaluate Radiological Control Technician qualification should be composed of at least three persons to include a Radiological Control Technician Supervisor, Radiological Control staff, and line management operations department supervisors and staff personnel, as applicable. Radiological Control Technician Instructors may participate as nonvoting members."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 615.4

"The Board should assess the candidate's response to normal and emergency situations. Questions should be of the type that are not normally covered in a written examination."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 615.5

"The Board constituted to evaluate Radiological Control Technician Supervisor qualification should not include peers or subordinates as voting members."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 641

"Radiological Control Technician Qualification Requirements

Training and qualification of Radiological Control Technicians and their immediate supervisors shall address routine operations and also focus on recognizing and handling situations in both normal and changing radiological conditions. Newly qualified technicians and those still in training should be given the opportunity to work with qualified, experienced technicians to foster development."

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RELATED REFERENCES

1. DOE/EH0256T Article 641

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 642.1

"Radiological Control Technician

Radiological Control Technician qualification consists of the standardized core course training material, on-the-job training per the Qualification Standards, and passing both a final comprehensive written examination and final Oral Examination Board."

RELATED REFERENCES

1. DOE/EH0256T Article 642

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 642.4

"Entry-level prerequisites shall be established to ensure that Radiological Control Technicians meet standards for physical condition and education. At a minimum, these standards should include the following:

- a. High school education or equivalency;
- b. Fundamentals of mathematics, physics, chemistry and science;
- c. Systems and fundamentals of process, operations and maintenance;
- d. Reading and comprehension level sufficient to follow procedures, write permits, prepare survey maps, write reports and prepare shipping and transfer permits;
- e. Ability to work in a support role, including communicating verbal instructions to others;
- f. Physical requirements to handle Personal Protective Equipment, other equipment and assist others in work locations, commensurate with assignment."

RELATED REFERENCES

1. DOE/EH0256T Article 642

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 642.5

"Radiological Control Technicians are encouraged to pursue registration by the National Registry of Radiation Protection Technologists (NRRPT)."

RELATED REFERENCES

1. DOE/EH0256T Article 642

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 642.6

"Sites are encouraged to give credit toward completion of standardized core training requirements for NRRPT registration."

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RELATED REFERENCES

1. DOE/EH0256T Article 642

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 644.1

"Radiological Control Technician Supervisors
Radiological Control Technician Supervisors shall have qualified as Radiological Control Technicians and should participate in continuing radiological training programs."

RELATED REFERENCES

1. DOE/EH0256T Article 644

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 644.2

"Radiological Control Technician Supervisors should have supervisory and leadership capabilities to direct the work of technicians; effectively interact with crafts, line supervisors, professional staff and other managers; and be able to respond and direct others in emergency and abnormal situations. "

RELATED REFERENCES

1. DOE/EH0256T Article 644

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 644.3

"Radiological Control Technician Supervisors shall be requalified every 2 years through comprehensive Oral Examination Boards in accordance with Article 615."

RELATED REFERENCES

1. DOE/EH0256T Article 644

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 644.4

"Oral Examination Boards should focus on the ability to analyze situations and supervise subordinates. The Radiological Control Technician Supervisor's depth of knowledge should exceed that expected of a Radiological Control Technician."

RELATED REFERENCES

1. DOE/EH0256T Article 644

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 645.1

"Subcontracted Radiological Control Technicians
Subcontracted Radiological Control Technicians should have the same knowledge

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and qualifications required of facility technicians performing the same duties. At a minimum, the training and qualification program should include the following:

- a. Review of resumes to identify technicians with experience in jobs similar to those for which they will be employed;
- b. Written examination and oral evaluation to verify appropriate knowledge level;
- c. Identification of the duties technicians will be authorized to perform;
- d. Training in facility procedures and equipment associated with the authorized duties;
- e. Training on recent operating experience;
- f. Observation of on-the-job performances by the Radiological Control Technician Supervisor."

RELATED REFERENCES

1. DOE/EH0256T Article 645

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 645.2

"Subcontracted technicians who work at the facility for extended time periods (more than 6 months) should receive continuing training commensurate with their assigned duties. This should include successful completion of an oral examination."

RELATED REFERENCES

1. DOE/EH0256T Article 645

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 645.3

"Radiological Control Technical Supervisors shall be requalified every 2 years through comprehensive Oral Examination Boards in accordance with Article 615."

RELATED REFERENCES

1. DOE/EH0256T Article 645

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 654.1

"Radiological Control Personnel

Radiological Control technical staff and management should have:

- a. A combination of education and experience commensurate with their job responsibilities;
- b. Continuing training based on an assessment of job responsibilities to maintain and enhance proficiency;
- c. Continuing training to remain cognizant of changes to the facility, operating experience, procedures regulations and quality assurance requirements."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 654.2

"Radiological support personnel include but are not limited to: dosimetry technicians, instrument technicians, medical personnel, records clerks, whole body counter technicians and laboratory personnel."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 654.5

"Certification and involvement with professional industry organizations should be encouraged."

11.1.3

RP Training

This element includes requirements relating to the establishment of training programs for RP personnel and the curriculum which must be included as part of that program to ensure RP personnel are appropriately qualified to provide Radiation Protection support.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 121.10

"The authority and responsibility to establish a comprehensive and effective radiological control training program should be assigned to line managers and their subordinates. Training, in most cases, should be provided by a dedicated training organization, but the responsibility for quality and effectiveness rests with line management."

RELATED REFERENCES

1. DOE/EH0256T Article 121, Paragraph 9

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 122.2

"Improving the attitude of the work force should be supported by the training program. To achieve this, training personnel need to be knowledgeable about the work environment and those aspects of radiological control that are important to developing a better worker attitude and perspective."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 124.1

"Radiation and Risk Communications

Due to the continuing concerns of many people related to low radiation exposure and health impacts, managers should be trained to deal with the perception of personnel concerning radiation risks. Managers and first-line supervisors should be sensitive to the fact that workers have to 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. Appropriate personnel should receive training which is helpful in their dealing with workers who have anxiety about radiation. This training should include the following:

- a. Guidance on handling such personnel interactions
- b. Emphasis on being factual
- c. Fundamentals of communicating risks
- d. Importance of keeping management informed."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 126

"Improving Worker Awareness of Radiological Conditions

In performing assigned duties within radiological areas, workers should be familiar with the area radiological conditions and be aware of the possibility that changes may occur due to unforeseen reasons. Although the conduct of radiological surveys is viewed as a traditional role of Radiological Control Technicians, experience has shown that properly trained and qualified workers are capable of performing supplemental radiological surveys in the course of work. This process results in exposure savings and improved contamination control.

Specific examples of surveys that may be effectively performed by workers and result in ALARA exposure reductions include self-monitoring of dose rates during High Radiation Area entries and the monitoring of tools and equipment for contamination as a quantitative check during work in Contamination Areas. The performance of legal record surveys such as release surveys remains the responsibility of qualified Radiological Control Technicians."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 612

"Standardization

Standardized core courses and training materials shall be used to achieve consistency Department-wide. In establishing local training programs, the standardized core courses shall be presented and site-specific information shall be added. For example, training at accelerator facilities should expand course content for high energy radiation and activation products. Training at plutonium facilities should expand the course content for alpha control. In all cases, the standardized core course materials should be fully implemented. Standardized core course training material developed and maintained by DOE Headquarters (EH) consists of lesson plans, viewgraphs, student handbooks, qualification standards, question banks and wallet-sized training certificates. The standardized core course training materials were based on ASTM E 1168 87, "Standard Guide for Radiological Protection Training for Nuclear Facility Workers," and were developed using the principles of performance-based training per DOE 5480.20. The standardized core course for the Radiological Control Technicians partially fulfills DOE training accreditation requirements of DOE 5480.18A."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 612.1

"Standardized core course training material shall be used for General Employee Radiological Training, Radiological Worker I and II training and Radiological Control Technician training."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 612.2

"Wallet-sized training certificates that identify current training status should be provided."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 612.3

"Successful completion of the standardized courses for General Employee

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Radiological Training, Radiological Worker I and II and Radiological Control Technician at one DOE site shall be recognized by other DOE sites. However, site-specific aspects of the radiological training shall be completed. Site-specific training for General Employee Radiological Training and Radiological Worker I and II training may be included with other site orientation training."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 612.4

"At sites where there are multiple facilities, the training may be facility-specific if personnel access is limited to those facilities for which training has been completed."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 612.5

"The site Radiological Control Manager or a designee shall concur in site-generated radiological training material."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 613.2

"Training should address both normal and abnormal situations in radiological control."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 613.5

"Site-specific training and refresher training shall include changes in requirements and updates of lessons learned from operations and maintenance experience and occurrence reporting, for the site and across the DOE complex."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 613.6

"Verification of the effectiveness of radiological control training should be accomplished by surveying a limited subset of former students in the workplace. This verification is in addition to performance evaluations routinely performed by training departments. This evaluation should include observation of practical applications, discussions of the course material, and may include written examinations. The survey should be performed by Radiological Control managers and supervisors, quality assurance personnel or senior instructors after the former student has had the opportunity to perform work for several months. The results should be documented."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 642.2

"Radiological Control Technician training shall use the standardized core course training materials and in addition should emphasize site-specific information."

RELATED REFERENCES

1. DOE/EH0256T Article 642

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 642.3

"Radiological Control Technician candidates who have prerequisite knowledge, such as college credit, operational experience or related qualifications, may satisfy individual sections of the standardized core course training requirements by passing comprehensive challenge examinations."

RELATED REFERENCES

1. DOE/EH0256T Article 642

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 643.1

"Continuing Training
Following successful completion of standardized core course requirements including practical training, the Radiological Control Technician shall pass both a comprehensive written examination and an Oral Examination Board for final qualification."

RELATED REFERENCES

1. DOE/EH0256T Article 643

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 643.2

"Following Oral Examination Board qualification, the Radiological Control Technician should begin a 2-year cycle of continuing training required for requalification. Every requalification requires completion of practical training, a comprehensive written examination and a final Oral Examination Board."

RELATED REFERENCES

1. DOE/EH0256T Article 643

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 643.3

"Continuing training should provide continued improvement in the knowledge and skills of the Radiological Control Technician."

RELATED REFERENCES

1. DOE/EH0256T Article 643

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 643.4

"Continuing training should include site-specific and DOE-wide changes in requirements and updates of lessons learned from operating experience and industry events."

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RELATED REFERENCES

1. DOE/EH0256T Article 643

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 644.1

"Radiological Control Technician Supervisors
Radiological Control Technician Supervisors shall have qualified as Radiological Control Technicians and should participate in continuing radiological training programs."

RELATED REFERENCES

1. DOE/EH0256T Article 644

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 651

"Other Radiological Training
Management Training
Line Managers (DOE and contractors) who manage, supervise or provide oversight of Radiological Control Programs shall be trained in the principles of this Manual. Such training should be based on DOE standardized core course training materials supplemented by site-specific procedures and be completed by new personnel prior to formally assuming line supervision and management responsibilities. Incumbents should participate in continuing training. The continuing training should emphasize self-assessment and external evaluations including performance indicators, root causes and lessons learned based on operational experience."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 654.3

"Radiological support personnel should have:

- a. Training on standardized core course topics from Radiological Worker I and II and Radiological Control Technician training and additional job-specific topics, as applicable;
- b. Training appropriate to the tasks to be performed;
- c. Continuing training to provide continued improvement in knowledge and skills.

"

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 656.5

"Training should make it clear that lifesaving has priority over radiological controls."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 656.6

"Records of this training should be maintained."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 663

"Tritium Facilities

The following topics should be considered in addition to standardized core training requirements at tritium facilities:

- Properties of tritium
- Sources of tritium
- Exposure pathways and forms of tritium
- Exposure control
- Tritium containment
- Special instruments and measurement techniques
- Personnel protection
- Inventory control and accountability
- Airborne tritium measurement
- Airborne tritium controls
- Effluent recovery systems
- Tritium releases
- Bioassay program
- Biological effects."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.o(3)

"Radiation Protection Technician. Radiation protection technician training and retraining programs shall be established and conducted at a sufficient frequency, not to exceed every 2 years, to familiarize technicians with the fundamentals of radiation protection and the proper procedures for maintaining exposures ALARA. This program shall include both classroom and applied training and shall precede or be concurrent with assignment as a radiation protection technician while under the supervision of a trained individual. The knowledge of radiation safety fundamentals possessed by radiation protection technicians should be certified by examination prior to an unsupervised work assignment. The training program should include the topics listed in the paragraph (2) above and should emphasize procedures specific to the facility where the technician is assigned. The level of training in each topic is to be commensurate with the technician's assignment."

SITE REQUIREMENT SOURCE: INPO-88-010 Chapter II, Section C.2, Paragraph 1

"Radiological protection technicians receive theoretical and practical training in radiological protection. This training includes basic mathematics, physical science, plant systems, fundamental health physics (including health risks of occupational radiation exposure), operations of radiological protection equipment, practical application of health physics methods, and use of radiological protection procedures. The most important training for radiological protection technicians and their immediate supervisors is in recognizing and handling unusual situations involving radioactivity. The training program should stress that the potential for changing or abnormally high radiation levels in certain plant areas or systems could impact work in progress. Written, oral, and practical examinations and on-the-job training are given to each technician to ensure that he has the knowledge and skills needed to perform his job. Each nuclear station's radiological protection technician training program is accredited."

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11.1.4

Management Requirements/Commitments

This element addresses requirements for Radiation Protection Management to ensure commitments and responsibilities for major aspects of a sound and complete radiation protection program are established.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 121.1

"Senior Management Commitment

Senior managers should establish high standards for the performance of radiological control. These standards and management expectations should be frequently communicated to the work force."

RELATED REFERENCES

1. DOE/EH0256T Article 121, Paragraph 9

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 121.11

"Senior managers should be alert to opportunities for minimizing the generation of radiological waste and discharges to the environment, controlling contamination at its source and reducing radiation exposure to workers and the public."

RELATED REFERENCES

1. DOE/EH0256T Article 121, Paragraph 9

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 121.12

"Reporting a problem to a superior (contractor or DOE) does not absolve the manager from promptly fixing or mitigating a situation."

RELATED REFERENCES

1. DOE/EH0256T Article 121, Paragraph 9

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 121.2

"Senior managers should state in writing their firm commitment to a Radiological Control Program of the highest quality. Management commitment and support are demonstrated by allocating sufficient resources including personnel and providing for training to ensure workers are qualified for their assigned duties."

RELATED REFERENCES

1. DOE/EH0256T Article 121, Paragraph 9

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 121.3

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

RELATED REFERENCES

1. DOE/EH0256T Article 121, Paragraph 9

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 121.4

"Managers should hold workers and their supervisors accountable for radiological control performance. Relevant knowledge and performance should be assessed as a specific part of each person's performance evaluation. This assessment should not be limited to those who perform radioactive work, since many other workers have an impact on the Radiological Control Program."

RELATED REFERENCES

1. DOE/EH0256T Article 121, Paragraph 9

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 121.5

"Senior managers should solicit feedback from their radiological control professionals, line management and workers on radiological control performance."

RELATED REFERENCES

1. DOE/EH0256T Article 121, Paragraph 9

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 121.6

"Senior managers should adopt and promote a positive attitude toward radiological control that encourages initiatives to identify concerns at an early stage, to prevent problems from deteriorating and to promote doing the right job correctly the first time."

RELATED REFERENCES

1. DOE/EH0256T Article 121, Paragraph 9

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 121.7

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

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RELATED REFERENCES

1. DOE/EH0256T Article 121, Paragraph 9

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 125.2

"Managers at all levels are expected to be involved in the planning, scheduling and conduct of radiological work. Assurance of adequate radiological safety should not be compromised to achieve production, remediation or research objectives."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 125.3

"Supervisors should be technically knowledgeable and inquisitive and should ask questions of the work force concerning radiological work details to assure and demonstrate worker understanding and comprehension."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 125.4

"Line managers should periodically monitor work areas to observe personnel at work and to identify radiological deficiencies and concerns. Frequent inspections and walk-throughs, including off-hours and weekends (where appropriate), are essential to reinforce management expectations to the work force."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 125.5

"Managers, supervisors and workers should be involved in the development of accurate, clear, written procedures for performing radiological work. If during the use of procedures a written requirement cannot be responsibly followed, the work should be stopped and guidance obtained."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 125.6

"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. Retraining, indoctrination and procedure review are useful in addressing these issues."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 125.7

"Managers and supervisors should establish working conditions that encourage improved radiological control. This includes temperature, humidity and lighting as well as the more difficult considerations of accessibility. Work conditions should be considered in planning work."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 125.8

"Cleanliness and good housekeeping are essential. A good Radiological Control Program cannot exist in a sloppy, dirty workplace. Cleaning up after

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operations should be automatic for each person. It is not reasonable to expect radiological control to be separated from the work environment; they go together."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.1

"PERFORMANCE OBJECTIVE: Site/facility organization and administration should ensure effective implementation and control of radiological protection activities on the site/facility."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.1.4

"4. Appropriate responsibilities are assigned to site management personnel for such matters as:

- minimizing personnel radiation exposure;
- minimizing the contamination of areas, equipment, and personnel; and
- reducing solid radioactive waste volumes."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.1.7

"Radiological protection requirements are actively administered by site/facility management and supervision and adhered to by personnel."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.1.9

"Managers and supervisors observe radiological protection activities to ensure adherence to established policies and procedures and to identify and correct problems."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.2
ACCIDENTS/INCIDENTS.5

" 5. Management response to prevention and/or correction of incidents is positive. There is adequate follow-up, including additional training of workers, to keep all employees informed of the types of incidents that are occurring to enhance their safety consciousness or awareness."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.2 INTERNAL AUDITS.6

"6. Management is aware of the findings and recommendations from the internal audit and assures appropriate follow-up action."

11.1.5

Radiological Program Performance Goals

This element includes those requirements related to the establishment of Radiation Protection performance goals, the tracking of performance versus goals and the appropriate use of and response to performance reports.

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 121.8

"Senior managers shall require and approve radiological improvement goals. Goals should be measurable, realistic, auditable and challenging. Established goals should not be changed without technical justification and senior management approval. Senior management shall review progress toward the goals at least quarterly."

RELATED REFERENCES

1. DOE/EH0256T Article 121, Paragraph 9

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 121.9

"A performance indicator program for measuring and trending the effectiveness of the Radiological Control Program against predetermined goals should be established and maintained."

RELATED REFERENCES

1. DOE/EH0256T Article 121, Paragraph 9

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 131.1

**"Improving Radiological Performance
Radiological Performance Goals**

Goals are intended as a measure of and a motivation for improvement, not an end in themselves. These performance indicators are not to be viewed narrowly as numerical goals. These indicators should be used as tools to assist management in focusing their priorities and attention. The following are examples of goals that may be appropriate: Person-Rem of Collective Exposure: This goal should be based upon planned activities and historical performance. For those sites that have neutron radiation, a goal for neutron person-rem should also be established."

RELATED REFERENCES

1. DOE/EH0256T Article 131

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 131.2

"Numbers of Skin and Personal Clothing Contamination Occurrences: Personnel contaminations may indicate a breakdown of controls intended to prevent the spread of contamination."

RELATED REFERENCES

1. DOE/EH0256T Article 131

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 131.3

"Number of Intakes of Radioactivity: Personnel intakes of radioactivity should be minimized and management should focus attention on any failure of the controls that results in intakes."

RELATED REFERENCES

1. DOE/EH0256T Article 131

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 131.4

"Square Feet of Contaminated Area (within buildings): Operating with a smaller contaminated area results in less radioactive waste, fewer personnel contaminations and improved productivity. The reduction of existing contaminated areas needs to be balanced by the recognition that this generates radioactive waste. Goals for both should be correlated."

RELATED REFERENCES

1. DOE/EH0256T Article 131

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 131.5

"Cubic Feet of Radioactive Waste: Minimizing the generation of radioactive waste reduces the environmental impact of DOE operations, helps reduce personnel exposure and reduces costs associated with handling, packaging and disposal."

RELATED REFERENCES

1. DOE/EH0256T Article 131

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 131.6

"Curies of Liquid and Airborne Radioactivity Released: Minimizing effluents reduces the environmental impact of DOE operations and reduces the costs associated with remediation."

RELATED REFERENCES

1. DOE/EH0256T Article 131

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 132.1

**"Management of Radiological Performance Goals
The contractor senior site executive shall establish, approve and maintain a radiological performance goals program."**

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RELATED REFERENCES

1. DOE/EH0256T Article 132

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 132.2

"The performance goals should be measurable, achievable, auditable challenging, and meaningful in promoting improvement."

RELATED REFERENCES

1. DOE/EH0256T Article 132

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 132.3

"Goals need to be developed primarily by those responsible for performing the work. Forming a Radiological Awareness Committee that includes the active participation of the work force is encouraged."

RELATED REFERENCES

1. DOE/EH0256T Article 132

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 132.4

"Radiological performance goals should be reviewed at least annually and revised as appropriate. Normally, more stringent goals should be set annually to reflect the improved radiological performance at the facility. Occasionally, a goal may be made less stringent to accommodate changes in work load or mission."

RELATED REFERENCES

1. DOE/EH0256T Article 132

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 133.1

"Radiological Performance Reports

The Radiological Control Manager should provide a periodic summary report to the contractor senior site executive for sites which exceed all annual collective dose of one person-rem. This report is suggested to be monthly but should not be less frequent than quarterly. This report should include at least the radiological performance goals established in accordance with Article 131. Examples of indicators that provide a more detailed analysis of performance are identified in Table 1-1. Indicators should be contained in the report for the month as well as tracking and trending for the prior twelve month period."

RELATED REFERENCES

1. DOE/EH0256T Article 133

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 133.2

"The Radiological Control Manager should provide radiation exposure information, such as supplemental dosimeter-readings or volume of waste generated, to supervisors and managers on a frequent enough basis to permit priority management of exposure control. The frequency should be consistent with the nature of the workload and the radiation exposure potential."

RELATED REFERENCES

1. DOE/EH0256T Article 133

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 133.3

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

RELATED REFERENCES

1. DOE/EH0256T Article 133

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.1.13

"13. Site/facility managers are aware of trends with regard to occupational radiation exposures, quantity and quality of solid and liquid radioactive waste, contamination and radiation levels and the number and location of radiation and contaminated areas within the site/facility."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.1.14

"14. Radiological protection personnel are actively encouraged to develop improved methods of meeting radiation protection objectives and goals."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.1.15

"15. Indicators of radiological protection performance are established and periodically assessed to enhance radiological protection effectiveness."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.2

"PERFORMANCE OBJECTIVE: The internal audit program for both routine operations and unusual radiological occurrences should provide adequate performance assessments."

11.1.6

Program Policy and Procedures

This element includes policies which have been established as requirements for the facility and which must be adhered to in all aspects of radiation protection at the facility. It also defines policies and requirements to be followed when establishing additional facility specific policies and procedures.

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 111

"Radiological Control Policy

A key element of the Radiation Protection Guidance to the Federal Agencies for Occupational Exposure approved by President Reagan on January 20, 1987, and a fundamental principle underlying this Manual is:

"There should not be any occupational

exposure of workers to ionizing radiation without the expectation of an overall benefit from the activity causing the exposure." The Department of Energy is firmly committed to having a Radiological Control Program of the highest quality. This applies to those DOE activities that manage radiation and radioactive materials and that may potentially result in radiation exposure to workers, the public and the environment."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 111[02]

"Department of Energy Radiological Control Policy

ALARA

Personal radiation exposure shall be maintained As-Low-As-Reasonably-Achievable (ALARA). Radiation exposure of the work force and public shall be controlled such that radiation exposures are well below regulatory limits and that there is no radiation exposure without commensurate benefit.

OWNERSHIP

Each person involved in radiological work is expected to demonstrate responsibility and accountability through an informed, disciplined and cautious attitude toward radiation and radioactivity.

EXCELLENCE

Excellent performance is evident when radiation exposures are maintained well below regulatory limits, contamination is minimal, radioactivity is well controlled and radiological spills or uncontrolled releases are prevented. Continuing improvement is essential to excellence in radiological control."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 114.1

"Site-Specific Manual

A Site-Specific Radiological Control Manual that invokes the requirements of this Manual shall be issued and endorsed by the contractor senior site executive. The Site-Specific Radiological Control Manual does not require review or approval by the DOE. One approach in the development of Site-Specific Radiological Control Manuals is to invoke the provisions of this Manual as written with site specific additions, supplements and clarifications clearly indicated, included in the appropriate chapters and directly referenced to the corresponding Article. Additions and supplements to address unique situations or to provide more detailed or prescriptive direction may be included only if these additions do not conflict with or diminish the requirements of this Manual. The contractor senior site executive is that person at a DOE contractor-operated facility or site who has final on-site corporate authority and is often called President, General Manager, Site-Manager, or Director."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 114.2

"Management policies, requirements, expectations and objectives for the site Radiological Control Program should be clearly and unambiguously stated."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 114.3

"The Site-Specific Manual shall be kept current and entered into the contractor document control system."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 114.4

"Where a site has multiple facilities, there should be one manual for the site and one Radiological Control Organization. If a prime contractor manages several DOE sites, effort should be made to have one corporate Radiological Control Manual that applies to all of that prime contractor's DOE sites. For a site that has multiple prime contractors, a common manual, with facility, contractor or building specific guidance to accommodate unique considerations, should be issued and endorsed by each contractor's senior site executive. For prime contractors who manage several sites but who also operate sites with more than one prime contractor, the site manual should take precedence over the corporate Radiological Control Manual."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 114.5

"Subcontractors shall comply with the Site-Specific Radiological Control Manual."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 115.2

"The degree of program formality and extent of the associated administrative process are expected to be commensurate with the radioactive material contamination and dose potential. For example, a site with an annual collective effective dose equivalent of one person-rem or less, that works with small quantities of unsealed radioactive material, would not be expected to have an ALARA program as complex as one required at higher dose sites. At low dose sites some program elements may be satisfied by brief policy statements."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 116.2

"To assist contractors in identifying and adopting proven practices and implementing procedures in a timely manner within the DOE Complex, contractors are encouraged to develop through the User Groups Radiological Work Practices Handbooks that can be used by a given category or class of facilities associated with the User Group.

Suggested User Group categories are as follows:

- Reactors
- Uranium
- Environmental Restoration/Waste Management
- Plutonium
- Tritium
- Accelerators

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- Large Research and Development Laboratory Operations
- Small Research and Development Laboratory Operations (annual collective effective dose equivalent of one person-rem or less)

The development of such Handbooks should be coordinated with the Office of Environment, Safety and Health."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 121

"Leadership in Radiological Control

Superior, consistent performance is achieved when qualified personnel use approved procedures and management actively monitors the workplace and assesses ongoing activities. Such activities include, but are not limited to, operations, remediation, laboratory work, research and development and cleanup. Constant review and informed interest by senior management is required to achieve a superior Radiological Control Program. Management leads by example. What management does speaks louder than what management says. Management at all levels should emphasize the need for high standards for radiological control through direct communication, instruction and inspection of the work space. The DOE Field Office Manager and the contractor senior site executive responsible for the site should have a basic knowledge of radiation, its effects and radiological control requirements. The DOE Field Office Manager and the contractor senior site executive should also be familiar with the current radiological performance record. Key principles common in a successful, well-managed Radiological Control Program are provided in this Chapter."

RELATED REFERENCES

1. DOE/EH0256T Article 121, Paragraph 9

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 122.3

"The attitude that constant improvement is required in radiological work needs to be developed at all levels of management and in the work force. Cooperation between the work force and the Radiological Control Organization has to be developed and fostered. The workers should not look upon radiological controls as hurdles or restrictions to be bypassed."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 122.4

"Radiological Control Organization personnel should be helpful in showing workers how to follow the rules. This spirit of cooperation needs to be developed without subverting the control functions of the Radiological Control Technicians. A situation in which radiological controls are left solely to the Radiological Control Organization is unacceptable."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 123

"Worker Responsibilities

Trained personnel should recognize that their actions directly affect contamination control, personnel radiation exposure and the overall radiological environment associated with their work. The following radiological control rules are applicable to each person in the workplace. A

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poster that displays the worker responsibilities listed below should be produced and displayed at appropriate access points and work areas."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 125.5

"Managers, supervisors and workers should be involved in the development of accurate, clear, written procedures for performing radiological work. If during the use of procedures a written requirement cannot be responsibly followed, the work should be stopped and guidance obtained."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 125.9

"Subcontractors and subcontracted employees should be treated the same as facility staff in the area of radiological matters, should have comparable training and shall meet the same requirements and expectations."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 373

"Other Workplace Hazards

Radiological controls should be implemented in a balanced way to ensure that protection from all workplace hazards can be implemented. Other hazards to consider include:

1. General construction hazards;
2. Confined spaces;
3. Flammable materials;
4. Reactive chemicals;
5. Heat stress;
6. Chemical exposures;
7. Energized electrical equipment;
8. Biological hazards;
9. Rotating equipment;
10. Noise and vibration;
11. Excavations."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.1.11

"11. Procedures approved by site/facility management are in place to implement the radiological protection program and are updated periodically."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.1.12

"12. Radiological protection problems are documented and evaluated. These evaluations are reviewed for trends, and actions are taken to correct the causes."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10

"PERFORMANCE OBJECTIVE: The radiation monitoring and contamination control program should ensure worker protection from radiation exposures."

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.3 PROCEDURES.1

"*1. The radiation protection documentation system has a hierarchically arranged system that allows the tracing of DOE Order requirements from:

- The Orders to policy,
- Policy to contractor standards and controls, and
- Contractor standards and controls to procedures."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.3 PROCEDURES.2

"*2. The contractor has a written policy on radiation protection (including ALARA)."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.3 PROCEDURES.3

"*3. Radiation protection standards, procedures, and controls have recognizable or formal technical bases for limits, methods, and personnel protection standards. They include sound radiological requirements such as those recommended in American National Standards Institute (ANSI) and National Council on Radiation Protection and Measurements (NCRP) documents."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.3 PROCEDURES.5

" 5. Radiation protection procedures are adequately documented and updated periodically. This includes, but is not limited to:

- Site/facility posting,
- Developing and maintaining all radiation protection records,
- Reporting unusual radiation occurrences,
- Operating radiation-generating equipment,
- Using radiation monitoring instruments,
- Using radiation sources (e.g., reference and calibration),
- Tracking personnel medical evaluation,
- Reporting radiation exposures,
- Using protective clothing,
- Responding to radiological emergency events,
- Surveying and monitoring,

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- Providing counting room equipment and procedures, and
- Utilizing instrument maintenance and control."

FACILITY REQUIREMENT SOURCE: DOE5400.5 Chapter I, Section 5

"It is the policy of DOE to implement legally applicable radiation protection standards and to consider and adopt, as appropriate, recommendations by authoritative organizations, e.g., the National Council on Radiation Protection and Measurements (NCRP) and the International Commission on Radiological Protection (ICRP). It is also the policy of DOE to adopt and implement standards generally consistent with those of the Nuclear Regulatory Commission (NRC) for DOE facilities and activities not subject to licensing authority."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 5

- "a. It is the policy of DOE to implement radiation protection standards that are consistent with the Presidential approved guidance to Federal Agencies promulgated by the Environmental Protection Agency (EPA) and based on the recommendations by authoritative organizations, e.g., the National Council on Radiation Protection and Measurements (NCRP), and the International Commission on Radiological Protection (ICRP).
- b. It is the policy of DOE to operate its facilities and conduct its activities so that radiation exposures are maintained within the Limits promulgated by this Order and as far below the limits of this Order as reasonably achievable. This policy applies to annual, committed, and cumulative dose equivalents."

11.1.7

Policy for Response to Abnormal Situations

This element includes requirements for appropriate response to abnormal situations which may occur as part of facility operations. These requirements must be included, as appropriate, in the training curriculum for both RP and other facility plant personnel and must also be included, as appropriate, in RP policies and procedures.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 144.2

"Radiological Control Technicians and their supervisors shall have the responsibility and authority to stop work or mitigate the effect of an activity if they suspect that the initiation or continued performance of a job, evolution or test will result in the violation of radiological control standards or result in imminent danger or unacceptable risk. Any worker through their supervisor also has stop work authority in accordance with Article 345."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 345.1

"Stop Radiological Work Authority
Radiological Control Technicians and their supervisors, line supervision, and

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any worker through their supervisor has the authority and responsibility to stop radiological work activities for any of the following reasons:

- a. Inadequate radiological controls;
- b. Radiological controls not being implemented;
- c. Radiological Control Hold Point not being satisfied."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 345.2

"Stop radiological work authority shall be exercised in a justifiable and responsible manner."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 345.3

"Once radiological work has been stopped, it shall not be resumed until proper radiological control has been reestablished."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 345.4

"Resumption of radiological work requires the approval of the line manager responsible for the work and the Radiological Control Manager."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 346.1

"Response to Abnormal Situations

The Site-Specific Radiological Control Manual or the emergency response manual shall establish requirements for alarm response procedures. Site alarm response procedures should address the general actions in items 2 through 6 below, modified as necessary to reflect specific facility conditions."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 346.2

"Response to a Continuous Air Monitor alarm should include the following actions:

- a. Stop work activities;
- b. Immediately exit the area;
- c. Notify Radiological Control personnel."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 346.3

"Response to increasing or unanticipated radiation levels, as identified by a supplemental dosimeter or Area Radiation Monitor Alarm, should include the following actions:

- a. Stop work activities;
- b. Alert others;
- c. Affected personnel immediately exit the area;
- d. Notify Radiological Control personnel."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 346.4

"Response to a criticality alarm should include the following actions:

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- a. Immediately evacuate the area, without stopping to remove protective clothing or perform exit monitoring;
- b. Report to designated assembly area."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 346.5

"Response to a personnel contamination monitor alarm should include the following actions:

- a. Remain in the immediate area;
- b. Notify Radiological Control personnel;
- c. Take actions that may be available to minimize cross-contamination, such as putting a glove on a contaminated hand;
- d. Take follow-up actions in accordance with Article 541."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 346.6

"Response to a spill of radioactive material should include the following actions:

- a. Stop or secure the operation causing the spill;
- b. Warn others in the area;
- c. Isolate the spill area if possible;
- d. Minimize individual exposure and contamination;
- e. Secure unfiltered ventilation;
- f. Notify Radiological Control personnel.

For spills involving highly toxic chemicals, workers should immediately exit the area without attempting to stop or secure the spill. They should then promptly notify the Industrial Hygiene or Hazardous Material team and Radiological Control personnel."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.2
ACCIDENTS/INCIDENTS.7

- " 7. Management will stop work if necessary to ensure that any corrective action is taken to preclude repetition of an accident."

11.1.8

Rad Protection Program Assessments/Internal Audits

This element includes requirements for the performance of Radiation Protection Assessments/Internal Audits and the use of the data resulting from those Assessments/Audits. The use of Assessments and Internal Audits to identify potential problems of deficiencies in programs is essential to ensuring continued compliance with requirements and industry good practices. Management commitment to responding in an appropriate and timely manner ensures that the results of assessments/audits result in ongoing program improvements.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 134.1

"Assessments

Assessment, as used in this Manual, refers to the process of providing independent feedback to senior line managers to indicate the adequacy of the Radiological Control Program. Inspections, audits, reviews, investigations and self-assessments are part of the

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numerous checks and balances needed in a good Radiological Control Program. Internal audits of the Radiological Control Program shall be conducted such that over a 3-year period, all functional elements are assessed for program performance, applicability, content and implementation. These should be performed by the Radiological Control Organization, the quality Assurance Organization and other organizations."

RELATED REFERENCES

1. DOE/EH0256T Article 134

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 134.2

"Managers, supervisors and workers should look upon assessments as helpful. It is desirable to approach assessments with nothing to hide and with the Radiological Control Program as an open book. Results of assessments should be incorporated into the ongoing process of improving radiological control."

RELATED REFERENCES

1. DOE/EH0256T Article 134

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 134.3

"Managers should encourage the positive view that identifying even minor deficiencies represents an opportunity for further improvement. The number of deficiencies do not in themselves measure the overall quality of the Radiological Control Program. A prioritization system to implement actions for resolving the deficiencies should be implemented."

RELATED REFERENCES

1. DOE/EH0256T Article 134

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 134.4

"In developing corrective action plans for assessment activities, managers should address basic underlying reasons for the identified deficiencies or concerns, not just the specific symptoms identified by the reviewer."

RELATED REFERENCES

1. DOE/EH0256T Article 134

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 134.5

"Feedback on findings from assessments, root-cause analyses, status of corrective actions and adherence to action plan schedules should be frequently provided to management."

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RELATED REFERENCES

1. DOE/EH0256T Article 134

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 146.1

"In addition to the normal reviews and inspections that are performed on a periodic basis as specified in DOE 5482.1B, an additional level of assessment is important in identifying problems to senior management. A Radiological Assessor shall perform these reviews."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 146.2

"The Radiological Assessor should have access/report to the contractor senior site executive and should be outside the line organizations and the Radiological Control Organization. For smaller sites it is reasonable to obtain independent, external review of radiological control operations on a periodic basis. For larger facilities or for those contractors responsible for multiple sites, a full-time positions should be assigned."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.1.1

"*1. Inspections and audits utilizing DOE 5482.1B, Section 10, are scheduled and performed by contractor safety personnel independent of the operation to determine the effectiveness of the radiological protection program to identify problems and to initiate necessary corrective actions."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.2 INTERNAL AUDITS.1

"*1. The internal audit program complies with DOE 5482.1B, Section 9.d and DOE 5480.1B, Chapter XI."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.2 INTERNAL AUDITS.2

"2. All radiation protection program elements are audited (i.e., procedures, records, routine survey program, internal and external dosimetry, instrumentation, calibration, etc.)."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.2 INTERNAL AUDITS.3

"3. The internal audit is conducted by individuals knowledgeable in radiation protection but independent of the program being audited."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.2 INTERNAL AUDITS.4

"4. Internal audits are conducted on a specified frequency, at least every 3 years."

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.2 INTERNAL AUDITS.5

"5. Internal audits are documented."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.r(1)

"Contractor internal audits of all functional elements of the radiation protection program shall be conducted as often as necessary but no less frequently than every 3 years. The audit should include, but is not limited to:

- (a) External dosimetry;**
- (b) Internal dosimetry;**
- (c) Portable and fixed instrumentation;**
- (d) Respirators;**
- (e) Contamination control;**
- (f) Radiological monitoring;**
- (g) ALARA program;**
- (h) Nuclear accident dosimetry;**
- (i) Source material control;**
- (j) X-ray protection;**
- (k) Training;**
- (l) Posting;**
- (m) Records."**

11.2

FACILITY MONITORING AND SURVEYS

This element addresses the requirements for Radiation Protection personnel to monitor/survey radiological conditions in the facility. Requirements for determining and implementing fixed monitoring and alarm systems are included as are requirements for performing surveys using portable radiation monitoring/measuring equipment.

Stationary monitoring systems are used, as appropriate, to monitor radiation levels and ambient air radioactivity levels for the purpose of controlling exposure. They are also used to monitor personnel or equipment for contamination for the purpose of controlling and limiting the spread of contamination and thus reducing personnel exposure. Alarms are used in conjunction with stationary monitoring equipment to warn personnel of any unexpected rise in radiation or airborne radioactivity levels caused by ventilation changes, movement of radioactive material, loss of shielding, unintended process function events or

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accidents, or by any other activities which could affect these levels. Similarly, alarms are used to warn personnel if individuals or equipment being monitored exceed allowable contamination levels.

Portable radiation monitoring/measuring equipment is also used for many of the same purposes and to assess radiation, contamination and airborne levels in work areas.

Radiation monitoring Equipment, airborne radioactivity monitors, personnel/equipment contamination monitors and associated alarm systems are maintained by the RP organization. Criticality alarm systems are the responsibility of the Nuclear Safety Program as discussed in the Nuclear Safety Functional Area.

The Radiological Monitoring/Surveys element includes requirements for performing surveys in support of personnel protection as well as general requirements for performing surveys. Radiation Protection personnel may also provide services required as part of the Environmental Protection functional area by collecting samples or performing monitoring in support of Environmental Protection. General requirements for performing surveys will apply and any additional requirements specific to performing environmental surveys will be included as part of the Environmental Protection requirements identification document.

SITE REQUIREMENT SOURCE: 10CFR20 Part 20.201.a

"Precautionary Procedures. Surveys.

- a. As used in the regulations in this part, "survey" means an evaluation of the radiation hazards incident to the production, use, release, disposal, or presence of radioactive materials or other sources of radiation under a specific set of conditions. When appropriate, such evaluation includes a physical survey of the location of materials and equipment, and measurements of levels of radiation or concentrations of radioactive material present."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 551.1

"Radiological Monitoring and Surveys
Requirements

Radiological monitoring of radiation exposure levels, contamination and airborne radioactivity shall be conducted to characterize workplace conditions and to identify areas requiring postings."

RELATED REFERENCES

1. DOE/EH0256T Article 551

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 551.11

"Monitoring results should be made available to line management and used in support of pre- and post-job evaluations, ALARA preplanning, contamination control and management of radiological control operations."

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RELATED REFERENCES

1. DOE/EH0256T Article 551

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 551.12

"Monitoring data in each building or area should be compiled and reviewed at least quarterly. Changes or trends should be noted and corrective actions assigned."

RELATED REFERENCES

1. DOE/EH0256T Article 551

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 551.2

"Monitoring shall be performed only by trained and qualified personnel using properly calibrated instruments."

RELATED REFERENCES

1. DOE/EH0256T Article 551

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 551.3

"Surveys for radiation, contamination and airborne radioactive materials shall be performed as specified in Technical Work Documents and Radiological Work Permits."

RELATED REFERENCES

1. DOE/EH0256T Article 551

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 551.4

"The Radiological Control Organization shall perform and document a review of the adequacy of sampling and monitoring systems as part of any facility or operational changes affecting radiological control. In the absence of such changes, a review should be conducted annually."

RELATED REFERENCES

1. DOE/EH0256T Article 551

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 551.6

"Assessment of radiological conditions should include a sufficient number of survey points to characterize the radiation present and to verify boundaries."

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RELATED REFERENCES

1. DOE/EH0256T Article 551

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 551.7

"Surveys should be performed before, during and at the completion of work that has the potential for causing changes in levels of radiation and radioactivity."

RELATED REFERENCES

1. DOE/EH0256T Article 551

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 551.8

"Survey frequencies should be established based on potential radiological conditions, probability of change in conditions and area occupancy factors."

RELATED REFERENCES

1. DOE/EH0256T Article 551

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 551.9

"Monitoring results should be reviewed by the cognizant radiological supervisor. The review should ensure that all required surveys have been performed and that the documentation is accurate and complete."

RELATED REFERENCES

1. DOE/EH0256T Article 551

SITE REQUIREMENT SOURCE: DOE-PNL-6534 Section 4.6.4

"The first step in the design of a prospective surveillance program is to characterize the potential for intakes of plutonium and other radionuclides that may be present in the facility.

The second step is to maintain a quality program for routine measurement of the workplace, such as surface contamination monitoring, air sampling, and continuous air monitoring. The results of these measurements should be used to indicate when retrospective bioassay measurements are needed. The routine bioassay measurements program should show that workplace measurements are effective in identifying conditions that result in confirmed intakes of plutonium."

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 RADIATION MONITORING.3

- " 3. Procedures and criteria for completion of survey forms, acceptable radiation levels, evaluation of survey results, and reporting of off-standard survey results are available."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 RADIATION MONITORING.5

- " 5. Documented procedures are available and training conducted to ensure that routine dose rate and contamination surveys are conducted in a manner that is consistently repeatable in terms of location, use of smears, and instrument interpretation."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.12

- "12. Adequate field surveys of work locations are performed and documented to determine when routine and special dosimetry are needed."

FACILITY REQUIREMENT SOURCE: DOE6430.1A Division 1300, Section 6.5.3

"Use of devices to warn personnel of possible contamination or other hazardous materials shall be evaluated and such devices shall be provided in accordance with this evaluation. Provisions shall be made for personnel monitoring devices, such as hand and foot counters, in the vicinity of work stations. Installed monitors (supplemented with personal monitoring methods if necessary) shall be used to monitor personnel exiting an operating area through access ways. CAMSs shall be provided to detect and to alarm at prescribed airborne radioactivity levels."

FACILITY REQUIREMENT SOURCE: DOE6430.1A Section 1300-6.5.7

"In addition to a local station alarm, radiation monitoring systems (criticality alarms, CAMSs, alarms associated with stack monitoring systems, and so on) shall have central (i.e., control room or radiation monitoring office) readout and alarm panels that are accessible after a DBA to evaluate internal conditions."

SITE REQUIREMENT SOURCE: INPO-88-010 Chapter VI, Section C.3(2), Paragraph 2

"Samples from out of the way locations and equipment and from potential sources of contamination should be obtained to ensure that a complete assessment of the area is made. Sample locations should be restricted to general walkways for routine surveys."

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SITE REQUIREMENT SOURCE: NUREG-0761 Section 7.b(1)

"Routine Surveys - General

- (a) Radiation protection surveys as required by 10 CFR Part 20, Section 20.201 should include not only physical measurements and monitoring but also investigation and correction of abnormal radiological conditions which may be discovered.
- (b) Frequencies of surveys and monitoring should be established based on the potential hazard, probability of change in radiological conditions, and occupancy factors. Surveys should be performed in both restricted and unrestricted areas to provide positive verification that radioactive materials are being adequately controlled and are not spreading to, or building up, in uncontrolled areas.
- (c) A mechanism should be established to assure that survey data are available and used for informing personnel of hazards, job evaluation, trend analysis, and ALARA pre-planning."

SITE REQUIREMENT SOURCE: WAC-402-24 Section 085

"Each licensee shall make or cause to be made such surveys as defined in WAC 402-12-050, as may be necessary for the licensee or registrant to establish compliance with these regulations and are reasonable under the circumstances to evaluate the extent of radiation hazards that may be present. "

RELATED REFERENCES

1. 10CFR20 Part 20.201.b

11.2.1

Radiation Monitors and Alarms

This element addresses the requirements for monitoring work area radiation dose rates. The requirements are primarily aimed towards the use of stationary monitoring equipment. This equipment may or may not be equipped with alarms or with remote readouts in the control room or in some other part of the facility.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 553.1

"Area Radiation Monitors

In addition to the requirements of Article 551, area radiation monitors (not to include area monitoring dosimeters discussed in Article 514) should be installed in frequently occupied locations with the potential for unexpected increases in dose rates and in remote locations where there is a need for local indication of dose rates prior to personnel entering remote locations."

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RELATED REFERENCES

1. DOE/EH0256T Article 553

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 553.2

"Area radiation monitors should not be substituted for radiation exposure surveys in characterizing a workplace."

RELATED REFERENCES

1. DOE/EH0256T Article 553

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 553.3

"The need and placement of area radiation monitors should be documented and assessed when changes to facilities, systems or equipment occur."

RELATED REFERENCES

1. DOE/EH0256T Article 553

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 553.4

"Area radiation monitors should be tested at least quarterly to verify audible alarm system operability and audibility under ambient working conditions and operability of visual alarms when so equipped."

RELATED REFERENCES

1. DOE/EH0256T Article 553

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 553.5

"If installed instrumentation is removed from service for maintenance or calibration, a radiation monitoring program providing at least equal detection capability should be maintained, consistent with the potential for unexpected increases in radiation dose rates."

RELATED REFERENCES

- i. DOE/EH0256T Article 553

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 RADIATION MONITORING.6

" 6. Facility area monitoring readouts and alarms are adequate to inform workers of workplace radiation levels."

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SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.g(3)(b)

"Radiation Monitoring. Appropriate stationary (area) and/or portable radiation instruments shall be available and used to measure dose rates for the purpose of controlling exposure to radiation. These instruments shall be routinely calibrated and maintained. The combination of instruments used shall provide capability to measure types of radiation (neutron, gamma, beta, or x-radiation) and dose rates characteristic of that which could be encountered at that facility."

FACILITY REQUIREMENT SOURCE: DOE6430.1A Section 1300-6.5.4

"Where ionizing radiation is present (due to process material, equipment, or operations), an area radiation monitoring and alarm system shall be provided to alert personnel of unexpected increases in ionizing radiation levels."

11.2.2

Dose Rate Surveys

This element includes the requirements for surveying the radiation levels prior to and during the performance of work activities. These requirements are aimed primarily at the use of portable survey equipment by trained and qualified radiation protection personnel to assess and document radiation levels in plant areas.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 234.2

"Dose rate measurements used to determine criteria for Radiation Areas should be made at a distance of 30 centimeters from the radiation source or from any surface through which the radiation penetrates. For Very High Radiation Areas, the measurement should be made at 100 cm."

RELATED REFERENCES

1. DOE/EH0256T Article 234

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 234.3

"Contact readings should be used to determine the presence of Hot Spots."

RELATED REFERENCES

1. DOE/EH0256T Article 234

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 552.1

"Radiation Exposure Surveys

In addition to the requirements of Article 551, routine radiation surveys should be performed in accordance with the following minimum frequencies:

- a. Daily, in office space located in Radiological Buffer Areas where the potential exists for external radiation exposure;
- b. Weekly, in routinely occupied Radiological Buffer Areas and Radiation Areas;

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- c. Upon initial entry, weekly during continuing operations, and when levels are expected to change in High Radiation Areas;
- d. Weekly, for operating HEPA-filtered ventilation units;
- e. Weekly, for temporary Radiation Area boundaries to ensure that radiation areas do not extend beyond posted boundaries;
- f. Monthly, or upon entry, if entries are less frequent than monthly for Radioactive Material Areas;
- g. Monthly, for potentially contaminated ducts, piping and hoses in use outside radiological facilities."

RELATED REFERENCES

- 1. DOE/EH0256T Article 552

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 552.2

"Performance of radiation surveys should include dose rate measurements of the general area, dose rates at a distance of 30 centimeters from a source or surface of interest to evaluate potential whole body exposures, and dose rates on contact with potential sources of radiation where there is a potential for hands-on work."

RELATED REFERENCES

- 1. DOE/EH0256T Article 552

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 552.3

"Surveys should be conducted whenever operations are being performed that might result in personnel being exposed to small intense beams of radiation, such as those generated by shielded x-ray devices or due to removal or alteration of shielding."

RELATED REFERENCES

- 1. DOE/EH0256T Article 552

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 RADIATION MONITORING.2

- " 2. A documented radiation monitoring program is in place that includes the frequency and location for radiation surveys."

SITE REQUIREMENT SOURCE: NUREG-0761 Section 7.b(2)

"Dose Rate Surveys

- (a) Dose rate surveys should be performed with instruments calibrated for the type and range of radiation being monitored, e.g., beta survey instruments should be calibrated for beta radiation.

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- (b) Surveillance performed within large areas posted as high radiation areas where whole-body dose rates vary significantly should include the posting of "hot" spots and identifying low dose rate areas. Typical "hot" spot signs may designate 1/2, 1, 2, etc., rem/hr areas."

11.2.3

Airborne Radioactivity Monitors, Alarms and Surveys

This element includes requirements relating to the assessment of airborne radioactivity at the facility. It includes requirements for use of non-portable equipment which may include local area alarms and/or remote readouts in the control room or another area of the facility. It also includes requirements for the use of portable equipment by trained and qualified radiation protection personnel.

SITE REQUIREMENT SOURCE: ANSI-Z88.2-1980 Section 3.5.12

"The concentration of the airborne radioactivity level of the respiratory hazard in the work area shall be monitored initially prior to respirator selection and periodically during respirator use to ensure that the proper type of respirator is being utilized."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 555.1

"Airborne Radioactivity Monitoring

In addition to the requirements of Article 551, air monitoring equipment should be used in situations where airborne radioactivity levels can fluctuate and early detection of airborne radioactivity could prevent or minimize inhalation of radioactivity by personnel. Selection of air monitoring equipment should be based on the specific job being monitored. Air monitoring equipment includes portable and fixed air sampling equipment and continuous air monitors."

RELATED REFERENCES

1. DOE/EH0256T Article 555

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 555.2

"Air sampling equipment shall be used in occupied areas where, under normal operating conditions, a person is likely to receive an annual intake of 2 percent or more of the specified Annual Limit of Intake (ALI) values (40 Derived Air Concentration (DAC) hours). AFI annual intake of 2 percent of a specified ALI generally represents a committed effective dose equivalent to a person of approximately 100 mrem."

RELATED REFERENCES

1. DOE/EH0256T Article 555

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 555.3

"Continuous air monitoring equipment shall be installed in occupied areas where a person without respiratory protection is likely to be exposed to a concentration of radioactivity in air exceeding 1 DAC or where there is a need to alert potentially exposed workers to unexpected increases in the airborne radioactivity levels. A person exposed continuously to a concentration of radioactivity in air of 1 DAC for 1 work week would generally receive a committed effective dose equivalent of approximately 100 mrem."

RELATED REFERENCES

1. DOE/EH0256T Article 555

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 555.4

"Air sampling equipment should be positioned to measure air concentrations to which persons are exposed. If this cannot be achieved, a program of personal breathing-zone air sampling should be initiated."

RELATED REFERENCES

1. DOE/EH0256T Article 555

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 555.6

"Continuous air monitoring equipment required by Article 555.3 shall have alarm capability and sufficient sensitivity to alert personnel that immediate action is necessary in order to minimize or terminate inhalation exposures."

RELATED REFERENCES

1. DOE/EH0256T Article 555

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 555.7

"The proper operation of continuous air monitoring equipment should be verified daily by performing an operational check. Operational checks should include positive air-flow indication, non-zero response to background activity, and internal check sources or 60 Hz electronic checks when available. Continuous air monitoring equipment should be verified weekly by checking for instrument response with a check source or with ambient levels of radon and thoron daughters."

RELATED REFERENCES

1. DOE/EH0256T Article 555

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 555.8

"Preliminary assessments of air samples utilizing field survey techniques should be performed promptly upon removal. In situations where background levels of radon and thoron daughters interfere with evaluation of alpha air samples, prompt field assessments may not be possible."

RELATED REFERENCES

1. DOE/EH0256T Article 555

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 555.9

"Air sample results should be evaluated as quickly as practicable for evaluation of the need for respiratory protection, area evacuation (if necessary), worker intake and worker relief from respirator use."

RELATED REFERENCES

1. DOE/EH0256T Article 555

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 RADIATION MONITORING.1

"*1. Survey limits for breathing air are established. These limits are related to the controlled area concentration values in DOE guidance."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.6.3

" 3. Accurate and timely airborne radioactivity survey information is available for determining the boundaries of airborne radioactivity areas, posting entry requirements, and minimizing internal exposure to workers during work activities. The boundaries of these areas are clearly identified and posted."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.6.7

" 7. Monitoring data are used to perform trend analysis. Appropriate corrective action is taken whenever there are significant numbers of positive in-vivo counts observed or when air concentrations are elevated, even though the observed levels are less than regulatory limits."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.9

"PERFORMANCE OBJECTIVE: Air monitoring systems through selection, location, calibration, and maintenance should ensure reliable estimates of air activity for radiological control purposes."

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.9.1

- "*1. Action levels, investigation levels, and maximum permissible concentrations (MPC) used are based on appropriate technical criteria to evaluate air sampling and monitoring results and determine necessary control procedures."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.9.10

- "10. Appropriate radiation detectors are used to analyze air samples."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.9.11

- "11. Adequate counting equipment for filters is available. The equipment is properly calibrated and maintained. Counting procedures are available and followed by technicians. Adequate records are maintained to permit QA/QC verification of sample results. Corrections for counting losses due to absorption and/or backscatter within filters are made for alpha and beta radiation."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.9.12

- "12. Corrections for radon daughter-product interference are made."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.9.2

- "*2. The minimum detection limits (MDL) or minimum detectable activities (MDA) for the specific radionuclides of interest are provided. The detection levels provide optimum worker protection and are appropriate for established action levels, investigation levels and MPCs are documented."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.9.4

- " 4. A documented, acceptable air sampling and monitoring program is in place, and is supported by sufficient studies (e.g., air flow patterns, particle size distribution)."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.9.5

- " 5. Air sampling and monitoring equipment is used and is appropriate for the nature of the operation and sources."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.9.6

- " 6. The nominal flow rates and sampling intervals used by the contractor for grab sampling, continuous sampling, personal sampling (i.e., breathing zone), air monitoring, and emergency sampling are based on appropriate technical criteria."

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.9.7

" 7. Appropriate filter media are used for particulates."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.9.9

" 9. Results of breathing zone sampling are compared with area air sampling."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.g(3)(a)

"Workplace

- (a) Air Monitoring. Ambient air monitoring shall be performed in occupied areas with the potential to exceed 10 percent of any derived air concentration values given in Attachment 1. Representative ambient air monitoring samples should be taken in strategic locations to detect and evaluate airborne radioactive material at work locations. Data obtained from air monitoring shall be used for assessing the control of airborne radioactive material in the workplace; it should not normally be used to evaluate the dose equivalent to radiation workers. Air monitors shall be routinely calibrated and maintained, and should be capable of measuring on DAC when averaged over 8 hours (8 DAC-hours)."

SITE REQUIREMENT SOURCE: DOE6430.1A Section 1300-6.5.2

"Air monitoring and warning systems shall be installed in work areas where hazardous materials are stored or handled and where hazardous airborne particles or vapors may be present. Air sampling heads shall be located to provide a representative sample of potential airborne radioactive materials being breathed. Air monitoring systems shall comply with ANSI N13.1."

SITE REQUIREMENT SOURCE: INPO-88-010 Chapter IV, Section 3(a)(2), Paragraph 2

"Continuous air monitors should be set in a consistent manner to alarm at a significant level above background (e.g., two or three times background count rates). The alarm setpoints may be raised during periods of high short-lived fission product or natural radon daughter product concentrations with the approval of radiological protection supervision. Alarm setpoint changes should be documented so the setpoint can be returned to normal when short-lived or natural radioactivity is no longer significant. Alarm capabilities and alarm setpoints should be checked periodically (e.g., daily) to ensure proper operation."

SITE REQUIREMENT SOURCE: NUREG-0761 Section 7.c(4)

"Airborne Radioactivity Surveys

- (a) When continuous air monitoring is performed, periodic high volume grab samples or breathing zone air samples should be taken to verify that air monitoring is representative of the actual work area.

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- (b) Capabilities should be provided for exhausting grab samples back to their source when extremely high levels of activities are expected.
- (c) A minimum detectable activity for the equipment in use should be established.
- (d) Collection efficiencies for particulate and iodine sampling media should be established."

11.2.4

Contamination Monitoring and Surveys

This element addresses the requirements for monitoring contamination in plant areas and/or on plant equipment. It includes requirements for when areas and/or equipment is to be monitored and for appropriate use of monitoring equipment.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 554.1

"Contamination Surveys

In addition to the requirements of Article 551, routine contamination surveys should be conducted as follows:

- a. Prior to transfer of equipment and material from one Radiological Buffer Area to another;
- b. Prior to transfer of equipment and material from highly contaminated areas within Radiological Buffer Areas unless precautions such as bagging or wrapping are taken prior to transfer;
- c. Only, at contamination area control points, change areas, or step-off pads when in use, or per shift in high use situations;
- d. Daily, in office space located in Radiological Buffer Areas;
- e. Daily, in lunch rooms or eating areas near Radiological Buffer Areas;
- f. Weekly, in routinely occupied Radiological Buffer Areas;
- g. Weekly, or upon entry if entries are less frequent, in areas where radioactive materials are handled or stored;
- h. Weekly, or upon entry if entries are less frequent, where contamination boundaries or postings are located;
- i. During initial entry into a known or suspected contamination area, periodically during work, at completion of job, or as specified in a Radiological Work Permit;
- j. After a leak or spill of radioactive materials."

RELATED REFERENCES

- 1. DOE/EH0256T Article 554

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 554.3

"Contamination surveys should incorporate techniques to detect both removable and fixed contamination."

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RELATED REFERENCES

1. DOE/EH0256T Article 554

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 554.6

"Swipe surveys for removable contamination shall be reported in units of disintegrations per minute per 100 cm² (dpm/100 cm²). For swipe surveys of small items covering less than 100 cm², the results shall be reported in units of dpm per area swiped."

RELATED REFERENCES

1. DOE/EH0256T Article 554

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 554.7

"Large area wipes are encouraged and should be used to supplement standard swipe techniques in areas generally assumed not to be contaminated, such as entrances to Radiological Buffer Areas. If an evaluation indicates that an area wiped is contaminated, a thorough contamination swipe survey should be performed."

RELATED REFERENCES

1. DOE/EH0256T Article 554

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.11

"11. Contaminated or potentially contaminated areas are adequately surveyed, documented, and posted at specific frequencies, based upon the contamination levels, traffic patterns, and occupancy levels."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.12

"12. Routine contamination surveys are conducted in areas that are not normally contaminated. Frequency of those surveys is commensurate with the potential for contamination and with the significance of finding contamination in a particular area."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.23

"23. Adequate counting equipment for swipes is available. The equipment is properly calibrated and maintained. Counting procedures are available and followed by technicians. Adequate records are maintained to permit QA/QC verification of sample results."

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11.3

PERSONNEL EXPOSURE MONITORING

The personnel exposure monitoring element includes those requirements necessary to ensure that both internal and external exposures to personnel are properly monitored and assessed. It also includes requirements relating to exposure limits for plant personnel, visitors, minors, women with declared pregnancies and the general public.

The personnel monitoring program is developed for the purpose of monitoring and tracking personnel exposure to improve radiation protection practices/procedures and for demonstrating compliance with regulatory and administrative limits for personnel exposure to radiation. A comprehensive personnel exposure monitoring program defines the area or situations where monitoring is to be performed and the appropriate type of monitoring to be used considering the types, form and energies of the radiation present in that area or situation.

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.g

"Monitoring. Occupational workers shall be monitored, as appropriate, to demonstrate compliance with the radiation protection standards in paragraph 9.b. and to estimate the dose equivalents received from external and internal sources of radiation. Workplaces shall be routinely monitored, as appropriate, for identification and control of potential exposure sources."

11.3.1

Exposure Limits

This element includes requirements which define regulatory and administrative exposure limits for plant personnel, visitors and the general public.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 211

"Administrative Control Levels and Dose Limits

The DOE's objective is to maintain personnel radiation exposure well below regulatory dose limits. To accomplish this objective, challenging numerical Administrative Control Levels are established at levels below the regulatory limits to administratively control and help reduce individual and collective radiation dose. These control levels are multi-tiered with increasing levels of authority required to approve higher Administrative Control Levels. With issuance of this Manual, the committed effective dose equivalent is used to assign internal dose received by personnel at DOE facilities. The committed effective dose equivalent is the resulting dose committed to the whole body from internally deposited radionuclides over a 50-year period after intake."

RELATED REFERENCES

1. DOE/EH0256T Article 211

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 211.1

"Administrative Control Level

A DOE Administrative Control Level of 2,000 mrem per year per person is established for all DOE activities. Approval by the Program Secretarial Official or designee shall be required prior to allowing a person to exceed 2,000 mrem."

RELATED REFERENCES

1. DOE/EH0256T Article 211

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 211.2

"An annual facility Administrative Control Level shall be established by the contractor senior site executive based upon an evaluation of historical and projected radiation exposures, work load and mission. The selection of the specific value shall be more restrictive than the DOE Administrative Control Level. This control level should be reevaluated annually. The choice of a low level for 1 year should not preclude choosing either a higher or lower level in a subsequent year."

RELATED REFERENCES

1. DOE/EH0256T Article 211

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 211.3

"For most facilities, an annual facility Administrative Control Level of 500 mrem or less should be challenging and achievable. An annual Administrative Control Level above 1,500 mrem is in most cases not sufficiently challenging to meet the goals of this Manual."

RELATED REFERENCES

1. NUREG-0761 Section 5.b(3)
2. DOE/EH0256T Article 211

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 211.4

"No person shall be allowed to go above the facility Administrative Control Level without the prior approval of the contractor senior site executive."

RELATED REFERENCES

1. DOE/EH0256T Article 211

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 212.1

"Lifetime Control Level

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To administratively control a worker's lifetime occupational radiation exposure, a Lifetime Control Level of N rem shall be established where N is the age of the person in years. Special Control Levels (Article 216) shall be established for personnel who have doses exceeding N rem."

RELATED REFERENCES

1. DOE/EH0256T Article 212

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 212.2

"The internal contribution to lifetime dose should continue to be reassessed as further bioassay results and improved methods for assessing internal dose become available."

RELATED REFERENCES

1. DOE/EH0256T Article 212

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 213.1

"Radiological Worker Dose Limits
Dose limits are provided in Table 2-1 and shall not be exceeded. These regulatory limits are consistent with the "Radiation Protection Guidance to Federal Agencies for Occupational Exposure" signed by the President."

RELATED REFERENCES

1. DOE5480.11 Section 9.b
2. DOE5480.11 Section 9.b(1)
3. DOE5480.11 Section 9.b(2)
4. DOE5480.11 Section 9.d(1)
5. DOE5480.11 Section 9.d(2)
6. DOE5480.11 Section 9.e
7. DOE/EH0256T Article 213

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 213.2

"Radiological workers from other DOE or DOE contractor facilities may receive occupational exposure as a radiological worker if they:

- a. Provide record of current Radiological Worker I or II standardized core training
- b. Receive site-specific Radiological Worker I or II training at the facilities where they will be working
- c. Provide their radiation dose records for previous years and written estimates for the current year.

RELATED REFERENCES

1. DOE/EH0256T Article 213

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 213.3

"Proposed use of the 10-rem Planned Special Exposure as specified in DOE 5480.11 shall be applied only in extraordinary situations and when the following requirements have been met:

- a. The proposed activity has been reviewed by the Radiological Control Manager and submitted by the senior site executive to the lead Program Secretarial Official for approval by the Program
- b. The proposed activity has been jointly approved by the Program Secretarial Official and the Assistant Secretary for Environment, Safety and Health."

RELATED REFERENCES

1. DOE/EH0256T Article 213

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 213.4

"Emergency exposure limits are not Planned Special Exposure limits. Guidelines for emergency exposures are provided in Appendix 2A."

RELATED REFERENCES

1. DOE5480.11 Section 9.c
2. DOE/EH0256T Article 213

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 214

"Visitor Dose Limit

Visitors to DOE sites shall be limited to an annual radiation dose of 100 mrem from the sum of internal and external radiation sources unless they either qualify as radiological workers in accordance with Article 632 or 633, or meet the special considerations of Article 657."

RELATED REFERENCES

1. DOE/EH0256T Article 214

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 215.1

"Embryo/Fetus Dose Limits

After a female radiological worker voluntarily notifies her employer in writing that she is pregnant, for the purposes of fetal/embryo dose protection, she is considered a declared pregnant worker. The employer shall provide the option of a mutually agreeable assignment of work tasks, without loss of pay or promotional opportunity, such that further occupational radiation exposure is unlikely."

RELATED REFERENCES

1. DOE5480.11 Section 9.b(3)
2. DOE/EH0256T Article 215

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 215.2

"For a declared pregnant worker who chooses to continue working as a radiological worker:

- a. The dose limit for the embryo/fetus from conception to birth (entire gestation period) is 500 mrem.
- b. Efforts should be made to avoid exceeding 50 mrem per month to the pregnant worker."

RELATED REFERENCES

1. DOE5480.11 Section 9.b(3)
2. DOE/EH0256T Article 215

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 215.3

"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."

RELATED REFERENCES

1. DOE5480.11 Section 9.b(3)
2. DOE/EH0256T Article 215

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 216

"Special Control Levels

Certain situations require lower individualized exposure control levels. In addition to considering recommendations from senior radiological control and medical officials, the contractor senior site executive should obtain advice from professionals in other disciplines such as human resources and legal in establishing Special Control Levels. The contractor senior site executive may wish to establish these Special Control Levels using a radiological health advisory group."

RELATED REFERENCES

1. DOE/EH0256T Article 216

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 216.1

"A Special Control Level for annual occupational exposure shall be established for each person with a lifetime occupational dose exceeding N rem, where N is the age of the person in years. The Special Control Level shall not exceed 1 rem and should allow the person's lifetime occupational dose to approach N rem as additional occupational exposure is received."

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RELATED REFERENCES

1. DOE/EH0256T Article 216

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 216.2

"An employer should be attentive to special circumstances of employees, such as those undergoing radiation therapy, and establish special Control levels as appropriate."

RELATED REFERENCES

1. DOE/EH0256T Article 216

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.b

"Radiation Protection Standards for Internal and External Exposure for Occupational Workers

The exposure of an occupational worker to radiation resulting from routine DOE activities shall not cause the limiting values for assessed dose specified herein and summarized in Figure 1 to be exceeded. Continued exposure of any worker over a substantial portion of a working lifetime at or near the limiting values for assessed dose to individual workers should be avoided. (Note: Natural background and therapeutic and diagnostic medical exposures are not to be included in dose records or in assessment of dose against limiting values.)"

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.b(1)

"Stochastic Effects. The limiting value of annual effective dose equivalent from both internal and external sources received in any year by an occupational worker is 5 rem (0.05 sievert)."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.b(2)

"Non-Stochastic Effects. The limiting value of annual dose equivalent received in any year by an occupational worker for individual organs and tissue is 15 rem (0.15 sievert) to the lens of the eye or 50 rem (0.5 sievert) to any other organ, tissue (including the skin of the whole body), or extremity of the body."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.b(3)

"Unborn Child. The limiting value of annual dose equivalent received by the unborn child from the period of conception to birth (entire gestation period) as a result of occupational exposure of a female occupational worker, who has notified her employer in writing that she is pregnant, is 0.5 rem (0.005 sievert). Efforts should be made to avoid substantial variation above the uniform monthly exposure rate that would satisfy this limiting value. If the dose to the unborn child is determined to have already exceeded 0.5 rem (0.005 sievert) by the time a worker notifies her employer in writing of her

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pregnancy, the worker shall not be assigned to tasks where additional occupational exposure is likely. The limiting value of dose equivalent to the unborn and the assignment of female workers (who have declared pregnancy in writing to their employer) to tasks where additional occupational exposure is not likely does not create a basis for discrimination and should be achieved in conformance with the provisions of Title VII of the Civil Rights Act of 1964 [See Environmental Protection Agency (1) - pages 2829 and 2832 of Federal Register, Vol. 52, No. 17, 1987]."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.c

"Planned Special Exposure. Planned special exposures (non-emergency) that would result in an individual exceeding the annual effective dose equivalent limit are allowed in highly unusual situations where alternatives which would avoid higher exposures are unavailable or impractical. Such planned special exposures, together with the annual occupational dose received or anticipated to be received in that year, shall not exceed 2 times the annual effective dose equivalent limit specified in paragraph 9.b.(1). Planned special exposures require the approval of the Head of the DOE Field Organization. A second planned special exposure to the same individual at any time requires the approval of the Assistant Secretary for Environment, Safety, and Health 9EH-1). Documentation of planned special exposures shall be maintained in an individual's occupational exposure history."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.d(1)

"Radiation Protection Standards for Internal and External Exposure to Minors and Students

- (1) Minors. An individual under age 18 shall neither be employed in, nor allowed to enter, controlled areas in such a manner that he or she exceeds a limiting value of 0.1 rem (0.001 sievert) per year from the sum of the committed effective dose equivalent from internal irradiation and the annual effective dose equivalent from external irradiation."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.d(2)

"Students. Students under age 18 shall not be exposed to radiation during individually authorized educational activities such that he or she exceeds a limiting value of 0.1 rem (0.001 sievert) per year from the sum of the committed effective dose equivalent from internal irradiations and the annual effective dose equivalent from external irradiation. This exposure shall be considered a part of the limit for workers under age 18 and not supplemental to it [i.e., where individuals under age 18 are exposed to radiation both as a student and as a minor in a year, their exposure as a student shall be added to their exposure as a minor and the total is not to exceed the single limiting value of 0.1 rem for minors]."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.e

"Radiation Protection Standards for Public Entering a Controlled Area. The effective dose equivalent received by any member of the public resulting from

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exposure during direct onsite access at a DOE facility shall not exceed a limiting value of 0.1 rem (0.001 sievert) per year from the committed effective dose equivalent from internal irradiation plus the effective dose equivalent from any external irradiation. In addition, exposures shall not cause a dose equivalent to any tissue (including the skin and the lens of the eye) to exceed 5 rem (0.05 sievert) per year for any member of the public. Guidance for entry during emergency conditions is provided in paragraph 9.p. of this Order."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.f(1)

"Combining Internal and External Dose Equivalent. The annual effective dose equivalent to an individual shall be determined by summing the annual effective dose equivalents from internally deposited radionuclides and from external exposure to radioactive material and/or radiation generating devices resulting from DOE activities. When in-vivo and/or in-vitro measurements confirm the retention of radionuclides in the body, with respect to evaluating conformance with the limiting value for occupational exposure, the annual effective dose equivalent due to all radionuclides retained in the body from these intakes shall be assessed for as long as the annual effective dose equivalent is 10 mrem or greater. Exposures to the skin, extremities, and lens of the eye are not included in the determination of the annual effective dose equivalent. For uniform external irradiation of the whole body, a weighing factor (Wt) equal to one may be used. This whole body dose is to be measured in accordance with the provisions in paragraph 9g(1). Non-uniform external and internal irradiation values of Wt for organs and tissues are defined in paragraph 8e(12)."

SITE REQUIREMENT SOURCE: NUREG-0761 Section 5.b(3)

"There should be an administrative dose control system, requiring approval by line arrangement, which controls both planned and actual doses to individuals as they progressively (incrementally) approach limits of 10 CFR 20.101 or administrative limits established for the facility. It is considered good practice and recommended by the staff that doses to personnel be maintained to the NCRP/ICRP/EPA recommendation of 5 rems/yr. Consideration should be given by licensees to voluntarily controlling individual doses to 5 rems/yr. Such a practice is to be used to reduce the risk to those small number of people who may exceed this criteria while providing a tool to reduce collective dose to the plant workers. The RPM should require review of all individual doses that exceed or are expected to exceed a specified investigator level, which should normally be 1.5 rems annual whole-body dose. These approvals should be based on a determination that the dose to be received by the individual is ALARA. Individual operations and support group managers, supervisors, and foreman should all strive actively to keep individual and group exposures at a minimum and to keep the number of workers exposed at a minimum. Guidelines and policies governing emergency exposures and overexposures should be outlined. This dose control systems should be implemented via the Radiation work Permit (RWP) system."

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11.3.2

External and Internal Monitoring

This element addresses those requirements related to the monitoring of internal and external exposure to radiation. These requirements define when monitoring is to be performed and provide the basis for the overall monitoring program.

SITE REQUIREMENT SOURCE: ANSI-N343 Section 16.2

"Internal Dosimetry Records. An internal dosimetry record shall be maintained for each individual who is monitored. The minimum records shall include data on:

- (1) Current employees who participate in the bioassay program
- (2) Terminated employees who have in the past participated in the bioassay program
- (3) Visitors or contractors who participate in the bioassay program"

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 511.1

**"External Dosimetry
Requirements**

Personnel dosimetry shall be required for personnel who are expected to receive an annual external whole body dose greater than 100 mrem or an annual dose to the extremities, lens of the eye or skin greater than 10 percent of the corresponding limits specified in Table 2-1. Neutron dosimetry shall be provided when a person is likely to exceed 100 mrem annually from neutrons."

RELATED REFERENCES

1. DOE5480.11 Section 9.g(1)
2. DOE/EH0256T Article 511

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 521.1

**"Internal Dosimetry
Requirements**

Personnel who enter Radiological Buffer Areas shall participate in a bioassay program when they are likely to receive intakes resulting in a committed effective dose equivalent of 100 mrem or more."

RELATED REFERENCES

1. DOE5480.11 Section 9.g(2)
2. DOE/EH0256T Article 521
3. ANSI-N343 Section 6.1

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 521.2

"Personnel shall participate in followup bioassay monitoring when their routine bioassay results indicate an intake in the current year with a committed effective dose equivalent of 100 mrem or more."

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RELATED REFERENCES

1. DOE/EH0256T Article 521

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 521.3

"Personnel whose routine duties may involve exposure to surface or airborne contamination or to radionuclides readily absorbed through the skin, such as tritium, should be considered for participation in the bioassay program."

RELATED REFERENCES

1. DOE/EH0256T Article 521

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 521.4

"Personnel shall submit bioassay samples, such as urine or fecal samples, and participate in bioassay monitoring, such as whole body or lung counting, at the frequency required by the bioassay program."

RELATED REFERENCES

1. DOE/EH0256T Article 521

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 521.5

"Personnel shall be notified promptly of positive bioassay results and the results of dose assessments and subsequent refinements. Dose assessment results shall be provided in terms of mrem."

RELATED REFERENCES

1. DOE/EH0256T Article 521

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 522

"Technical Requirements for Internal Dosimetry
DOE plans to implement accreditation programs for bioassay measurements and internal dose assessment and to provide supplemental technical guidance on the implementation of internal dosimetry programs. Until these accreditation programs are available, this Manual provides the technical guidance to implement the internal dosimetry programs."

RELATED REFERENCES

1. DOE5480.11 Section 9.g(2)
2. DOE/EH0256T Article 522

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 522.1

"A technical basis document shall be developed for the internal dosimetry program."

RELATED REFERENCES

1. DOE/EH0256T Article 522

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 522.2

"Baseline bioassay monitoring of personnel who are likely to receive intakes resulting in a committed effective dose equivalent greater than 100 mrem shall be conducted before they begin work that may expose them to internal radiation exposure."

RELATED REFERENCES

1. DOE/EH0256T Article 522

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 522.3

"Periodic bioassay monitoring methods and frequencies shall be established for personnel who are likely to receive intakes resulting in a committed effective dose equivalent greater than 100 mrem. The technical basis for the methods and frequency of bioassay monitoring should be documented."

RELATED REFERENCES

1. DOE/EH0256T Article 522

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 522.4

"Management shall require termination bioassay monitoring when a person who participated in the bioassay program terminates employment or concludes work involving the potential for internal exposure. The number of persons failing to achieve this monitoring should be reviewed periodically and should be used to determine whether further efforts to get cooperation are warranted."

RELATED REFERENCES

1. DOE/EH0256T Article 522

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 522.5

"Bioassay analyses shall also be performed when any of the following occurs:

- a. Facial contamination is detected that indicates a potential for internal contamination;
- b. Nasal contamination is detected;
- c. Airborne monitoring indicates the potential for intakes exceeding 100 mrem committed effective dose equivalent;

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- d. An intake is suspected for any reason."

RELATED REFERENCES

1. DOE/EH0256T Article 522
2. ANSI-N343 Section 6.2.5

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 522.6

"Levels of intakes that warrant the consideration of medical intervention shall be established for site-specific radionuclides. The effectiveness of medical intervention, such as blocking or chelating agents, shall be documented using bioassay results."

RELATED REFERENCES

1. DOE/EH0256T Article 522

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 522.7

"A preliminary assessment of any intakes detected should be conducted prior to permitting an employee to return to radiological work."

RELATED REFERENCES

1. DOE/EH0256T Article 522

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 522.8

"Internal dosimetry program personnel should use radionuclide standards from or traceable to the National Institute of Standards and Technology (NIST)."

RELATED REFERENCES

1. DOE/EH0256T Article 522

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 522.9

"Internal dosimetry program personnel should participate in the conduct of intercomparison studies and should use the "DOE Phantom Library.""

RELATED REFERENCES

1. DOE/EH0256T Article 522

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 523

"Technical Requirements for Dose Assessment
Interpretations of bioassay results and subsequent dose assessments should include the following:

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1. Characteristics of the radionuclide, such as chemical and physical form.
2. Bioassay results and the person's previous exposure history.
3. Exposure information, such as route of intake and time and duration of exposure.
4. Biological models used for dosimetry of radionuclides;
5. Models to estimate intake or deposition and to assess dose.
6. Intradepartmental coordination between the Radiological Control Organization and the medical organization for doses that may require medical intervention."

RELATED REFERENCES

1. DOE/EH0256T Article 523

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 543

"Exposures to Airborne Radioactivity

Potential intakes of radioactive material are indicated when personnel without respiratory protection are exposed to airborne radioactivity or when respiratory protection has been compromised. If intakes of radioactive material are indicated which could result in a committed effective dose equivalent greater than 100 mrem, the following actions should be taken:

1. Identify personnel potentially exposed to airborne radioactivity.
2. Obtain nasal smears for qualitative indication of intakes where appropriate.
3. Analyze air samples to determine airborne concentrations where appropriate.
4. Determine duration of potential exposure to airborne radioactivity.
5. Perform bioassay appropriate for radionuclides involved.
6. Evaluate dose prior to permitting the worker to return to radiological work."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.10

"10. Extremity dosimetry devices are worn when performing work where extremity exposures are likely to be significantly higher than whole-body exposures."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.12

"12. Adequate field surveys of work locations are performed and documented to determine when routine and special dosimetry are needed."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.4

"*4. Visitors to radiation areas are monitored to determine any exposures. Exposures are reported in accordance with DOE 5484.1."

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.6

- " 6. Technical criteria and dose rate levels for assignment of extremity and personnel dosimeters are established and documented."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.7

- " 7. Procedures to identify workers for whom monitoring is required and the frequency with which their dosimeters are processed are available and are technically based."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.8

- " 8. Personnel who enter radiologically controlled areas wear appropriate dosimetry devices capable of accurately measuring whole-body and/or extremity exposures from the types of radiation present."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.6.7

- " 7. Monitoring data are used to perform trend analysis. Appropriate corrective action is taken whenever there are significant numbers of positive in-vivo counts observed or when air concentrations are elevated, even though the observed levels are less than regulatory limits."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.6.9

- " 9. Procedures and resources are available to perform dose calculations when significant internal exposures occur."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.7

"PERFORMANCE OBJECTIVE: The internal radiation dosimetry program should ensure that personnel radiation exposures are accurately determined and recorded."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.7.1

- "*1. The technical criteria employed to determine which employees are included in the bioassay program, and the frequency of bioassay are documented and are consistent with ANSI N343, ANSI N13.30 (draft), and ALARA practices."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.7.10

- "10. Procedures are employed to prevent cross contamination of (indirect) bioassay samples."

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.7.11

- "11. Particle size and solubility of airborne contaminants to which a worker has or may have been exposed are determined."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.7.12

- "12. The contractor has a documented policy on work restrictions as a result of internal radiation exposure (i.e., to permit dose assessment and/or for temporary or permanent work restrictions)."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.7.13

- "13. Procedures are established and documented to identify individuals who fail to leave routine in vitro bioassay samples."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.7.14

- "14. Procedures for in vitro and/or in vivo bioassay of visitors, if appropriate, to radiation areas are established and documented."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.7.15

- "15. The minimum detection level for in vitro and/or in vivo bioassay procedures are documented."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.7.2

- "*2. A quality control program, including the use of internal audit samples, is employed by the contractor."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.7.3

- "*3. The frequency and timeliness of in vitro and/or in vivo bioassay and notification of field personnel of results is appropriate for the radionuclides present and the nature of the operations."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.7.4

- "*4. Procedures to identify workers for whom bioassay is required and the frequency is technically based."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.7.5

- "5. The types of routine monitoring of workers (in vivo and/or in vitro) are appropriate for the radionuclides present."

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.7.6

" 6. Personnel who perform work in radiologically controlled areas where a potential for airborne radioactivity exists are monitored for internal deposition of radioactivity as follows:

- At least annually;
- Prior to performing radioactive work, after initial employment, and upon termination of employment;
- Whenever it is suspected that personnel breathed high airborne radioactivity;
- Periodically for those workers who have the highest potential for breathing high airborne radioactivity; and
- Following personnel contaminations, unless exempted by the radiological protection manager or his designee."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.7.7

" 7. Procedures for the internal radiation dosimetry and updated periodically."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.7.8

" 8. Trigger points to instigate an investigation of an intake or supposed intake are established and technically based."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.7.9

" 9. A radiation dose to organs is computed following an intake. If doses are calculated for some intakes but not for others, a technical basis for deciding which intakes require dose calculations is established."

SITE REQUIREMENT SOURCE: DOE/EH0256T Article 523

"Interpretations of bioassay results and subsequent dose assessments should include the following:

1. Characteristics of the radionuclide, such as chemical and physical form
2. Bioassay results and the persons previous exposure history
3. Exposure information, such as route of intake and time and duration of exposure
4. Biological models used for dosimetry of radionuclides
5. Models to estimate intake or deposition and to assess dose

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6. Intradepartmental coordination between the Radiological Control Organization and the medical organization for doses that may require medical intervention."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.g(1)

"External Radiation. Personnel dosimetry programs shall be adequate to demonstrate compliance with the radiation protection standards provided in paragraph 9.b. Personnel dosimeters shall be routinely calibrated and maintained and shall meet the requirements of the DOE Laboratory Accreditation Program for Personnel Dosimetry as specified in DOE 5480.15. Personnel dosimetry shall be provided to radiation workers who have the potential to exceed in a year any once of the following from external sources:

- (a) One hundred mrem (0.001 sievert) annual effective dose equivalent to the whole body.
- (b) Five rem (0.05 sievert) annual dose equivalent to the skin.
- (c) Five rem (0.05 sievert) annual dose equivalent to any extremity.
- (d) One and a half rem (0.015 sievert) annual dose equivalent to the lens of the eye."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.g(2)

"Internal Radiation. Internal dose evaluation programs (including routine bioassay programs) shall be adequate to demonstrate compliance with the radiation protection standards in paragraph 9.b. Such programs are required for radiation workers exposed to surface or airborne radioactive contamination where the worker could receive 0.1 rem (0.001 sievert) annual effective dose equivalent from all intakes of all radionuclides from occupational sources, or if any organ or tissue dose equivalent could exceed 5 rem (0.05 sievert) annual dose equivalent."

11.3.3

Dosimetry Program

This element includes requirements relating to the facility dosimetry program. It includes requirements of the selection of equipment, qualification of the program, and other requirements relating to the proper use of dosimetry equipment for personnel monitoring.

SITE REQUIREMENT SOURCE: ANSI-N319-1976 Section 4.1

"Dosimetry System Performance

The dosimetry system shall be capable of detecting a minimum quarterly neutron dose equivalent of 300 mrem. Therefore, the lower limit of detection for the dosimetry system shall be no greater than 300 mrem divided by the number of dosimetry periods per quarter. For the purpose of this standard, the limit of detection of the dosimetry system is considered to be that value of neutron dose equivalent for which the neutron responses of a set of ten or more dosimeters identically exposed will have a standard deviation of no greater than 50%."

SITE REQUIREMENT SOURCE: ANSI-N319-1976 Section 4.2

"The dosimetry system shall be capable of determining a dose equivalent up to 10 rem."

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SITE REQUIREMENT SOURCE: ANSI-N319-1976 Section 4.5

"The dosimeter shall meet the requirements of 4.1 through 4.4 when subjected to the following environmental factors after exposure to the test spectrum. (Each of these environmental tests may be performed separately.)

- (1) Temperature extremes of 0° C and 45° C (32° F and 113° F) for one week
- (2) A relative humidity of 90% for one week
- (3) Normal artificial room light or normal sunlight for the extent of the dosimetry period
- (4) A drop to a hard surface from a height of 1.5 meters (4.9 feet)."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 511.2

"Dosimeters shall be issued only to personnel formally instructed in their use and shall be worn only by those to whom the dosimeters were issued."

RELATED REFERENCES

1. DOE/EH0256T Article 511

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 511.3

"To minimize the number of personnel in the dosimetry program, the issuance of dosimeters is discouraged to other than personnel entering Radiation Areas, High Radiation Areas or Radiological Buffer Areas where there is a potential for external exposure. Although issuing dosimeters to personnel who are not occupationally exposed to radiation can appear as a conservative practice, it creates the impression that the wearers are occupationally exposed to radiation."

RELATED REFERENCES

1. DOE/EH0256T Article 511

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 511.4

"Personnel shall return dosimeters for processing as scheduled or upon request, and should be restricted by line-management from continued radiological work until dosimeters are returned."

RELATED REFERENCES

1. DOE/EH0256T Article 511

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 511.5

"Personnel shall wear their primary dosimeters on the chest area, on or between the waist and the neck, in the manner prescribed by dosimetry personnel."

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RELATED REFERENCES

1. DOE/EH0256T Article 511

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 511.7

"The practice at some facilities of taking thermoluminescent dosimeters (TLDs) off-site is discouraged and shall not be implemented where not in place."

RELATED REFERENCES

1. DOE/EH0256T Article 511

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 511.8

"Personnel shall not wear dosimeters issued by their resident facilities while being monitored by a dosimeter at another site. Personnel shall not expose their dosimeters to security x-ray devices, excessive heat, or medical sources of radiation."

RELATED REFERENCES

1. DOE/EH0256T Article 511

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 511.9

"A person whose dosimeter is lost, damaged, or contaminated should place work in a safe condition, immediately exit the area and report the occurrence to the Radiological Control Organization. Reentry of the person into Radiological Buffer Areas should not be made until a review has been conducted and management has approved reentry."

RELATED REFERENCES

1. DOE/EH0256T Article 511

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 512.1

"Technical Requirements for External Dosimetry
DOE 5480.15 specifies the requirements for accreditation of personnel external dosimetry monitoring programs by the DOE Laboratory Accreditation Program (DOELAP). A technical basis document shall be developed for the external dosimetry program. Personnel external dosimeters include but are not limited to TLDs, track etch dosimeters and neutron sensitive film."

RELATED REFERENCES

1. DOE/EH0256T Article 512, Paragraph 1

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 512.2

"The technical basis document shall also address dosimeters monitoring radiation outside the scope of DOELAP, such as dosimetry associated with high-energy accelerators and extremity dosimeters."

RELATED REFERENCES

1. DOE/EH0256T Article 512

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 512.3

"Facilities should participate in intercomparison studies for external dosimetry programs."

RELATED REFERENCES

1. DOE/EH0256T Article 512

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 512.4

"Personnel exposures to the skin, lens of the eye and extremities shall be reported separately when monitored."

RELATED REFERENCES

1. DOE/EH0256T Article 512

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 512.5

"Multiple dosimeters should be issued to personnel to assess whole body exposure in non-uniform radiation fields or as required on Radiological Work Permits. Non-uniform radiation fields exist when the dose to a portion of the whole body will exceed the dose to the primary dosimeter by more than 50 percent and the anticipated whole body dose is greater than 100 mrem. The technical basis document should describe the methodology used in determining the dose of record when multiple dosimeters are used."

RELATED REFERENCES

1. DOE/EH0256T Article 512

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 512.6

"A dose assessment shall be performed for each instance of a lost, damaged or contaminated personnel dosimeter."

RELATED REFERENCES

1. DOE/EH0256T Article 512

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 513

"Pocket and Electronic Dosimeters

Pocket and electronic dosimeters are supplemental dosimeters that provide real-time indication of exposure to radiation and assist in maintaining personnel doses less than Administrative Control Levels."

RELATED REFERENCES

1. DOE/EH0256T Article 513

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 513.1

"Supplemental dosimeters shall be issued to personnel prior to entry into a High Radiation Area, when a person could exceed 10 percent of an Administrative Control Level from external radiation in 1 work day, or when required by a Radiological Work Permit (RWP). Pocket dosimeters should be selected with the lowest range applicable (typically 0-200 mR) for anticipated personnel exposures."

RELATED REFERENCES

1. DOE/EH0256T Article 513

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 513.2

"Supplemental dosimeters shall be worn simultaneously with the primary dosimeter and located in accordance with Article 511.5."

RELATED REFERENCES

1. DOE/EH0256T Article 513

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 513.3

"Supplemental dosimeters shall be read periodically while in use and should not be allowed to exceed 75 percent of full scale."

RELATED REFERENCES

1. DOE/EH0256T Article 513

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 513.5

"The energy dependence of supplemental dosimeters, particularly to low-energy beta radiation, should be considered in determining their applicability."

RELATED REFERENCES

1. DOE/EH0256T Article 513

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 513.6

"Use of electronic dosimeters is encouraged for entry into High Radiation Areas or when planned doses greater than 100 mrem in 1 work day are expected. An electronic dosimeter provides an early warning of elevated exposure through the use of alarm set points at specified dose rates of integrated doses."

RELATED REFERENCES

1. DOE/EH0256T Article 513

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 513.7

"When the dose results from the pocket or electronic dosimeters differ by more than 50 percent from the primary dosimeter result and the primary dosimeter result is greater than 100 mrem, an investigation should be initiated to explain the difference."

RELATED REFERENCES

1. DOE/EH0256T Article 513

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 514.1

"Area monitoring dosimeters shall be used to record and document radiation levels in routinely occupied areas adjacent to areas where radiation or operations with radiation exist."

RELATED REFERENCES

1. DOE/EH0256T Article 514

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 514.2

"Area monitoring dosimeter results should be used to support dosimetry investigations where personnel express concerns about their work environments and exposure to ionizing radiation."

RELATED REFERENCES

1. DOE/EH0256T Article 514

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 514.3

"Area monitoring dosimeters should be used in Controlled Areas to supplement existing monitoring programs and to provide data in the event of an emergency. "

RELATED REFERENCES

1. DOE/EH0256T Article 514

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SITE REQUIREMENT SOURCE: DOE-PNL-6534 Section 4.8.6, Paragraph 3

"Dosimeters capable of measuring beta, gamma, and neutron exposures should be assigned to every individual who routinely works in the process area. The exchange period should be based on facility experience. Normally monthly to quarterly exchange periods should be the preferred frequency. However, a less frequent exchange (e.g., annual) may improve the detection capabilities and reduce the amount of false dose equivalents recorded."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5

"PERFORMANCE OBJECTIVE: The routine and accident personnel radiation dosimetry programs should ensure that personnel radiation exposures are accurately determined and recorded."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 NUCLEAR ACCIDENT DOSIMETRY.3

" 3. Personnel dosimeters worn in radiation areas are adequate to cover the range of exposures and energies anticipated from an accident."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.1

"*1. The program appropriately incorporates the requirements of ANSI Standards 13.5-1972, N319-1976, N323-1978, and Department of Energy Laboratory Accreditation Program (DOELAP) Standard for personnel dosimetry systems."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.14

"14. A quality control program is implemented and documented to evaluate dosimetry program performance which includes intercomparison studies and laboratory validation procedures."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.15

"15. Correction factors or other appropriate methods are employed to ensure exposures from the types of radiation present and high- and low-energy gammas are accurately recorded in rem."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.16

"16. Dosimeter operations are performed by and results interpreted by qualified personnel."

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.21

"21. A procedure for estimating the dose from a lost dosimeter is available."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.9

"9. Whole-body exposures dosimeters are worn in the proper location and manner to measure the highest whole-body exposure."

SITE REQUIREMENT SOURCE: DOE5480.15 Section 9.h(1) thru (7)

"Heads of DOE and DOE Contractor Personnel Dosimetry Programs or their Designated Representatives shall:

- (1) Complete and submit an initial application for a DOE Laboratory Accreditation Program performance evaluation through the Head of the appropriate Field Element who must concur on the application (paragraph 9e(4)). Applications are contained in DOE/EH-0026.
- (2) Submit dosimeters for testing upon request of the Performance Evaluation Program Administrator. Each test requires three separate submissions of dosimeters at intervals of approximately one month.
- (3) Evaluate irradiated dosimeters in terms of the units specified by DOE/EH-0027 and report the values to the Performance Evaluation Program Administrator.
- (4) Allow site assessors to examine all aspects of the program, including facilities, equipment, dosimeters, procedures, notebooks, records, reports, position descriptions, personnel qualifications, and training documentation.
- (5) Respond in writing within 45 days of receipt of the site assessment report to any recommendations. Responses should be sent to the Performance Evaluation Program Administrator, with the concurrence of the Head of the appropriate Field Element. The response shall include corrective action (as appropriate) and completion dates.
- (6) Within 60 days, identify and implement plans to make appropriate changes in equipment, procedures, and/or personnel to achieve a program capable of receiving accreditation in the event that accreditation is denied. Plans shall have the concurrence of the Head of the appropriate Field Element.

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- (7) Apply and complete testing procedures and onsite assessment for re-accreditation before each 2-year anniversary of the initial accreditation."

11.3.4

Calculation Methods/Models

This element includes requirements that go beyond monitoring exposure and/or exposure levels to calculating exposure to plant workers and the relative biological effect. It includes recommended/required formulas and calculations as well as methods for combining exposures from different exposure modes or to different parts of the body to determine overall personnel exposure (Total Effective Dose Equivalent or TEDE).

SITE REQUIREMENT SOURCE: ANSI-N13.6-1966 Section 6.2

"Procedures and Methods for Interpretation and Evaluation of Individual Exposure Data. Procedures describing the techniques and methods employed to obtain, process, and evaluate data for individuals external and internal exposure records should be recorded. Records of the methods used to obtain an individual's exposure should contain reference to pertinent published documents or reports, and should show the period of applicability of such methods."

SITE REQUIREMENT SOURCE: DOE-PNL-6534 Section 4.6.7, Paragraph 2

"There are several published methods for estimating intake from bioassay data (Skrable et al. (/a); Skrable 1983; King 1986; Johnson and Carver 1981). These methods each employ an idealized mathematical model of the human body showing how materials are retained in and excreted from the body over time following the intake. An intake retention model is a simplified mathematical description of the complex biokinetics of a radioactive material in the human body. These models are used to predict the fraction of an intake that will be detected in whole body or chest measurements and in urine or fecal samples. Intake retention models consist of an uptake retention model that relates uptake to bioassay data, and a feed model that relates intake to uptake and bioassay data. Results predicted by the model may then be compared with the observed bioassay data. The model may be iteratively adjusted until the best fit between theory and the observed data is achieved.

/a Skrable, K. W., G. E. Chabot, C. S. French, and T. R. LaBone. 1986. "Intake Retention Functions and Their Applications to Bioassay and the Estimation of Internal Radiation Doses." Health Physics (submitted for publication in 1986)."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 8.e(12)

"Weighing Factor (Wt). Is used in the calculation of annual and committed effective dose equivalent to equate the risk arising from the irradiation of tissue T to the total risk when the whole body is uniformly irradiated. The weighing factors as defined in ICRP Publication 26 and NCRP Report 91 are:

Organs or Tissues	Weighing Factor
Gonads	0.25
Breasts	0.15

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Red Bone Marrow	0.12
Lungs	0.12
Thyroid	0.03
Bone Surf	0.03
Remainder \1	0.30

\1 "Remainder" means the five other organs or tissue with the highest dose (e.g., liver, kidney, spleen, thymus, adrenal, pancreas, stomach, small intestine, upper large intestine or lower large intestine). The weighing factor for each remainder organ or tissue is 0.06. The extremities, skin, and lens of the eye are excluded from the "remainder" organs or tissue for assessment of effective dose equivalent."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.f(1)

"Combining Internal and External Dose Equivalent. The annual effective dose equivalent to an individual shall be determined by summing the annual effective dose equivalents from internally deposited radionuclides and from external exposure to radioactive material and/or radiation generating devices resulting from DOE activities. When in-vivo and/or in-vitro measurements confirm the retention of radionuclides in the body, with respect to evaluating conformance with the limiting value for occupational exposure, the annual effective dose equivalent due to all radionuclides retained in the body from these intakes shall be assessed for as long as the annual effective dose equivalent is 10 mrem or greater. Exposures to the skin, extremities, and lens of the eye are not included in the determination of the annual effective dose equivalent. For uniform external irradiation of the whole body, a weighing factor (Wt) equal to one may be used. This whole body dose is to be measured in accordance with the provisions in paragraph 9g(1). Non-uniform external and internal irradiation values of Wt for organs and tissues are defined in paragraph 8e(12)."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.f(2)

"Non-Uniform Exposure to Skin. For non-uniform exposures to skin from x rays, beta radiation, or skin contamination, one of the following assessments shall be made and recorded:

- (a) When the area of skin exposed is > 100 cm² the maximum value of dose averaged over any area of 100 cm² is to be assessed, recorded, and included in the annual skin (shallow) dose equivalent."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.f(2)(b)

"When the area of skin exposed is > 10 cm² but < 100 cm² the dose equivalent to that tissue is to be determined by:

$$H = fD$$

where: D is the maximum dose averaged over a 1 cm² of skin and f is the fraction of skin exposed compared to 100 cm². In no case shall an "f" of < 0.1 be used. This value of dose is to be recorded and included in the annual skin (shallow) dose equivalent."

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SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.f(2)(c)

"When the area of skin exposed is $< 10 \text{ cm}^2$ the maximum value of dose averaged over any 1 cm^2 is to be assessed and recorded in the individual's occupational exposure history as a special entry but is not to be included in the annual skin (shallow) dose equivalent."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.f(4)(a)

"Air and Water Concentration Guides

- (a) Air. Derived air concentration (DAC) values for control of the workplace are given in Attachment 1. They were derived from the ICRP Publication 30 values for committed effective dose equivalent values, translated to conventional U.S. units of rem and curie. The ICRP Publication 23 recommended annual inhalation volume for male workers (40 hr/wk, 50 wk/yr) was assumed to be 2400 m^3 . The DAC values or other air concentration values shall not be used for the calculation of internal dose equivalent received by a worker except for unusual circumstances where bioassay data is unavailable or inadequate."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.f(5)

"Quality Factors. The dose equivalent limits specified in this chapter are expressed in terms of rem; this requires that the absorbed dose (expressed in rads) be multiplied by an appropriate quality factor (Q). The quality factors to be used for determining dose equivalent in rem are shown in Figures 2 and 3."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.h

"Methods of Estimating Dose Equivalent. Methods of estimating the dose equivalent from external and internal sources of radiation are to be appropriate to the workplace conditions and consistent with the recommendations of NCRP, ICRP, and EPA."

11.4

ENTRY AND EXIT CONTROL

This element addresses the requirements for controlling entry to and exit from radiologically protected areas to ensure personnel exposures are controlled and are maintained As Low As Reasonably Achievable (ALARA). It includes requirements for physical controls, procedural controls and for providing appropriate information to personnel working in radiologically protected areas through appropriate posting of radiological information and warnings.

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.3 POSTING.4

- "*4. Entrance to areas where radioactive materials are used or stored is restricted based upon established criteria."

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SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.1

"Entry Control Program. An appropriate entry control program shall be established for radiological areas. This should include a buffer area prior to entry to a radiological area where appropriate. The level of control should be consistent with the degree of hazard. Signs and barricades, control devices on entrances, conspicuous visual and/or audible alarms, locked entrance ways, and/or administrative procedures should be used as appropriate to ensure that personnel entry into radiological areas is controlled. Step-off pads and protective clothing shall be required for entry to contaminated areas. For very high radiation areas, the entry control program shall include at a minimum one of the following:

- (1) Control devices on each entrance or access point which function automatically to prevent entry when a very high radiation area exists; permit entry only after the radiation level is reduced below 0.1 rem (0.001 sievert) per hour; and prevent use or operation of the radiation source, thereby preventing the existence of a very high radiation area, while an individual is in the area.
- (2) A control device which energizes a conspicuous visible or audible alarm signal so that the individual entering the very high radiation area through a failed control device is aware of the radiation level and radiation protection personnel are aware of the entry. Administrative procedures shall define the required actions of personnel when alarms are activated.
- (3) Locked entry ways, except during periods when access to the area is required, with positive control over and radiation surveys made for the initial entry and periodically as necessary.
- (4) Control devices that will automatically generate audible and visible 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 area or the activation of a secondary control device which will prevent use or operation of the source."

11.4.1

Access Restrictions

This element addresses requirements for controlling access into facilities and areas through the use of either procedural or physical controls. These controls, when established in radiologically protected areas are intended to either warn personnel of hazards, to physically control entry and exit or to limit/control exposure when entering areas.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 231.10

"Physical barriers should be placed so that they are clearly visible from all

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directions and at various elevations. They should not be easily walked over or under, except at identified access points. These barriers shall be set up such that they do not impede the intended use of emergency exits or evacuation routes."

RELATED REFERENCES

1. DOE/EH0256T Article 231

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 233.1

"The size of the Radiological Buffer Area should be commensurate with the potential for the spread of contamination outside Contamination, High Contamination and Airborne Radioactivity Areas. At a minimum, the Radiological Buffer Area should include the area adjacent to any exit from and entrance to Contamination, High Contamination and Airborne Radioactivity Areas."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 233.2

"A Radiological Buffer Area is not required for High Contamination Areas that are completely within Contamination Areas."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 233.3

"A Radiological Buffer Area should surround or be contiguous with Radiation, High Radiation and Very High Radiation Areas. The boundary for the Radiological Buffer Area and these radiation areas may be one in the same."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 332.1

"Radiological Buffer Areas

Minimum requirements for unescorted entry into Radiological Buffer Areas shall include the following:

- a. Radiological Worker I training;
- b. Personnel dosimetry, as appropriate."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 332.2

"Personnel who exit a Radiological Buffer Area containing Contamination Areas, High Contamination Areas, or Airborne Radioactivity Areas should monitor as specified in Article 338."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 333.1

"Radioactive Material Areas

Radiological Worker I training shall be required for unescorted entry into Radioactive Material Areas containing either of the following:

- a. Sealed radioactive sources;
- b. Radioactive material labeled and packaged in accordance with Articles 412 and 413."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 333.2

"Entry into Radioactive Material Areas where whole body dose rates exceed 5 mr/hr or removable contamination levels exceed Table 2-2 values shall be in accordance with the requirements of Articles 334.1 and 335.1, respectively."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 334.1

"Radiation, High Radiation and Very High Radiation Areas

Minimum requirements for unescorted entry into Radiation Areas shall include the following:

- a. Radiological Worker I training;
- b. Worker's signature on the Radiological Work Permit (RWP), as applicable; c. Personnel dosimetry."

RELATED REFERENCES

1. DOE/EH0256T Article 334

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 334.2

"Physical controls to prevent inadvertent or unauthorized access to High and Very High Radiation Areas shall be maintained in accordance with Appendix 3B."

RELATED REFERENCES

1. DOE/EH0256T Article 334

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 334.3

"Minimum requirements for unescorted entry into High Radiation Areas shall include the following:

- a. Radiological Worker II training;
- b. Worker's signature on the RWP;
- c. Personnel and supplemental dosimeters;
- d. Survey meter or dose rate indicating device available at the work area."

RELATED REFERENCES

1. DOE/EH0256T Article 334

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 334.4

"Minimum requirements for unescorted entry into High Radiation Areas where dose rates exist such that a worker could exceed a whole body dose of 1 rem in one hour shall include those items listed in Article 334.3 and the following:

- a. A determination of the worker's current exposure, based on primary and supplemental dosimeter readings;
- b. Pre-job briefing, as applicable;

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- c. Review and determination by the Radiological Control Organization regarding the required level of Radiological Control Technician coverage."

RELATED REFERENCES

1. DOE/EH0256T Article 334

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 334.5

"Workers shall be prevented from entry to Very High Radiation Areas when the radiation source is exposed and very high radiation fields are present. In addition to the controls required in Articles 334.2 and 334.3, a survey shall be made prior to the first entry to the area after the source has been secured or shielded to verify the very high radiation field has been terminated."

RELATED REFERENCES

1. DOE/EH0256T Article 334

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 334.6

"Facility operations personnel should be notified prior to personnel entry to areas where operational or system changes made by operations personnel could result in significantly increased area dose rates."

RELATED REFERENCES

1. DOE/EH0256T Article 334

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 334.7

"The number, issue and use of keys shall be strictly controlled where locked entryways are used to control access to High and Very High Radiation Areas."

RELATED REFERENCES

1. DOE/EH0256T Article 334

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 334.8

"The Radiological Control Organization should maintain an inventory of High and Very High Radiation Areas."

RELATED REFERENCES

1. DOE/EH0256T Article 334

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 334.9

"Weekly inspections of the physical access controls to High and Very High Radiation Areas should be made to verify controls are adequate to prevent unauthorized entry."

RELATED REFERENCES

1. DOE/EH0256T Article 334

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 335.1

"Contamination, High Contamination and Airborne Radioactivity Areas Minimum requirements for unescorted entry into Contamination Areas shall include the following:

- a. Radiological Worker II training;
- b. Worker's signature on the RWP, as applicable;
- c. Protective clothing;
- d. Personnel dosimetry, as appropriate."

RELATED REFERENCES

1. DOE/EH0256T Article 335

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 335.2

"Minimum requirements for unescorted entry into High Contamination or Airborne Radioactivity Areas shall include the following:

- a. Radiological Worker II training;
- b. Worker's signature on the RWP;
- c. Protective clothing and respiratory protection, as specified by the RWP;
- d. Pre-job briefing for High Contamination or Airborne Radioactivity Areas, as applicable;
- e. Personnel dosimetry, as appropriate."

RELATED REFERENCES

1. DOE/EH0256T Article 335

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 335.3

"Personnel exiting Contamination, High Contamination or Airborne Radioactivity Areas shall:

- a. Remove protective clothing as specified in Appendix 3C;
- b. Perform whole body frisking to detect personnel contamination in accordance with Article 338;
- c. Tools or equipment being removed from the area shall be monitored for release in accordance with Article 421 or for retention in the contaminated tool crib in accordance with Article 442.5."

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RELATED REFERENCES

1. DOE/EH0256T Article 335

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 335.4

"Exit points from Contamination, High Contamination or Airborne Radioactivity Areas should include the following:

- a. Step-off pad located outside the exit point, contiguous with the area boundary;
- b. Step-off pads maintained free of radioactive contamination;
- c. Labeled containers inside the area boundary for the collection of protective clothing and equipment;
- d. Contamination monitoring equipment located as close to the step-off pad as background radiation levels permit."

RELATED REFERENCES

1. DOE/EH0256T Article 335

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 335.5

"Multiple step-off pads should be used at the exits from High Contamination Areas. Use of multiple step-off pads is described in Appendix 3C."

RELATED REFERENCES

1. DOE/EH0256T Article 335

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 336.1

"Visitor Entry Requirements

Site procedures shall identify area entry requirements and access restrictions for visitors."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 336.2

"Visitors with a demonstrated need to enter the following areas may be allowed access if such access is controlled with a combination of training and the use of escorts trained for the specific area:

- a. Radiological Buffer Areas;
- b. Radiation and High Radiation Areas;
- c. Contamination Areas;
- d. Radioactive Material Areas."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 336.3

"Visitors shall be prevented from entering Very High Radiation Areas in accordance with Article 334.5 and should be prohibited access to High Contamination and Airborne Radioactivity Areas."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 553.6

"Where an area radiation monitor is incorporated into a safety interlock system the circuitry shall be such that a failure of the monitor shall either prevent entry into the area or prevent operation of the radiation producing device."

RELATED REFERENCES

1. DOE/EH0256T Article 553

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.3 POSTING.2

"*2. Radiation levels are established and documented for when areas are to be barricaded and marked to prevent inadvertent entry, and when areas are to be physically locked to preclude unauthorized entry."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.1(1)

"For very high radiation areas, the entry control program shall include at a minimum one of the following:

- (1) Control devices on each entrance or access point which function automatically to prevent entry when a very high radiation area exists; permit entry only after the radiation level is reduced below 0.1 rem (0.001 sievert) per hour; and prevent use or operation of the radiation source, thereby preventing the existence of a very high radiation area, while an individual is in the area."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.1(3)

"Locked entry ways, except during periods when access to the area is required, with positive control over and radiation surveys made for the initial entry and periodically as necessary."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.1(4)

"Control devices that will automatically generate audible and visible 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 area or the activation of a secondary control device which will prevent use or operation of the source."

SITE REQUIREMENT SOURCE: WAC-402-24 Section 090(1)(e)(ii)

"Each entrance or access point to a high radiation area shall be:

- (A) Equipped with a control device which shall cause the level of radiation to be reduced below that at which an individual might receive a dose of 100 millirems in 1 hour upon entry into the area; or
- (B) Equipped with a control device which shall energize a conspicuous visible or audible alarm signal in such a manner that the individual entering the high radiation area and the licensee or a supervisor of the activity are made aware of the entry; or

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- (C) Maintained locked except during periods when access to the area is required, with positive control over each individual entry."

RELATED REFERENCES

1. 10CFR20 Part 20.203.c.(2)

SITE REQUIREMENT SOURCE: WAC-402-24 Section 090(1)(e)(iii)

"The controls required by paragraph (e)(ii) of this section shall be established in such a way that no individual will be prevented from leaving a high radiation area."

RELATED REFERENCES

1. 10CFR20 Part 20.203.c.(3)

SITE REQUIREMENT SOURCE: WAC-402-24 Section 090(1)(e)(iv)

"In the case of a high radiation area established for a period of 30 days or less, direct surveillance to prevent unauthorized entry may be substituted for the controls required by paragraph (e)(ii) of this section. Direct surveillance requires the continuous physical presence of an individual capable of taking all necessary precautions to prevent unwarranted exposure of individuals."

RELATED REFERENCES

1. 10CFR20 Part 20.203.c.(4)

11.4.2

Posting

This element addresses those requirements related to the posting of areas with information concerning either the various types of radiological hazards contained in the areas or with warnings to notify workers of requirements and conditions. Posting is accomplished through both the placement of warning signs and through the posting of survey information for workers to review when entering areas.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 222.1

"Contamination Control Levels

A surface shall be considered contaminated if either the removable or total radioactivity is detected above the levels in Table 2-2. If an area cannot be decontaminated promptly, then it shall be posted as specified in Article 235."

RELATED REFERENCES

1. DOE/EH0256T Article 222

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 223.2

"Occupied areas with airborne concentrations of radioactivity that are greater than or potentially greater than 10 percent of a Derived Air Concentration shall be posted as specified in Article 235. For most radionuclides, air containing 10 percent of a Derived Air Concentration results in a committed effective dose equivalent of approximately 10 mrem if inhaled continuously for one work week. Values of Derived Air Concentrations are provided in DOE 5480.11."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 231.1

"Posting

Posting Requirements

Radiological posting shall be used to alert personnel to the presence of radiation and radioactive materials and to aid them in minimizing exposures and preventing the spread of contamination. Boundaries used for radiological control purposes are depicted in Figure 2-1."

RELATED REFERENCES

1. DOE/EH0256T Article 231

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 231.11

"Posting of doors should be such that the postings remain visible when doors are open or closed."

RELATED REFERENCES

1. DOE/EH0256T Article 231

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 231.2

"Signs shall contain the standard radiation symbol colored magenta or black on a yellow background. Lettering shall be either magenta or black. Magenta is the preferred color over black. Standardized signs, as described in the standardized core training, should be used where practicable."

RELATED REFERENCES

1. DOE/EH0256T Article 231

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 231.3

"Radiological postings should be displayed only to signify actual or potential radiological conditions. Signs used for training should be clearly marked, such as "For Training Purposes Only."

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RELATED REFERENCES

1. DOE/EH0256T Article 231

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 231.4

"Posted areas should be as small as practicable for efficiency."

RELATED REFERENCES

1. DOE/EH0256T Article 231

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 231.5

"Postings should be maintained in a legible condition and updated based upon the results of the most recent surveys."

RELATED REFERENCES

1. DOE/EH0256T Article 231

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 231.6

"If more than one radiological condition (such as contamination and high radiation) exists in the same area, each condition should be identified."

RELATED REFERENCES

1. DOE/EH0256T Article 231

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 231.7

"In areas of ongoing work activities, the dose rate and contamination level or range of each should be included on or in conjunction with each posting as applicable."

RELATED REFERENCES

1. DOE/EH0256T Article 231

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 231.8

"Entrance points to areas of ongoing work activities controlled for radiological purposes should state basic entry requirements, such as dosimetry, Radiological Work Permit (RWP) and respirator required."

RELATED REFERENCES

1. DOE/EH0256T Article 231

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 231.9

"Rope, tape, chain and similar barriers used to designate the boundaries of posted areas should be yellow and magenta in color."

RELATED REFERENCES

1. DOE/EH0256T Article 231

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 232.1

"Posting Controlled Areas

Areas within the site boundary should be clearly posted to alert personnel to the presence of radiation and radioactive materials above natural background levels. These areas shall be designated Controlled Areas. Persons who enter only the controlled Area without entering Radiation, Contamination, Airborne Radioactivity or Radiological Buffer Areas are not expected to receive more than 100 mrem in a year."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 232.2

"The contractor may select the type of sign used to avoid conflict with local security requirements. This selection shall be approved by the site senior executive."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 233

"Posting Radiological Buffer Areas

A Radiological Buffer Area shall be established within the Controlled Area to provide a second boundary to minimize the spread of contamination. The Radiological Buffer Area is intended for use where ongoing work activities may create airborne radioactivity or the spread of contamination. It is not expected that Radiological Buffer Areas be established around inactive or secured Contamination Areas. The need for Radiological Buffer Areas in conjunction with Radioactive Material Areas should be evaluated."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 233.4

"Posting of Radiological Buffer Areas shall be in accordance with Article 231 and shall contain the wording "CAUTION, RADIOLOGICAL BUFFER AREA." Radiological Buffer Areas that have the same boundaries as radiation areas do not have to be posted."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 234.1

"Posting Radiation Areas

Areas shall be posted to alert personnel to the presence of external radiation in accordance with Table 2-3 and Article 231."

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RELATED REFERENCES

1. DOE/EH0256T Article 234

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 234.4

"Posting of Hot Spots is not required in High Radiation Areas with general area dose rates greater than 1 rem/hr or in Very High Radiation Areas."

RELATED REFERENCES

1. DOE/EH0256T Article 234

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 234.5

"The type of personnel dosimeter used by the facility should be included on the sign if the personnel dosimeter is not a Thermoluminescent Dosimeter (TLD)."

RELATED REFERENCES

1. DOE/EH0256T Article 234

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 234.6

"The requirement for an RWP should be included either on or in conjunction with the posting."

RELATED REFERENCES

1. DOE/EH0256T Article 234

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 234.7

"Dose received in an hour may be used as the criterion for posting (Column 2 of Table 2-3). In this Table, the unit "rad" is associated with dose rates that pose an immediate danger."

RELATED REFERENCES

1. DOE/EH0256T Article 234

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 235.1

"Posting Contamination, High Contamination, and Airborne Radioactivity Areas shall be posted to alert personnel to contamination in accordance with Tables 2-4 and Article 231."

RELATED REFERENCES

1. DOE/EH0256T Article 235

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 235.2

"The requirement for an RWP should be included either on or in conjunction with each posting as applicable."

RELATED REFERENCES

1. DOE/EH0256T Article 235

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 235.3

"Derived Air Concentration (DAC) values for use with Table 2-9 are found in DOE 5480.11."

RELATED REFERENCES

1. DOE/EH0256T Article 235

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 236.1

"Posting Radioactive Material Areas

Areas where radioactive materials are used, handled or stored should be posted

"CAUTION, RADIOACTIVE MATERIAL." The posting shall meet the requirements in Article 231."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 236.2

"Radioactive Material Areas should be located within Controlled Areas."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 236.3

"Posting for Radioactive Material Areas is not required when the radioactive material is inside a Contamination or Airborne Radioactivity Area."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 237.1

"Posting Underground Radioactive Material Areas

Underground Radioactive Material Areas shall be established to indicate the presence of underground items that contain radioactive materials such as pipelines, radioactive cribs, covered ponds, covered ditches, catch tanks, inactive burial grounds, and sites of known, covered, unplanned releases (spills)."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 237.2

"Underground Radioactive Material Area shall be posted "UNDERGROUND RADIOACTIVE MATERIAL." The posting shall meet the applicable requirements of Article 231. "

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 237.3

"Underground Radioactive Material Areas can be located inside or outside Controlled Areas and are exempt from the entry and exit requirements of Chapter 3."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 551.1

**"Radiological Monitoring and Surveys
Requirements**

Radiological monitoring of radiation exposure levels, contamination and airborne radioactivity shall be conducted to characterize workplace conditions and to identify areas requiring posting."

RELATED REFERENCES

1. DOE/EH0256T Article 551

**SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION
CONTROL.9**

- " 9. Contaminated areas are clearly identified and have the contamination levels and the protective measures required clearly posted at the entrance."

**SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 RADIATION
MONITORING.4**

- " 4. Dose rate values are established for posting radiation areas and approximate dose rates are posted."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.3 POSTING.1

- "*1. The technical criteria, and dose rate and/or levels, for defining radiation, high radiation, very high radiation, contamination, and airborne radioactivity areas are established, documented, and consistently applied."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.3 POSTING.3

- "*3. DOE required forms are posted in all facilities on the site."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.3 POSTING.6

- " 6. Results of radiation surveys of radiation areas are posted at the entrance."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.3 POSTING.7

- " 7. Airborne activity areas are posted to alert personnel to possible respiratory protection requirements."

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.3 POSTING.9

" 9. Areas where radioactive materials are handled or stored are clearly and accurately posted."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.6.3

" 3. Accurate and timely airborne radioactivity survey information is available for determining the boundaries of airborne radioactivity areas, posting entry requirements, and minimizing internal exposure to workers during work activities. The boundaries of these areas are clearly identified and posted."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.6.4

" 4. Accurate and timely contamination survey information is available for determining the boundaries of airborne radioactivity areas, posting entry requirements, and minimizing internal exposure to workers during work activities. The boundaries of these areas are clearly identified and posted."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.k

"Posting and Labeling. Areas in DOE nuclear facilities shall be posted in accordance with the provisions given below. Radioactive material and/or its container shall be individually labeled where normal posting of the area and control of the material would not provide adequate protection. The design of signs, labels, and the radiation symbol shall conform to ANSI N12.1-1971 and ANSI N2.1-1971. The background color is to be yellow; the symbol color may be black or magenta."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.k(1)

"Controlled Area. The access to any controlled area where radioactive materials or elevated radiation fields may be present shall be clearly and conspicuously posted as a controlled area. The type of sign used may be selected by the contractor with the approval of the field organization to avoid conflict with local security requirements."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.k(2)(a)

"Radiological Area

(a) Posting for External Radiation. The access to any area where an individual can at any time during normal operations receive a dose equivalent greater than 5 mrem (50 μ Sv) in 1 hour at 30 centimeters from the radiation source or any surface through which radiation penetrates shall be posted as below. In addition, the anticipated dose rate or range of dose rates shall be included on or in conjunction with each of the signs, as appropriate."

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SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.k(2)(a)1-3

- "1 "Radiation Area" for any area within a controlled area where an individual can receive a dose equivalent greater than 5 mrem (50 μ Sv) but less than 100 mrem (1 mSv) in 1 hr at 30 cm from the radiation source or from any surface through which the radiation penetrates,
- 2 "High Radiation Area" for any area within a controlled area where an individual can receive a dose equivalent of 100 mrem or greater (0.001 sievert) but less than 5 rem (0.05 sievert) in 1 hr at 30 cm from the radiation source or from any surface through which the radiation penetrates, and
- 3 "Very High Radiation Area" for any area within a controlled area where an individual can receive a dose of 5 rem (0.05 sievert) or greater in 1 hour at 30 cm from the radiation source or from any surface through which the radiation penetrates."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.k(2)(b)

"Posting for Airborne Radioactive Material. The access to any area where airborne radioactive material concentrations greater than 1/10 of the derived air concentrations (Attachment 1) are present shall be clearly and conspicuously posted with a sign that identifies the radiological conditions which exist (e.g., "Airborne Radioactivity Area"). The type of sign used shall be consistent with the radiation protection control policies established at the facility and may be selected by the contractor with the approval of the field organization."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.k(2)(c)

"Posting for Surface Contamination. The access to any area where surface contamination levels greater than 10 times those specified in Attachment 2 are present shall be clearly and conspicuously posted with a sign that identifies the radiological conditions which exist (e.g., "Contamination Area"). The type of sign used shall be consistent with the radiation control policies established at the facility and may be selected by the contractor with the approval of the field organization."

SITE REQUIREMENT SOURCE: INPO-88-010 Chapter III, Section 4.b

"Postings and Use of Survey Information

An area should be posted and controlled as required by regulation. For transitory high radiation areas, such as moving a large source through the RCA, the area need not be posted, but positive control should exist using means such as a radiological protection technician in attendance. Hot spots should be identified (for example, components with contact readings greater than 100 mrem/hr and more than five times the general area dose rates).

Survey information in the form of maps, signs, RWPs, or status boards should be readily available at work areas and easy to understand. This survey information should also be sufficiently detailed to allow workers to be knowledgeable of the exposure rate profile in large areas such as the reactor building or containment and should be dated so workers are aware of its

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timeliness. Workers should review this information prior to entering radiation and high radiation areas and use it to control their exposures."

SITE REQUIREMENT SOURCE: WAC-402-24 Section 090(1)(a)(b)(c)

"General.

- (a) Except as otherwise authorized by the department, symbols prescribed by this section shall use the conventional radiation caution colors (magenta or purple on yellow background). The symbol prescribed by this section is the conventional three-bladed design.
- (b) The conventional radiation symbol as described in (a) of this subsection shall be used only for:
 - (i) Instructing individuals to be cognizant of a potential radiation hazard as prescribed in (c) through (j) of this subsection
 - (ii) Indicating that information presented pertains to the topic of radiation.
- (c) In addition to the contents of signs and labels prescribed in this section, licensees may provide on or near such signs and labels any additional information which may be appropriate in aiding individuals to minimize exposure to radiation or to radioactive material."

RELATED REFERENCES

- 1. 10CFR20 Part 20.203.a

SITE REQUIREMENT SOURCE: WAC-402-24 Section 090(1)(d)

"Radiation areas. Each radiation area and entrance thereto shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION
RADIATION AREA"

RELATED REFERENCES

- 1. 10CFR20 Part 20.203.b

SITE REQUIREMENT SOURCE: WAC-402-24 Section 090(1)(e)(i)

"High radiation areas.

- (1) Each high radiation area and entrance thereto shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION
HIGH RADIATION AREA"

RELATED REFERENCES

- 1. 10CFR20 Part 20.203.c.(1)

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SITE REQUIREMENT SOURCE: WAC-402-24 Section 090(1)(f)

"Each airborne radioactivity area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION
AIRBORNE
RADIOACTIVITY AREA"

RELATED REFERENCES

1. 10CFR20 Part 20.203.d.(2)

SITE REQUIREMENT SOURCE: WAC-402-24 Section 090(1)(g)(i)

"Additional requirements.

- (1) Each area or room in which licensed material is used or stored and which contains any radioactive material (other than natural uranium or thorium) in an amount exceeding 10 times the quantity of such material specified in Appendix B of this part shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION
RADIOACTIVE
MATERIAL(S)"

RELATED REFERENCES

1. 10CFR20 Part 20.203.e.(1)

SITE REQUIREMENT SOURCE: WAC-402-24 Section 090(1)(h)(i)(ii)

"Containers.

- (1) Except as provided in this section, each container of radioactive material shall bear a durable, clearly visible label identifying the radioactive contents.
- (2) A label required pursuant to (h)(i) of this subsection shall bear the radiation caution symbol and the words: "Caution, Radioactive Material". It shall also provide sufficient information to permit individuals handling or using the containers, or working in the vicinity thereof, to take precautions to avoid or minimize exposures."

RELATED REFERENCES

1. 10CFR20 Part 20.203.f

SITE REQUIREMENT SOURCE: WAC-402-24 Section 090(2)

"Notwithstanding the provisions of subsection (1)(h)(i) of this section labeling is not required:

- (a) For laboratory containers, such as beakers, flasks, and test tubes, used transiently in laboratory procedures when the person using such containers is

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present. For such containers, a label identifying the radioactive contents is required.

- (b) For containers that do not contain licensed materials in quantities greater than the applicable quantities listed in WAC 402-24-230, Appendix B.
- (c) For containers containing only natural uranium or thorium in quantities no greater than 10 times the applicable quantities listed in WAC 402-24-230, Appendix B.
- (d) For containers that do not contain licensed materials in concentrations greater than the applicable concentrations listed in WAC 402-24-220 Column 2, Table I, Appendix A.
- (e) For containers when they are attended by an individual who take the precautions necessary to prevent the exposure of any individual to radiation or radioactive materials in excess of the limits established by the regulations in this part.
- (f) For containers when they are in transport and packaged and labeled in accordance with regulations of the Department of Transportation.
- (g) For containers which are accessible only to individuals authorized to handle or use them, or to work in the vicinity thereof, provided that the contents are identified to such individuals by a readily available written record.
- (h) For manufacturing or process equipment, such as nuclear reactors, reactor components, piping and tanks."

RELATED REFERENCES

1. 10CFR20 Part 20.203.f.(3)

SITE REQUIREMENT SOURCE: WAC-402-24 Section 090(3)

"Each licensee shall, prior to disposal of an empty uncontaminated container to unrestricted areas, remove or deface the radioactive material label or otherwise clearly indicate that the container no longer contains radioactive materials."

RELATED REFERENCES

1. 10CFR20 Part 20.203.f.(4)

SITE REQUIREMENT SOURCE: WAC-402-24 Section 095(3)

"Caution signs are not required to be posted at areas or rooms containing radioactive materials for periods of less than eight hours provided that

- (1) the materials are constantly attended during such periods by an individual who shall take the precautions necessary to prevent the exposure of any individual to radiation or radioactive materials in excess of the limits established in the regulations in this part; and
- (2) such area or room is subject to the licensee's control."

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RELATED REFERENCES

1. 10CFR20 Part 20.204.c

11.4.3

Radiation Work Permits

This element addresses requirements relating to the radiation work permit program. The radiation work permit program is another type of procedural control but is particularly important as it plays a major role in ensuring that the radiation protection program works on all levels.

RP personnel are normally made aware of work which must be performed in the facility when a request for a radiation work permit is submitted. The requirement that work in radiologically protected areas be performed under an appropriate radiation work permit is the primary method of ensuring appropriate surveys are performed prior to the work, appropriate controls are established for the task and personnel follow the requirements of those controls.

Finally, the radiation work permit program is the major vehicle for documenting the radiological aspects of the job.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 321

"Work Preparation

Radiological Work Permits

The Radiological Work Permit (RWP) is an administrative mechanism used to establish radiological controls for intended work activities. The RWP informs workers of area radiological conditions and entry requirements and provides a mechanism to relate worker exposure to specific work activities. The RWP should include the following information:

1. Description of work
2. Work area radiological conditions
3. Dosimetry requirements
4. Pre-job briefing requirements, as applicable
5. Training requirements for entry
6. Protective clothing and respiratory protection requirements
7. Radiological Control coverage requirements and stay time controls, as applicable
8. Limiting radiological conditions that may void the RWP
9. Special dose or contamination reduction considerations
10. Special personnel frisking considerations
11. Technical work document number, as applicable
12. Unique identifying number
13. Date of issue and expiration
14. Authorizing signatures."

RELATED REFERENCES

1. DOE/EH0256T Article 321

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 322.1

"Use of Radiological Work Permits

RWPs shall be used to control the following activities:

- a. Entry into High and Very High Radiation Areas;**
- b. Entry into High Contamination Areas;**
- c. Entry into Airborne Radioactivity Areas."**

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 322.2

"RWPs should be used to control the following activities:

- a. Entry into Radiation Areas;**
- b. Entry into Contamination Areas;**
- c. Handling of materials with removable contamination that exceed the values of Table 2-2."**

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 322.3

"Job-specific RWPs shall be used to control non-routine operations or work in areas with changing radiological conditions. The job-specific RWP shall remain in effect only for the duration of the job."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 322.4

"General RWPs may be used to control routine or repetitive activities, such as tours and inspections or minor work activities, in areas with well-characterized and stable radiological conditions. General RWPs should not be approved for periods longer than 1 year."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 322.5

"Radiological surveys shall be routinely reviewed to evaluate adequacy of RWP requirements. RWPs shall be updated if radiological conditions change to the extent that protective requirements need modification."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 322.6

"RWPs should be posted at the access point to the applicable radiological work area."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 322.7

"Workers shall sign that they have read, understand and will comply with the RWP prior to initial entry to the area and after any revisions to the RWP."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 322.8

"Worker pocket or electronic dosimeter readings should be recorded in a format that identifies and provides linkage to the applicable RWP."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 322.9

"An alternative formal mechanism, such as written procedures or experiment authorizations, may be used in lieu of an RWP as the administrative control over radiological work activities. If an alternative mechanism is used, it should meet the requirements of this Article and Articles 321 and 323."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 323.1

"Radiological Work Permit Preparation

The responsibility for ensuring adequate planning and control of work activities resides with line management. The lead work group responsible for the planned activity or for the area should initiate the preparation of the RWP."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 323.2

"RWPs shall be reviewed and approved by the Radiological Control Organization."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 323.3

"The RWP shall be based on current radiological surveys and anticipated radiological conditions."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 323.4

"The RWP shall be approved by the supervisor responsible for the work or area and the appropriate Radiological Control supervisor. Revisions or extensions to RWPs shall be subject to the same approval process."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.3

"*3. Radiation work permits or similar controls are used to control access to contaminated areas."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.3 POSTING.5

" 5. Current radiation work permits (radiation zone entry permits) meeting the requirements of the site/facility are posted at entrances to work areas. They reflect actual working conditions. Out-of-date work permits are removed in a timely manner."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.3 PROCEDURES.4

" 4. Radiation work procedures (permits) are used for all radiation area work. These procedures are approved by health physics staff and contain adequate provisions for:

- Protective apparel,

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- Work limitations,
- Job descriptions,
- Radiological conditions, and
- Special instructions."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.6.5

- " 5. Radiation work permits or similar controls are used to control personnel entry into areas where airborne radioactivity exists or where radioactive material may become airborne due to work being performed."

11.5

CONTAMINATION CONTROL

This element addresses those requirements relating to contamination control and the establishment of a contamination control program. It includes requirements for all types of contamination - solid, waterborne or airborne.

Controlling contamination is directly related to reducing exposure to personnel at the facility for several reasons. The most important reason involves the amount of time it takes for personnel to work in contaminated areas (particularly if respiratory protective equipment is required) versus working in clean areas. The most direct relationship between contamination control and exposure involves the potential for contamination to be ingested or inhaled while performing work in contaminated areas.

For these reasons, limiting and controlling contamination is an important part of both the overall Radiation Protection program and the facility ALARA program.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 221

"Contamination Control and Control Levels

Control of radioactive contamination is achieved by using engineering controls and worker performance to contain contamination at the source, reducing existing areas of contamination and promptly decontaminating areas that become contaminated."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 316.1

"Minimization of Internal Exposure

The minimization and control of internal exposure as discussed in Article 136 should be conducted in accordance with the following hierarchy of controls: Engineering controls, including containment of radioactive material at the source wherever practicable, should be the primary method of minimizing airborne radioactivity and internal exposure to workers."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 316.2

"Administrative controls, including access restrictions and the use of specific work practices designed to minimize airborne contamination, should be used as the secondary method to minimize worker internal exposure."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 463.1

"Decontamination
Radiological Work Permits or technical work documents shall include provisions to control contamination at the source to minimize the amount of decontamination needed."

RELATED REFERENCES

1. DOE/EH0256T Article 463

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 463.2

"Work preplanning shall include consideration of the handling, temporary storage, and decontamination of materials, tools and equipment."

RELATED REFERENCES

1. DOE/EH0256T Article 463

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.17

"17. Operations with a high potential for release of contamination are performed in accordance with job-specific procedures that minimize the potential for release."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.18

"18. The use of equipment capable of spreading contamination, such as blowers, fans, and vacuum cleaners, is controlled to prevent the spread of contamination."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.5

" 5. Adequate documented protective measures are employed, where practicable, to maximize contamination control."

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.6

" 6. Leaks from radioactive systems are promptly contained and repaired, and affected areas are decontaminated."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.7

" 7. Contamination and dose rate limits for equipment and tools stored and used only in radiation zones are established."

SITE REQUIREMENT SOURCE: INPO-88-010 Chapter IV, Section 3(b), Bullet 3

"To the greatest extent practical, the area posted should be enclosed or contained within a room, tent, bag, box, or other device to prevent the spread of airborne and loose surface radioactivity."

11.5.1

Source Containment, Confinement, and Ventilation Control

This element addresses those requirements relating to the containment and confinement of contamination - primarily that contamination which is airborne or has the potential for becoming airborne. It includes requirements for the appropriate maintenance and use of ventilation and other types of equipment to control contamination. It also includes requirements relating to appropriate work practices to prevent airborne contamination and appropriate engineering controls to limit and control airborne contamination.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 136

"Internal Exposures

Control and prevention of internal exposure from long-lived radionuclides in the workplace present special challenges to a Radiological Control Program and warrant particular attention. Even though internal exposure is measured in the same units as external exposure and carries the same risk per unit effective dose equivalent, the perception exists that it is of greater significance since the exposure is the result of radioisotopes retained within the body.

Administration of internal dose assessment is costly in dollars and worker time. Control and analysis of samples is also more complicated than the elements of external dosimetry.

In order to minimize internal exposures, managers should take deliberate actions to control contamination at the source and reduce Airborne Radioactivity, Contamination and High Contamination Areas. Work should be planned to avoid the routine use of respiratory protection devices. Internal exposures should be reduced to the minimum practicable level and the following should be considered:

- Workers may be exposed to unanticipated levels of elevated airborne radioactivity. Collecting representative airborne radioactivity samples and the time required for technicians or automated instruments to

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determine the airborne concentration of radionuclides may contribute to worker intakes of radioactivity.

- If controls fail, internal depositions of radionuclides can occur in a short period of time.
- The continued exposure of workers to airborne radioactivity over extended periods of time can create worker concerns.
- Doses from some internal radionuclides are difficult to measure. Although some radionuclides, such as cesium and tritium, can be readily measured at levels that produce only a few mrem, some long-lived radionuclides, like plutonium, require years for accurate measurements of hundreds of mrem.
- Medical intervention, such as the administration of blocking and chelating agents, to mitigate internal deposition adds risks by introducing additional chemicals into the body."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 316.2

"Administrative controls, including access restrictions and the use of specific work practices designed to minimize airborne contamination, should be used as the secondary method to minimize worker internal exposure."

FACILITY REQUIREMENT SOURCE: DOE-N5480.6 Section 452.1

"Control of Radioactive Drains

Radioactive drain systems are designed to transport radioactive liquids.

Improper use may cause an environmental release.

Radioactive drain systems should not discharge to the environment nor be used for the disposal of nonradioactive liquids."

FACILITY REQUIREMENT SOURCE: DOE-N5480.6 Section 452.2

"Existing radioactive drains should be evaluated to ensure the following:

- a. Verification of the existing radioactive drain piping configuration;
- b. Installation of flow-indicating devices in leak-off lines;
- c. Use of plugs to prevent nonradioactive input;
- d. Consideration of alternative work controls before systems are drained for maintenance;
- e. Controls prohibiting unauthorized use of drains."

FACILITY REQUIREMENT SOURCE: DOE-N5480.6 Section 452.3

"Modifications to the design or operation of existing radioactive drain systems should be controlled to include:

- a. Design considerations that prevent nonradioactive drain connections into radioactive drains;
- b. Procedural and design controls to prevent cross-connections of radioactive drains with nonradioactive systems;
- c. Management review of subsequent changes to the design of radioactive drain systems or radioactive drain controls;
- d. Management controls to restrict the introduction of hazardous wastes into radioactive drain systems."

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FACILITY REQUIREMENT SOURCE: DOE-N5480.6 Section 453.1

"Control of Airborne Radioactivity

Processes and activities with the potential for producing airborne radioactivity shall include engineering controls to limit releases."

FACILITY REQUIREMENT SOURCE: DOE-N5480.6 Section 453.2

"The Radiological Control Organization shall be notified when engineering controls that prevent worker exposure to airborne radioactivity, such as barriers, gloveboxes and glovebags, are compromised. An evaluation should be made of continuing operations with compromised engineering controls. The use of respiratory protection to continue is discouraged. Implementation of short-term engineering modifications that provide a commensurate level of worker protection is the preferred alternative."

FACILITY REQUIREMENT SOURCE: DOE-N5480.6 Section 453.3

"Preventive maintenance and surveillance procedures shall be established to ensure equipment controls are maintained in an operable condition for containment of airborne radioactivity."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.6.2

" 2. Engineered controls are used to prevent the intake of radioactive material, including the following, when feasible:

- Portable filtration systems are used to control airborne contaminants,
- Containment structures, such as tents, are used to protect personnel working in adjacent areas, and
- Unique fittings are used for the plant breathing air system."

11.5.2

Personnel Contamination Monitoring

This element addresses the requirements relating to the monitoring of personnel for contamination during and after work in radiologically protected areas. These requirements define when monitoring must be performed and specific requirements for properly performing personnel monitoring.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 221.2

"Monitoring for contamination should be performed using frisking equipment that under laboratory conditions can detect total contamination of at least the values specified in Table 2-2. Use of automatic monitoring units that meet the above requirements is encouraged."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 338.1

"Monitoring for Personnel Contamination

Personnel shall perform a whole body frisk under the following conditions:

- a. Immediately upon exiting Contamination Areas, High Contamination Areas and Airborne Radioactivity Areas;
- b. As directed by the RWP or the Radiological Control Organization."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 338.2

"In addition to the above, personnel exiting a Radiological Buffer Area containing Contamination, High Contamination or Airborne Radioactivity Areas should, at a minimum, perform a hand and foot frisk. This frisk is optional if the Radiological Buffer Area exit is immediately adjacent to the location where the exiting worker has already performed a whole body frisk."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 338.3

"Where frisking cannot be performed at the exit from Contamination Areas, High Contamination Areas or Airborne Radioactivity Areas due to high background radiation levels, personnel shall:

- a. Remove all protective equipment and clothing at the exit;
- b. Proceed directly to the nearest designated monitoring station;
- c. Conduct a whole body frisk."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 338.4

"Personnel frisking shall be performed after removal of protective clothing and prior to washing or showering."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 338.5

"Personnel frisking shall be performed using instruments that meet the minimum detection requirements of Article 221.2. Guidelines for personnel frisking are provided in Appendix 3D."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 338.6

"The use of automated personnel contamination monitors is encouraged."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 338.7

"Personal items, such as notebooks, papers and flashlights, shall be subject to the same frisking requirements as the person carrying them."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 338.8

"Instructions for personnel frisking should be posted adjacent to personnel frisking instruments or monitors."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 541.1

**"Handling Radiologically Contaminated Personnel
Skin Contamination
Survey techniques shall be established to determine the extent of skin
contamination."**

RELATED REFERENCES

1. DOE/EH0256T Article 541

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 541.2

**"When personnel detect skin contamination, they shall notify the Radiological
Control Organization."**

RELATED REFERENCES

1. DOE/EH0256T Article 541

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 541.3

**"The extent of skin contamination should be determined prior to initiating
decontamination procedures."**

RELATED REFERENCES

1. DOE/EH0256T Article 541

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 541.5

**"Levels of skin contamination that trigger the need for dose assessments should be
established for site-specific radionuclides. These trigger levels should
not exceed 100 mrem."**

RELATED REFERENCES

1. DOE/EH0256T Article 541

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 541.6

**"Personnel with skin contamination that triggers the need for dose assessment
should be informed of the initial dose estimate to their skin as soon as
practicable, preferably prior to the end of their work day."**

RELATED REFERENCES

1. DOE/EH0256T Article 541

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 541.7

"Personnel with skin contamination for which dose assessment was not performed should be informed of the nature of the contamination and an upper estimate on the potential dose (such as less than 10 mrem) as soon as practicable, preferably prior to the end of their work day."

RELATED REFERENCES

1. DOE/EH0256T Article 541

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 541.8

"An assessment of skin exposure requires time to conduct a detailed evaluation. Assessments shall be conducted in accordance with Appendix 2B and, promptly after completion, the results should be explained to the persons affected."

RELATED REFERENCES

1. DOE/EH0256T Article 541

SITE REQUIREMENT SOURCE: DOE-PNL-6534 Section 4.4.2, Page 4.30, Paragraph 3

"After performing work that, in retrospect, involved a high potential for intake of radioactive material, each worker shall be required to provide a swipe of the nasal passages, which shall be counted immediately. If respiratory protection was worn there is no need for nasal swipes unless a breach of the respirator seal is suspected. If facial contamination is detected at the exit contamination survey, a nasal swipe should be counted immediately. Guidance on the actions to be taken if a nasal swipe is positive can be found in Sections 4.6 and 4.7 <DOE-PNL-6534>."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.20

"20. Personnel exiting posted contamination areas are required to monitor their whole body and extremities for contamination. For personnel exiting a radiologically controlled area, the degree of monitoring is based on the potential for contamination. Appropriate monitoring equipment is available."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.21

"21. Portal monitors are not used as the primary monitoring method for personnel contamination."

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SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.g(4)(c)

"Personnel and Personal Property Contamination Monitoring shall be provided, as appropriate, and used immediately prior to or after exits from radiological areas established to control surface or airborne radioactive contamination. If monitoring is performed after the exit, appropriate controls shall be implemented to prevent the loss of control of contamination. Detectable contamination on personnel and personal property should be removed by appropriate decontamination methods."

FACILITY REQUIREMENT SOURCE: DOE6430.1A Division 1300, Section 6.5.3

"Use of devices to warn personnel of possible contamination or other hazardous materials shall be evaluated and such devices shall be provided in accordance with this evaluation. Provisions shall be made for personnel monitoring devices, such as hand and foot counters, in the vicinity of work stations. Installed monitors (supplemented with personal monitoring methods if necessary) shall be used to monitor personnel exiting an operating area through access ways. CAMSs shall be provided to detect and to alarm at prescribed airborne radioactivity levels."

11.5.3

Personnel Contamination Control

This element addresses those requirements relating to ensuring that the contamination of personnel is minimized and, as appropriate, controlled. It deals primarily with personnel practices which support personnel contamination control. Decontamination of personnel is covered under a separate sub-element of contamination control.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 221.1

"Personnel Contamination Control

Personnel exiting Contamination Areas, High Contamination Areas, Airborne Radioactivity Areas or Radiological Buffer Areas established for contamination control shall frisk for contamination as required by Article 338. This does not apply to personnel exiting areas containing only radionuclides, such as tritium, that cannot be detected using hand-held or automatic frisking equipment."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 342.11

"To minimize intakes of radioactive material by personnel, smoking, eating, or chewing shall not be permitted in Contamination, High Contamination or Airborne Radioactivity Areas. When a potential exists for personnel heat stress, drinking may be permitted within a Contamination Area under the following conditions and controls:

- a. The potential for heat stress cannot be reduced by the use of administrative or engineering controls;
- b. All drinking is from approved containers or sources;
- c. At a minimum, worker's hands and faces are monitored for contamination prior to drinking.
- d. Participating workers are monitored as part of the bioassay program.

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- e. The applicable requirements and controls are described in approved procedures."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 542.1

"Contaminated Wounds

Emergency medical care should be administered immediately for injuries involving radioactive materials in accordance with National Council on Radiation Protection and Measurements Report Number 65. Medical treatment of injuries takes precedence over radiological considerations."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 542.2

"The treatment of contaminated injuries should include the following:

- a. Treatment of contaminated wounds by medically qualified personnel;
- b. Monitoring of wounds and associated bandages for contamination, including alpha emitters if applicable;
- c. Identification of the radionuclides involved;
- d. Medical determination of the need for therapeutic intervention such as blocking or chelating agents;
- e. Initiation of appropriate bioassay monitoring;
- f. Determination of need for work restrictions."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 542.3

"An injured person should be counseled promptly on the medical and radiological implications resulting from contaminated wounds that result in internal doses greater than 2 percent of the Table 2-1 limits. The counseling should be performed by senior radiological control and medical professionals."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.19

"19. Procedures for use of step-off pads and the removal of protective clothing are posted where such removal is required and are consistently followed."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.4

"*4. Maximum permissible personnel contamination levels (skin and clothing) have been established. Detected contamination in excess of these levels are investigated and documented as to source, probable cause, and other pertinent information. Records of these investigations are maintained and reviewed by radiological protection management for trends, and corrective action taken as necessary."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.6.8

" 8. Eating, drinking, smoking, and chewing are not permitted in contaminated or potentially contaminated areas."

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SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.g(4)(b)

"Workplace Surfaces in Radiological Areas shall be posted (paragraph 9k) and controlled, as appropriate. The degree of control from simple (e.g., shoe covers and lab coat) to complex (e.g., multiple layers of protective clothing and respiratory protection) should be based on the specific contaminants present and the level of contamination."

11.5.4

Equipment and Area Contamination Control

This element addresses those requirements relating to controlling and reducing contamination in plant areas and on plant equipment. It deals primarily with work practices which support contamination control. Decontamination is covered under a separate sub-element of contamination control.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 125.9[02]

"Conditions that could cause or promote the spread of contamination, such as a leaking roof or piping, should be identified and corrected on a priority basis."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 222.3

"In addition to the posting criteria in Article 235, the conditions for establishing and maintaining Fixed Contamination Areas include all of the following:

- a. Radiological surveys shall be performed to detect contamination that may become removable over time.
- b. A formal inventory shall be maintained of Fixed Contamination Areas.
- c. Markings shall be kept legible.
- d. Removable contamination should be reduced to below detectable levels before a fixative coating is applied.
- e. Fixed contamination should be covered with two layers of fixative coatings having different colors.
- f. Markings should include the standard radiation symbol, be clearly visible from all directions and contrast with the colors of the surface coatings.
- g. Additional coating should be applied when the bottom color appears.
- f. A plan for identifying and adding to the inventory of existing areas of fixed contamination not included in the initial inventory should be developed."

RELATED REFERENCES

1. DOE/EH0256T Article 222

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 222.4

"A Fixed Contamination Area may be located outside Controlled Areas unless unrestricted access is likely to result in a dose to any person greater than 100 mrem in a year."

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RELATED REFERENCES

1. DOE/EH0256T Article 222

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 222.5

"A Fixed Contamination Area is exempt from the general posting requirements of Article 231 and entry and exit requirements of Chapter 3."

RELATED REFERENCES

1. DOE/EH0256T Article 222

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 222.6

"For contaminated soil that is not releasable in accordance with DOE 5400.5, a Soil Contamination Area shall be established that:

- a. Is posted as specified in Article 235. Posting should include instructions or special warnings to workers such as "Consult With Radiological Control Organization Before Digging" or "Subsurface Contamination Exists."
- b. Meets the requirements of Article 231.1 through 231.8."

RELATED REFERENCES

1. DOE/EH0256T Article 222

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 222.7

"Soil Contamination Areas may be located outside a Radiological Buffer Area."

RELATED REFERENCES

1. DOE/EH0256T Article 222

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 337.1

"Controlling the Spread of Contamination

The following measures should be used to prevent the spread of contamination across the boundary of Contamination Areas, High Contamination Areas and Airborne Radioactivity Areas:

Use solid barriers to enclose areas wherever practicable;"

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 337.2

"Mark and secure items such as hoses and cords that cross the boundary;"

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 337.3

"Control and direct airflow from areas of lesser to greater removable contamination;"

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 337.4

"Use engineering controls and containment devices such as glovebags, gloveboxes and tents."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 342.2

"Tools and equipment should be inspected to verify operability before being brought into Contamination, High Contamination or Airborne Radioactivity Areas."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 342.3

"The use of radiologically clean tools or equipment in Contamination, High Contamination or Airborne Radioactivity Areas should be minimized by the implementation of a contaminated tool crib in accordance with Article 492.5. When such use is necessary, tools or equipment with complex or inaccessible areas should be wrapped or sleeved to minimize contamination."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 342.4

"Engineering controls, such as containment devices, portable or auxiliary ventilation and temporary shielding, should be installed in accordance with the technical work documents and inspected prior to use."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 342.5

"Hoses and cables entering the work area should be secured to prevent the spread of contamination or safety hazards."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 372.1

"Environmental Conditions
Inclement weather or other environmental conditions may disrupt radiological controls. If that occurs, the following actions should be considered:
The use of covers, wind screens and runoff collection basins to preclude the inadvertent spread of radioactive material."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 372.2

"Provisions for worksite personnel to assemble and be monitored prior to release or reestablishment of work."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 372.3

"Evaluation of work area to determine if a need exists for modified work controls or decontamination."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.13

"13. The contamination control program provides maximum accessibility to all areas with minimum use of anti-contamination clothing."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.16

"16. Contamination control levels have been established. Controls are employed for areas, equipment, materials, tools, and other items if contamination levels exceed the established levels. Release surveys are performed by qualified personnel."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.8

"8. Methods, such as coffer dams, drip pans, and containments, are used to minimize the spread of contamination."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.6.6

"6. The number of areas where respiratory equipment is required is minimized."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.g(4)(a)

"Contamination Control and Monitoring. Appropriate instruments and techniques shall be used to provide contamination monitoring and control as described below:

- (a) Workplace Surfaces Outside Radiological Areas should be maintained essentially free of removable contamination but in any case contamination shall not exceed the levels defined in Attachment 2. Acceptable levels for total (fixed plus removable) contamination are also listed in Attachment 2."

11.5.5

Personnel, Equipment, and Area Decontamination

This element addresses those requirements relating to decontamination. Included are requirements for appropriate cleaning and decontamination as part of all plant activities involving contaminated material or systems. It also includes requirements for the decontamination of areas, equipment and personnel found to be contaminated.

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 221.3

"Personnel found with detectable contamination on their skin or personal clothing, other than noble gases or natural background radioactivity, should be promptly decontaminated as described in Article 541."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 222.2

"Surfaces exceeding the values of Table 2-2 for total contamination may be covered with a fixative coating to prevent the spread of contamination. However, reasonable efforts should be made to decontaminate an area before a coating is applied. A fixative coating shall not be applied without the approval of the Radiological Control Manager."

RELATED REFERENCES

1. DOE/EH0256T Article 222

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 342.1

"Work Conduct and Practices
Contamination levels caused by ongoing work shall be monitored and maintained ALARA. Work should be curtailed and decontamination performed at preestablished levels, taking into account worker exposure."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 342.10

"Requirements for area cleanup should be included in the technical work documents. Work activities should not be considered complete until support material and equipment have been removed and the area has been returned to at least prework status."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 463.3

"Decontamination activities shall be controlled to prevent the spread of contamination."

RELATED REFERENCES

1. DOE/EH0256T Article 463

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 463.4

"Water and steam are the preferred decontamination agents. Other cleaning agents should be selected based upon their effectiveness, hazardous properties, amount of waste generated, and ease of disposal."

RELATED REFERENCES

1. DOE/EH0256T Article 463

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 463.5

"Decontamination methods should be used to reduce the number of contaminated areas."

RELATED REFERENCES

1. DOE/EH0256T Article 463

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 463.6

"Efforts should be made to reduce the level of contamination and the number and size of contaminated areas that cannot be eliminated."

RELATED REFERENCES

1. DOE/EH0256T Article 463

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 463.7

"Facility line management should be responsible for directing decontamination efforts."

RELATED REFERENCES

1. DOE/EH0256T Article 463

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 464.1

"Vacuum Cleaners and Portable Air-Handling Equipment
Improper use of vacuum cleaners and portable air-handling equipment may result in the generation of airborne radioactivity, loose surface contamination, or high dose rates.

Vacuum cleaners and portable air-handling equipment used in Contamination, High Contamination, Airborne Radioactivity, Radioactive Material or Radiological Buffer Areas shall be equipped with High-Efficiency Particulate-Air (HEPA) filters."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 464.2

"ANSI/UL 586 provides HEPA filter integrity testing criteria. Vacuum cleaner and portable air-handling equipment HEPA filters shall be integrity tested prior to initial use, when units have been opened, and annually."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 464.3

"Vacuum cleaners used for radiological work shall be:

- a. Uniquely marked and labeled;
- b. Controlled by an RWP;

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- c. Controlled to prevent unauthorized use;
- d. Designed to ensure HEPA filter integrity under conditions of use;
- e. Designed to prevent unauthorized or accidental access to the inner surfaces of the vacuum."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 464.4

"Radiation and contamination surveys shall be performed periodically for vacuum cleaners in use and labels on these units shall be updated. The frequency of radiation surveys should depend on the specific use of the vacuum cleaner."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 464.5

"Airborne radioactivity levels shall be monitored when a vacuum cleaner is used in a highly contaminated area."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 541.3

"The extent of skin contamination should be determined prior to initiating decontamination procedures."

RELATED REFERENCES

- 1. DOE/EH0256T Article 541

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 541.4

"Skin decontamination methods should be established for site-specific radionuclides. Skin abrasion should be avoided during the decontamination process. Intrusive decontamination methods, such as tissue removal, require medical assistance."

RELATED REFERENCES

- 1. DOE/EH0256T Article 541

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.22

"22. Facilities for decontamination are available."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.13

"13. Personnel decontamination equipment, supplies, and procedures are properly stored and routinely inventoried."

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.8

" 8. The site/facility has adequate arrangements for decontamination of operative and inoperative instruments."

11.5.6

Hot Particle and Specific Nuclide Control

This element addresses those requirements relating to control of contamination from specific nuclides (such as uranium or plutonium) which are not applicable to all facilities. It also includes requirements for controlling "Hot Particles" (high specific activity individual radioactive particles) which may be encountered at a facility.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 363.1

"Tritium Operations

The following characteristics of tritium require consideration in the implementation of the Radiological Control Program at tritium facilities: Tritium emits low energy beta particles which cannot be monitored using external dosimeters, consequently requiring the use of bioassay measurements to evaluate worker dose."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 363.2

"Worker exposure to tritium as water vapor causes a much greater dose than exposure to elemental tritium gas."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 363.3

"Normal personnel frisking techniques are ineffective for tritium. Consequently, a high reliance is placed on worker bioassay and routine contamination and air monitoring programs."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 363.4

"Due to its high permeability, tritium is difficult to contain. Special attention should be directed to the selection of personal protective equipment and clothing. For the above reasons, guidance contained in the document, "Health Physics Manual of Good Practices at Tritium Facilities," MLM-3719, should be considered for tritium operations in preparing the Site-Specific Radiological Control Manual. This manual provides specific guidance related to internal dosimetry, contamination and air monitoring, tritium containment practices and techniques and personal protective equipment and clothing selection."

11.5.7

Respiratory Protection

This element addresses those requirements relating to the selection and appropriate use of respiratory protection equipment as part of the facility contamination control program.

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SITE REQUIREMENT SOURCE: 10CFR20 Part 20.103.c.(4)

"The licensee uses equipment within limitations for type and mode of use and provides proper visual, communication, and other special capabilities (such as adequate skin protection) when needed."

SITE REQUIREMENT SOURCE: ANSI-Z88.2-1980 Section 3.3.3

"The employer shall be responsible for the establishment and maintenance of a respiratory protection program which shall include the general requirements outlined in 3.5."

SITE REQUIREMENT SOURCE: ANSI-Z88.2-1980 Section 3.4.1

"The employee shall use the provided respiratory protection in accordance with instructions and training received."

SITE REQUIREMENT SOURCE: ANSI-Z88.2-1980 Section 3.4.2

"The employee shall guard against damage to the respirator."

SITE REQUIREMENT SOURCE: ANSI-Z88.2-1980 Section 3.5.1

"Written standard operating procedures covering a complete respirator program shall be established and implemented in conformance with 3.5.2 through 3.5.15. "

SITE REQUIREMENT SOURCE: ANSI-Z88.2-1980 Section 3.5.16

"The respirator shall be inspected by the wearer prior to its use to ensure that is in proper working condition. Each respirator stored for emergency or rescue use shall be inspected at least once a month."

SITE REQUIREMENT SOURCE: ANSI-Z88.2-1980 Section 3.5.14

"Respirator maintenance shall be performed regularly."

SITE REQUIREMENT SOURCE: ANSI-Z88.2-1980 Section 3.5.15

"An appraisal of the effectiveness of the respirator program shall be carried out at least annually. Action shall be taken to correct defects found in the program."

SITE REQUIREMENT SOURCE: ANSI-Z88.2-1980 Section 3.5.2

"The plant or company industrial hygiene, health physics, or safety engineering department shall administer the respirator program in close liaison with the medical department. Responsibility and authority for the respirator program shall be assigned to a single person."

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SITE REQUIREMENT SOURCE: ANSI-Z88.2-1980 Section 3.5.6

"Each respirator wearer shall be given training which shall include explanations and discussions of (1) the respiratory hazard and what happens if the respirator is not used properly, (2) the engineering and administrative controls being used and the need for respirators to provide protection, (3) the reason for selecting a particular type of respirator, (4) the function, capabilities, and limitations of the selected respirator, (5) the method of donning the respirator and checking its fit and operation, (6) the proper wearing of the respirator, (7) respirator maintenance, and (8) recognizing and handling emergency situations."

SITE REQUIREMENT SOURCE: ANSI-Z88.2-1980 Section 7.2

"The supervisor, the person issuing respirators, and the respirator wearers shall be given adequate training by a qualified person to ensure the proper use of respirators. Written records shall be kept of the names of persons trained and the dates when training occurred."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 223.1

"Airborne Radioactivity Control Levels
Personnel should not be exposed unnecessarily to airborne radioactivity. Use of engineering and administrative controls to reduce the potential for internal exposure should be evaluated before allowing personnel, with or without respiratory protection, to enter areas with airborne radioactivity."

RELATED REFERENCES

1. INPO-88-010 Chapter IV, Section 3(c)(1), Paragraph 1

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 316.3

"When engineering and administrative controls have been applied and the potential for airborne radioactivity still exists, respiratory protection should be used to limit internal exposures. Use of respiratory protection should be considered under the following conditions:

- a. Entry into posted Airborne Radioactivity Areas;
- b. During breach of contaminated systems or components;
- c. Work in areas or on equipment with removable contamination levels greater than 100 times the values in Table 2-2;
- d. During work on contaminated or activated surfaces with the potential to generate airborne radioactivity."

RELATED REFERENCES

1. DOE/EH0256T Article 316, Item 3

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 316.4

"The selection of respiratory protection equipment should include consideration of worker safety, comfort and efficiency. The use of positive pressure respiratory protection devices is recommended wherever practicable to alleviate fatigue and increase comfort."

RELATED REFERENCES

1. DOE/EH0256T Article 316, Item 4

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 316.5

"In specific situations the use of respiratory protection may be contraindicated due to physical limitations or the potential for significantly increased external exposure. In such situations, written authorization should be obtained from the line organization manager and the Radiological Control Manager prior to incurring internal exposure. Specific justification of the need to accept the exposure, including a description of measures taken to mitigate the airborne radioactivity, should be documented as part of the authorization process."

RELATED REFERENCES

1. DOE/EH0256T Article 316, Item 5

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 316.6

"The following controls are applicable for activities authorized in accordance with the above:

- a. Stay time controls to limit intake should be established for the entry;
- b. Evaluation of workplace airborne radioactivity levels should be provided through the use of continuous air monitors or air-samplers with expedited assessment and analysis of results."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 531

"Respiratory Protection Program

Respiratory protection equipment includes respirators with particulate or gas-filtering cartridges, supplied air respirators, self-contained breathing apparatus and airline supplied-air suits and hoods."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 531.1

"Requirements

Use of respiratory protection shall be reduced to the minimum practicable by implementing engineering controls and work practices to contain radioactivity at the source."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 531.2

"DOE 5480.4 mandates the requirements contained in ANSI Z88.2 and 29 CFR 1910.134 for implementation of the Respiratory Protection Program and associated training of personnel."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 531.3

"Respirators shall be issued only to personnel who are trained, fitted and medically qualified to wear the specific type of respirator. Training and qualification testing shall be performed annually."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 531.4

"Positive controls shall be maintained for the issue, use and return of respirators to ensure that only qualified personnel wear respirators."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 531.6

"Facility safety analyses should not take credit for the use of respiratory protection for routine work involving potential exposure to airborne radioactive materials. Engineering controls should be designed to control radioactive materials at the source, so that respiratory protection can be reduced."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 532

"Medical Assessment

Each prospective respirator wearer shall have a medical assessment prior to being fit-tested. The medical assessment shall determine if an employee's medical condition precludes the use of respirators and should follow the guidance in ANSI Z88.6 on frequency and content of the examination. The ability of an employee to accommodate the additional stress placed on the body when working in a respirator is part of this assessment."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 533

"Use of Respiratory Protection

Personnel using respiratory protection shall:

1. Be issued respirators only upon verification of medical approval, training and fit testing.
2. Perform fit checks of their respirators to ensure a proper seal before entering areas requiring respirator use.
3. Be clean shaven in the area of fit.
4. Use corrective lenses, if needed, that are approved for respirators.
5. Be instructed to leave the work area when experiencing respirator failure.
6. Be instructed to remove their respirators to avoid life-threatening situations when exiting an area after respirator failure."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 535

"Half-Face Respirators

The current revision of 10 CFR Part 20, which is to take effect January 1, 1994, states that half-face respirators are "...not satisfactory for use where it might be possible (e.g., if an accident or emergency were to occur) for the ambient airborne concentrations to reach instantaneous values greater than 10 times the...[DAC values]." "This type of respirator is not suitable for protection against plutonium or other high-toxicity materials."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 535.1

"Half-face respirators shall not be used on a routine basis as a precautionary measure for protecting workers from potential airborne radioactive materials. Half-face respirators are undesirable because their seal with the face is more likely to fail than with full-face respirators, particularly during heavy work. As a result, their permitted protection factor is low."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 535.2

"The use of half-face respirators is not prohibited in situations where intakes of radioactive material will be low, such as a few mrem, and where industrial and safety considerations warrant, such as during the operation of heavy equipment."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.6.1

"*1. A respiratory protection program complying with ANSI Z88.2 defines responsibilities and requirements in the following areas:

- Training,
- Control and use of respirators,
- Mask and fit testing, and
- Breathing air purity."

11.6

RADIOACTIVE MATERIALS MANAGEMENT

This element addresses the requirements associated with the storage, in-plant transportation and handling of radioactive materials. Radioactive materials include sealed sources, items with non-removable (fixed) contamination and other materials which are designated by regulations as radioactive materials and thus require appropriate controls.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 411

"PART 1 Radioactive Material Identification, Storage and Control

For the purposes of this Manual, radioactive material is any material, equipment or system component determined to be contaminated. Items

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located in known or suspected Contamination, High Contamination or Airborne Radioactivity Areas and having the potential to become contaminated are considered radioactive material. Radioactive material also includes activated material, sealed and unsealed sources, and materials that emit radiation. Controls for sealed sources are described in Article 431."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 411.1

"Requirements

Materials in Contamination, High Contamination or Airborne Radioactivity Areas shall be considered radioactive material until surveyed and released. These survey and release requirements do not apply to Airborne Radioactivity Areas where only gaseous, short-lived (half-life of 1 hour or less) activation products are present."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 411.4

"The Radiological Control Organization shall develop response and notification requirements associated with a loss of radioactive material, including searches, internal investigations, documentation and reporting. The Radiological Control Organization shall be notified in the event of a loss of radioactive material."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 431.8

"Receipt surveys of radiological material shipments shall be performed by the Radiological Control Organization."

11.6.1

Radioactive Material Handling

This element addresses requirements for the receipt, opening and handling of radioactive material at the facility.

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.3 POSTING.8

" 8. Only trained, authorized personnel handle radioactive materials."

11.6.2

Radioactive Material Packaging and Labeling

This element addresses the requirements for the packaging and labeling of radioactive material at the facility.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 411.2

"Except for sealed and unsealed sources, radioactive material located within Contamination, High Contamination or Airborne Radioactivity Areas does not require specific labeling or packaging."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 412.1

"Radioactive Material Labeling

Radioactive material outside Contamination, High Contamination or Airborne Radioactivity Areas shall be labeled in accordance with Table 4-1."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 412.2

"The following are not subject to labeling requirements:

- a. **Radioactive material surveyed and determined to have contamination levels lower than Table 2-2 values;**
- b. **Radioactive material or containers packaged and labeled for off-site shipment in accordance with Department of Transportation Regulations;**
- c. **Personal Protective Equipment and clothing;**
- d. **Radiological control samples such as air, process and soil samples or swipes that are in the custody of Radiological Control personnel or personnel properly trained in the handling, packaging and transport of these samples;**
- e. **Equipment or installed system components undergoing maintenance covered by a Radiological Work Permit;**
- f. **Portable tools and equipment with fixed contamination permanently marked with yellow or magenta and maintained in a contaminated tool crib or storage and distribution area;**
- h. **Nuclear weapon components;**
- i. **Historical items, such as uranium hexafluoride cylinders and large items used in demonstration projects, located within a Radioactive Material Area; such items shall be properly labeled when they are removed from a Radioactive Material Area."**

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 412.3

"Labels shall have a yellow background with a magenta or black standard radiation symbol. Lettering shall be magenta or black. Magenta is the preferred color."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 412.4

"Labels should include contact radiation levels, removable surface contamination levels (specified as alpha or beta-gamma), dates surveyed, surveyor's name and description of items."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 412.5

"Packaged radioactive material should have the label visible through the package or affixed to the outside."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 413.1

"Radioactive Material Packaging

Radioactive material that is outside Contamination, High Contamination or

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Airborne Radioactivity Areas and is confirmed or suspected of having removable radioactive contamination levels greater than Table 2-2 values shall be securely wrapped in plastic or placed in a container."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 413.2

"Radioactive material with sharp edges or projections should be taped or additionally protected to ensure package integrity."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 413.3

"Radioactive material with removable or potentially removable contamination levels in excess of 100 times Table 2-2 values should have additional packaging controls such as double-wrapping or the use of plastic bags inside containers."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 413.4

"Yellow plastic wrapping material should be used for packaging radioactive material. Yellow plastic sheets or bags should not be used for non-radiological purposes."

11.6.3

Radioactive Material Storage

This element addresses the requirements for the storage of radioactive materials at the facilities and the requirements for areas which are designated for the storage of radioactive materials.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 411.3

"Radioactive material may be capable of generating a High Radiation Area. These areas shall have special controls in accordance with Article 334."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 414.1

"Radioactive Material Storage
Radioactive material should be stored in a designated Radioactive Material Area."

FACILITY REQUIREMENT SOURCE: DOE-N5480.6 Section 414.10

"Radioactive material should be stored in a manner that reduces combustible loading. The use of cardboard containers for storage is discouraged."

FACILITY REQUIREMENT SOURCE: DOE-N5480.6 Section 414.11

"Flammable or combustible materials should not be stored adjacent to Radioactive Material Areas."

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FACILITY REQUIREMENT SOURCE: DOE-N5480.6 Section 414.12

"Fire protection measures, such as smoke detectors, water sprinklers and fire extinguishers, should be considered when establishing a Radioactive Material Area."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 414.2

"Long-term (more than 60 days) storage of radioactive material should be in a specially designated Radioactive Material Area."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 414.3

"Decontamination or disposal of radioactive material is the preferred alternative to long-term storage."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 414.4

"Each Radioactive Material Area should be approved by the Radiological Control Manager."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 414.5

"A custodian should be assigned responsibility for each Radioactive Material Area. A custodian may have responsibility for more than one storage area."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 414.6

"The custodian should conduct walkthroughs of Radioactive Material Areas to check container integrity."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 414.7

"The custodian should conduct annual or more frequent reviews of each Radioactive Material Area, with emphasis on decontamination, movement of material to long-term storage locations and disposal of unneeded material."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 414.8

"Storage of nonradioactive material in a Radioactive Material Area is discouraged."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 414.9

"Outdoor storage of radioactive material is discouraged. In cases where outdoor storage is necessary, the integrity of containers used shall be ensured to prevent degradation from weathering and subsequent release of radioactive material. The custodian should check container integrity monthly at outdoor Radioactive Material Areas."

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SITE REQUIREMENT SOURCE: NUREG-0761 Section 6.b(2)

"Procedures for radioactive materials storage and laydown areas should include:

- (a) criteria for posting and isolating
- (b) survey requirements
- (c) access requirements."

11.6.4

Release of Material and Equipment

This element addresses the requirements for the release of materials (radioactive or potentially radioactive/contaminated) from the facility. As most materials entering the radiologically protected area are considered potentially radioactive/contaminated, these requirements will apply to releasing most or all items from these areas. The requirements include both free release requirements and requirements to release for use in other areas of the facility.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 421.1

"Release and Transportation of Radioactive Material

Release to Controlled Areas

Radioactive material in Contamination, High Contamination or Airborne Radioactivity Areas shall be surveyed prior to release. Radioactive material to be released to Controlled Areas shall be demonstrated to have contamination levels less than Table 2-2 values. Radioactive material to be released to uncontrolled areas shall be surveyed in accordance with Article 422."

RELATED REFERENCES

1. DOE/EH0256T Article 421

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 421.2

"Radioactive material with contamination levels greater than Table 2-2 values shall be labeled and packaged prior to release to Controlled Areas."

RELATED REFERENCES

1. DOE/EH0256T Article 421

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 421.3

"Radioactive material not immediately released after survey shall be controlled to prevent recontamination while awaiting release."

RELATED REFERENCES

1. DOE/EH0256T Article 421

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 421.4

"Records for release of potentially contaminated materials should describe the property, date of last survey, identity of the person who performed the survey, type and identification number of the survey instrument used, and survey results."

RELATED REFERENCES

1. DOE/EH0256T Article 421

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 422.1

"Release to Uncontrolled Areas
Radioactive material in Controlled Areas or Radioactive Material Areas shall be surveyed prior to release to uncontrolled areas."

RELATED REFERENCES

1. DOE/EH0256T Article 422

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 422.2

"DOE 5400.5 describes criteria for releasing radioactive material to uncontrolled areas. Radioactive material being released shall also be evaluated for contamination under any coatings."

RELATED REFERENCES

1. DOE/EH0256T Article 422

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 422.3

"DOE 5400.5 describes criteria for releasing radioactive material that has been contaminated in depth or volume, such as activated material or smelted contaminated material."

RELATED REFERENCES

1. DOE/EH0256T Article 422

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 422.4

"Radioactive material not immediately released after survey shall be controlled to prevent contamination while awaiting release."

RELATED REFERENCES

1. DOE/EH0256T Article 422

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 422.5

"Labels shall be removed or defaced prior to release of radioactive material for unrestricted use."

RELATED REFERENCES

1. DOE/EH0256T Article 422

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 554.2

"Survey requirements for the release of radioactive materials shall be conducted in accordance with Articles 421 and 422."

RELATED REFERENCES

1. DOE/EH0256T Article 554

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 554.3

"Contamination surveys should incorporate techniques to detect both removable and fixed contamination."

RELATED REFERENCES

1. DOE/EH0256T Article 554

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 554.4

"Items with inaccessible surfaces which were located in known or suspected contamination areas and had the potential to become contaminated at levels likely to exceed Table 2-2 values should be treated as potentially contaminated and subject to administrative controls unless the items are dismantled and monitored or special survey techniques are used to survey all surfaces."

RELATED REFERENCES

1. DOE/EH0256T Article 554

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 554.5

"The requirements for assessing representative samples of bulk material, such as sand, sweeping compounds or plate steel, which are not suitable for normal loose and fixed contamination-level assessment techniques, are specified in DOE 5400.5."

RELATED REFERENCES

1. DOE/EH0256T Article 554

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 554.6

"Swipe surveys for removable contamination shall be reported in units of disintegrations per minute per 100 cm² (dpm/100 cm²). For swipe surveys of small items covering less than 100 cm², the results shall be reported in units of dpm per area swiped."

RELATED REFERENCES

1. DOE/EH0256T Article 554

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.1

"*1. Unrestricted radiological contamination release levels for personnel, equipment and materials, and facility surfaces are defined and comply with appropriate standards."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.2

"*2. The system for unrestricted radiological contamination release (i.e., monitoring procedures, authority to release, etc.) ensure that equipment and materials removed from contaminated areas are not contaminated above release levels and are not mixed with clean items prior to a final release."

FACILITY REQUIREMENT SOURCE: DOE5400.5 Chapter II, Section 5.b

"Release of Personal Property. Personal property, which potentially could be contaminated, may be released for unrestricted use if the results of a survey with appropriate instruments indicate that the property is within the contamination limits presented in Figure IV-1."

FACILITY REQUIREMENT SOURCE: DOE5400.5 Chapter II, Section 5.c, Item (5), a-f

"The records of released property shall include:

- (a) A description or identification of the property;
- (b) The date of the last radiation survey;
- (c) The identity of the organization and the individual who performed the monitoring operation;
- (d) The type and identification number of monitoring instruments;
- (e) The results of the monitoring operation; and
- (f) The identity of the recipient of the released material."

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**FACILITY REQUIREMENT SOURCE: DOE5400.5 Chapter II, Section 5.c,
Items (1)-(4)**

"Release of Materials and Equipment.

- (1) Surface Contamination Levels.** Prior to being released, property shall be surveyed to determine whether both removable and total surface contamination (including contamination present on and under any coating) is greater than the levels given in Figure IV-1 and that the contamination has been subjected to the ALARA process.
- (2) Potential for Contamination.** Property shall be considered to be potentially contaminated if it has been used or stored in radiation areas that could contain unconfined radioactive material or that are exposed to beams of particles capable of causing activation (neutrons, protons, etc.).
- (3) Surveys.** Surfaces of potentially contaminated property shall be surveyed using instruments and techniques appropriate for detecting the limits stated in Figure IV-1.
- (4) Inaccessible Areas.** Where potentially contaminated surfaces are not accessible for measurement (as in some pipes, drains, and ductwork), such property may be released after case-by-case evaluation and documentation based on both the history of its use and available measurements demonstrate that the unsurveyable surfaces are likely to be within the limits given in Figure IV-1."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.i

"Releases of Materials and Equipment from Radiological Areas. The following requirements apply for the release of materials and equipment from radiological areas for conditional use in controlled areas. In all cases, contaminated property shall be cleaned as thoroughly as practical before release. These requirements are not applicable to the release of materials or equipment for unrestricted use since such use could result in exposure to the general public. (NOTE: Requirements contained in this Order do not pertain to either induced radioactivity or decontamination and decommissioning release limits.)"

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.i(1)

"Material and equipment in radiological areas established to control surface or airborne radioactive material shall be treated as radioactive material and shall not be released from radiological areas to controlled areas if any of the following conditions exist:

- (a)** Measurements of accessible surfaces show that either the total or removable contamination levels exceed the guides specified in Attachment 2; or
- (b)** Prior use suggests that the contamination levels on inaccessible surfaces are likely to exceed the guides specified in Attachment 2."

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SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.i(2)

"Material and equipment exceeding the total and removable contamination levels specified in Attachment 2 shall be conditionally released for movement onsite from one radiological area for immediate placement in another radiological area only if appropriate monitoring and control procedures are established and exercised."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.i(3)

"Under exceptional conditions, material and equipment with fixed contamination that exceed the limits specified in Attachment 2 may be released for use in controlled areas outside radiological areas. As a condition of such release, the materials shall be routinely monitored, clearly labeled and/or tagged to alert personnel of the contaminated status, and have appropriate administrative procedures established and exercised to maintain control of these items."

11.6.5

Sealed Source Management

This element addresses the requirements specific to management and control of sealed sources.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 431.1

"Radioactive Source Controls

The following provisions apply to sealed and unsealed sources.

DOE N 5400.9 describes how sealed sources shall be controlled and maintained, and specifies requirements for receipt, inventory, storage, transfer, disposal and integrity testing. Unsealed sources shall be controlled and maintained in a similar manner except for integrity testing."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 431.2

"The Radiological Control Organization shall maintain, or cause to be maintained, accountability records for sealed sources."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 431.3

"Source custodians shall be appointed to maintain radioactive source controls."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 431.4

"Source custodians shall notify the Radiological Control Organization of changes in use, storage, transfer, disposal or loss of a sealed sources."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 431.5

"Sealed source integrity testing shall be done at least every 6 months or whenever damage might have occurred."

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RELATED REFERENCES

1. DOE/EH0256T Article 431, Item 5

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 431.6

"Labels used to identify sealed sources shall also identify the radionuclide, activity, date of assay, source model and serial number, and source custodian. "

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 431.7

"Procurement of radioactive sources shall be coordinated with the Radiological Control Organization. "

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 431.9

"Sources, including radiography sources, shall not be brought on-site by external organizations without the prior written approval of the Radiological Control Organization. "

11.7

LABORATORY ANALYSIS

This element addresses requirements for the appropriate handling and laboratory analysis of samples.

SITE REQUIREMENT SOURCE: DOE/EH0173T Section 6.1.1

"Each monitoring and surveillance organization should have a sample identification system that provides positive identification of samples and aliquots of samples throughout the analytical process. The system should incorporate a method for tracking all pertinent information obtained in the sampling process. "

11.8

RADIOLOGICAL PROTECTION EQUIPMENT AND SUPPLIES

The Radiological Protection Equipment and Supplies element includes requirements that address the control and maintenance of RP equipment and supplies to ensure their availability, accuracy and reliability. For example, equipment used for monitoring radiation exposures and exposure rates are required to meet defined technical standards for accuracy, sensitivity, angular dependence, and radiation type. Controls are also required to ensure that the equipment is properly calibrated and maintained.

11.8.1

Monitoring and Survey Instrumentation

This element addresses the requirements for certification, use and control of radiation monitoring equipment. The elements within are specific to the equipment itself. Requirements relating to surveys performed with the equipment or the monitoring or areas using the equipment are included in Section 11.2, Facility Monitoring and Surveys.

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SITE REQUIREMENT SOURCE: ANSI-N323 Section 4.1

"Precalibration. The following conditions shall be established prior to exposing the instrument to a source for adjustment and calibration:

- 1) The instrument should be free of significant radioactive contamination
- 2) The meter shall be adjusted to zero or the point specified by the manufacturer using the adjustment or adjustments provided
- 3) The batteries or power supply shall comply with the instrument manufacturer's specification
- 4) The instrument shall be turned on and allowed to warm up for the time period specified by the manufacturer
- 5) Electronic adjustments such as high voltage shall be set, as applicable, to the manufacturer's specifications
- 6) Geotropism shall be known for orientation of the instrument in the three mutually perpendicular planes, and this effect shall be taken into account during calibration and performance testing
- 7) The performance of any internal sampling time base in digital readout instruments should be verified as being within the manufacturer's specifications."

SITE REQUIREMENT SOURCE: ANSI-N323 Section 4.6

"Periodic Performance Test. To assure proper operation of the instrument between calibrations, the instrument shall be tested with the check source during operation and prior to each intermittent use."

SITE REQUIREMENT SOURCE: ANSI-N323 Section 4.6[02]

"Reference readings shall be obtained on each instrument when exposed to a check source in a constant and reproducible manner at the time of, or promptly after, primary calibration. If at any time the instrument response to the check source differs from the reference reading by more than ± 20 percent, the instrument shall be returned to the calibration facility for calibration or for maintenance, repair and recalibration, as required. Reference readings should be obtained for one point on each scale or decade normally used. The check source should accompany the instrument if it is specific to that instrument."

SITE REQUIREMENT SOURCE: ANSI-N323 Section 5.3[02]

"A periodic instrument check procedure shall be established by the user to assure continued proper operation."

SITE REQUIREMENT SOURCE: ANSI/ANS-13.5 Section 10

"Certificate A certificate shall accompany each exposure meter and shall include the following information:

- (1) Mark or type of the instrument
- (2) The manufacturer's name
- (3) The exposure in milliroentgen or roentgen, corresponding to the scale value

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- (4) The energy dependence curve of the instrument (that is, the response per roentgen as a function of the quantum energy) and a statement that the dosimeter is intended for use in X- or Gamma radiation fields only
- (5) The location and dimensions of the sensitive volume
- (6) The indication "airtight" or "not airtight" as appropriate
- (7) The maximal permissible exposure rate for the instrument
- (8) The thickness of the wall in mg/cm² and its composition
- (9) The variation of the sensitivity with the angle of incidence of radiation referred to a well-defined axis of the instrument
- (10) For a non-hermetically sealed instrument, the pressure and temperature which prevailed when the instrument was calibrated"

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 551.5

"Instruments used to perform radiation surveys shall be response-checked daily or prior to operation. When response checks are not within + 20 percent of the expected value, the instrument should be taken out of service. When response checks are not feasible, such as with instruments used to measure neutrons or tritium, compensatory actions should be established to ensure proper instrument performance."

RELATED REFERENCES

- 1. DOE/EH0256T Article 551

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.23

"23. Adequate counting equipment for swipes is available. The equipment is properly calibrated and maintained. Counting procedures are available and followed by technicians. Adequate records are maintained to permit QA/QC verification of sample results."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.13

"13. An adequate supply of instruments that will operate up to 100 R/h is available."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.14

"14. Adequate check sources are available and used for both emergency and routine instruments to ensure they operate properly prior to use."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.15

"15. "Extendable" detectors are available for remote monitoring under accident conditions."

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.17

"17. Procedures are available for workers to determine if instruments, such as hand and shoe counters, are operating."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.18

"18. The numbers and locations of fixed instruments are adequate to assess accident conditions. (They would not be affected by elevated background radiation and the readout will be accessible during a serious emergency.)"

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.19

"19. Fixed instruments alarm at a central location in addition to the alarm at the instrument location."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.20

"20. The exact locations of fixed instruments are documented (height above floor, etc.) so that the shielding effect can be calculated from drawings and the exposure rate in nearby locations estimated in the event of a serious accident (i.e., a criticality accident)."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.3

"3. Instrumentation selection is based on objective criteria (such as performance standards, site requirements, etc.). Selected instruments are acceptance tested against those criteria to ensure that they are satisfactory, and the results are documented."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.6

"6. The complement (number and types) of instruments are adequate to meet the needs of both the routine and non-routine radiation protection surveillance program and are appropriate for the activities and radiation sources present."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.g(3)(b)

"Radiation Monitoring. Appropriate stationary (area) and/or portable radiation instruments shall be available and used to measure dose rates for the purpose of controlling exposure to radiation. These instruments shall be routinely calibrated and maintained. The combination of instruments used shall provide capability to measure types of radiation (neutron, gamma, beta, or x-radiation) and dose rates characteristic of that which could be encountered at that facility."

11.8.2

Respiratory Equipment and Supplies

This element addresses the requirements for certification and maintenance of respiratory protection equipment. The requirements address the respiratory protection equipment

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itself. Requirements relating to the use of equipment as part of the contamination control program are included in Section 11.5, Contamination Control.

SITE REQUIREMENT SOURCE: 10CFR20 Part 20.103.c

"When respiratory protective equipment is used to limit the inhalation of airborne radioactive material pursuant to paragraph (b)(2) of this section, the licensee shall use equipment that is certified or had certification extended by the National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA)."

SITE REQUIREMENT SOURCE: 10CFR20 Part 20.103.f

"Only equipment that has been specifically certified or had certification extended for emergency use by NIOSH/MSHA shall be used as emergency devices."

11.8.3

Protective Clothing

This element addresses those requirements relating to the selection, control and use of protective clothing.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 325.1

"Personal Protective Equipment and Clothing

Personnel shall wear protective clothing during the following activities:

- a. Handling of contaminated materials with removable contamination in excess of Table 2-2 levels;
- b. Work in Contamination, High Contamination and Airborne Radioactivity Areas;
- c. As directed by the Radiological Control Organization or as required by the RWP."

RELATED REFERENCES

1. DOE/EH0256T Article 325

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 325.2

"Protective clothing and shoes designated for radiological control shall be:

- a. Marked in accordance with Article 451;
- b. Used only for radiological control purposes."

RELATED REFERENCES

1. DOE/EH0256T Article 325

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 325.3

"Protective clothing dress-out areas should be established directly adjacent to the work area. Workers should proceed directly to the radiological work area after donning Personal Protective Equipment and clothing."

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RELATED REFERENCES

1. DOE/EH0256T Article 325

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 325.4

"Personal Protective Equipment and clothing shall be selected as prescribed by the controlling RWP. General guidelines for protective clothing selection and use are provided in Appendix 3C and in Table 3-1."

RELATED REFERENCES

1. DOE/EH0256T Article 325

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 325.5

"The use of labcoats as radiological protective clothing is appropriate for limited applications such as those discussed in Appendix 3C where the potential for personal contamination is limited to the hands, arms, and upper front portion of the body. Labcoats should not be used as protective clothing for performing physical work activities in Contamination, High Contamination or Airborne Radioactivity Areas."

RELATED REFERENCES

1. DOE/EH0256T Article 325

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 325.6

"Instructions for donning and removing protective clothing should be posted at the dress-out and step-off pad areas."

RELATED REFERENCES

1. DOE/EH0256T Article 325

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 325.7

"The use of Personal Protective Equipment or clothing (including respiratory protection) beyond that authorized by the Radiological Control Organization detracts from work performance and is contrary to ALARA principles and waste minimization practices. Such use should not be authorized."

RELATED REFERENCES

1. DOE/EH0256T Article 325

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 325.8

"Company-issued clothing, such as work coveralls and shoes, should be considered the same as personal clothing. Company-issued clothing should not be used for radiological control purposes."

RELATED REFERENCES

1. DOE/EH0256T Article 325

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 461.1

"Support Activities
Personal Protective Equipment and Clothing
Protective clothing designated for radiological control use shall be specifically identified by color, symbol or appropriate labeling."

RELATED REFERENCES

1. DOE/EH0256T Article 461

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 461.2

"Protective clothing designated for radiological control use shall not be used for non-radiological work."

RELATED REFERENCES

1. DOE/EH0256T Article 461

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 461.3

"Personal Protective Equipment and clothing shall not be stored with personal street clothing."

RELATED REFERENCES

1. DOE/EH0256T Article 461

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 461.4

"Cleaned Personal Protective Equipment, such as face shields and respirators, that comes into contact with the wearer's face and company issued non-personal protective clothing shall be surveyed. This survey should be capable of detecting contamination levels equivalent to Table 2-2 total contamination values prior to reuse. The use of statistically representative sampling is acceptable."

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RELATED REFERENCES

1. DOE/EH0256T Article 461

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 461.5

"Laundered protective clothing should be surveyed using statistically representative sampling and should meet the following criteria prior to reuse:

- a. Beta-gamma radioactivity less than 10,000 dpm/100 cm²;
- b. Alpha radioactivity less than 1,000 dpm/100 cm²."

RELATED REFERENCES

1. DOE/EH0256T Article 461

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 461.6

"Sites and facilities are encouraged to:

- a. Apply the latest techniques and instrumentation to detect contamination on Personal Protective Equipment and clothing below Table 2-2 total contamination values.
- b. Continue efforts to reduce contamination levels on reusable Personal Protective Equipment and clothing."

RELATED REFERENCES

1. DOE/EH0256T Article 461

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 462.1

"Laundry

Clothing and equipment should be laundered according to facility, color, type, and level of contamination."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 462.2

"Laundry activities should be performed using processes that minimize both potential worker exposure and the volume of waste generated."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 462.3

"Clothing and equipment should be screened before they are laundered to segregate those that are damaged, present special handling problems, or require disposal."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 462.4

"Waste streams that contain soaps, detergents, solvents or other materials which could interfere with processing large-volume liquid waste streams should be segregated for separate processing."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 462.5

"Contracting for fully licensed laundry services is encouraged."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 462.6

"Cleaned Personal Protective Equipment and laundered protective clothing shall be inspected prior to use. Clothing should be free of tears, separated seams, deterioration and damage, or repaired in a manner that provides the original level of protection."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.14

"14. Sufficient quantities of protective clothing are available, and are consistently used where required."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.10 CONTAMINATION CONTROL.15

"15. Laundry procedures minimize spread of contamination."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.4.3

"3. Proper controls are used to minimize exposure to the skin and eyes, e.g., by use of protective clothing and equipment."

11.3.4

Dosimetry Equipment

This element addresses requirements relating to the certification and maintenance of dosimetry equipment. The requirements relate to the dosimetry equipment itself. Requirements relating to the dosimetry program and the use of dosimetry equipment as part of that program are included in Section 11.3, Personnel Exposure Monitoring.

SITE REQUIREMENT SOURCE: ANSI/ANS-13.5 Section 9.1

"The energy dependence of the instrument, that is, response per roentgen, over its stated range shall not exceed ± 10 percent of the value of the sensitivity at one specified energy."

SITE REQUIREMENT SOURCE: ANSI/ANS-13.5 Section 9.2

"In the range of exposure rates as indicated in the directions for use, the deviation of the sensitivity as result of recombination shall not exceed 10 percent. This deviation shall be measured with respect to sensitivity for at least a half scale exposure at a rate equivalent to maximum specified exposure rate."

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SITE REQUIREMENT SOURCE: ANSI/ANS-13.5 Section 9.3

"The discharge of a full charged dosimeter with a range of 100 milliroentgen or more shall not exceed 2 percent of full scale in 24 hours, if it is placed in surroundings where the exposure rate is not greater than 0.02 milliroentgen per hour and in ambient conditions."

SITE REQUIREMENT SOURCE: ANSI/ANS-13.5 Section 9.4

"The transient movement of the pointer, occurring at the instant the instrument is disconnected from the charging source, shall not exceed 5 percent of full scale for dosimeters with ranges 500 mR or less and 2 percent for meters with ranges in excess of 500 mR."

SITE REQUIREMENT SOURCE: ANSI/ANS-13.5 Section 9.5

"Under the conditions specified in section 8 of this standard, the total error of measurement of the 95 percent confidence level shall not exceed ± 12 percent of the full scale value."

SITE REQUIREMENT SOURCE: ANSI/ANS-13.5 Section 9.6

"The indications shall not vary by more than 5 percent of the maximum scale value with any change in position of the exposure meter. If this condition cannot be fulfilled, the operating instruction shall give the proper position of the exposure meter during the reading."

SITE REQUIREMENT SOURCE: ANSI/ANS-13.5 Section 9.7

"The radiation response of the instrument at every angle not exceeding 50° from the direction of maximum response of the instrument shall not be less than 70 percent of the maximum."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.18

"18. The amount of error (error range) in the dose measurements from personnel and extremity dosimeters are documented."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.19

"19. The minimum detection levels of personnel and extremity dosimeters for gamma, beta, and neutron radiation for the primary sources of radiation that exists on the site are documented."

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.2

"*2. The contractor participated or plans to participate in DOELAP to test its dosimeter."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.3

"*3. Actions have been taken to correct deficiencies identified by participation in DOELAP."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.5

" 5. Dosimeter (whole body and extremity) calibration facilities and procedures are adequate to cover the range of exposures, energies, and type of radiation anticipated."

11.8.5

Equipment Maintenance and Calibration

This element addresses requirements relating to the maintenance and calibration of radiation protection equipment.

SITE REQUIREMENT SOURCE: ANSI-N323 Section 4.2.1

"Primary Calibration

General. The reproducibility (precision) of the instrument should be known prior to making calibration adjustments. This is particularly important if the instrument failed to pass the source check (see 4.6) or if repairs have been made. To check reproducibility, the instrument should be exposed to a radiation field three or more times under identical conditions. The readings obtained should normally not deviate from the mean value by more than ± 10 percent."

SITE REQUIREMENT SOURCE: ANSI-N323 Section 4.2.2.1

"Linear Readout Instruments.

Linear instruments usually have a scale selection switch. If controls are provided for each scale, adjustment of each shall be made according to the manufacturer's specifications or at the midpoint of each scale. If only one control is provided, adjustment shall be made either (1) at the point specified by the manufacturer, (2) near the midpoint of the middle scale, or (3) near the midpoint of a scale that is particularly important to the user's requirements."

SITE REQUIREMENT SOURCE: ANSI-N323 Section 4.2.2.1[02]

"After adjustment, calibration shall be checked near the ends of each scale

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(approximately 20 percent and 80 percent of full scale). After an adjustment or adjustments have been completed, instrument readings shall be within ± 10 percent of known radiation values at these two points. However, readings within ± 20 percent shall be acceptable if a calibration chart or graph shall be prepared and made available with the instrument."

SITE REQUIREMENT SOURCE: ANSI-N323 Section 4.2.2.2

"Logarithmic Readout Instruments. Logarithmic readout instruments commonly have a single readout scale spanning several decades with two or more adjustments. The instrument should be adjusted for each scale according to the manufacturer's specifications or, alternatively, at points of particular importance to the user."

SITE REQUIREMENT SOURCE: ANSI-N323 Section 4.2.2.2[02]

"After adjustment, calibration shall be performed at a minimum of one point near the midpoint of each decade. After adjustments have been completed, instrument readings shall be within ± 10 percent of the known radiation values at these points. However, readings within ± 20 percent is acceptable if a calibration chart or graph is prepared and made available with the instrument. "

SITE REQUIREMENT SOURCE: ANSI-N323 Section 4.2.2.3

"Digital Readout Instruments. Digital instruments may have manual scale switching, automatic scale switching (auto ranging) or no scale switching. For instruments with either manual or automatic scale switching, the calibration shall be performed as in 4.2.2.1. For instruments without scale switching, the calibration shall be performed as in 4.2.2.2."

SITE REQUIREMENT SOURCE: ANSI-N323 Section 4.3.1

"Calibration for Special Conditions

General. If the instrument is to be used under conditions (that is, radiation energy, temperature and pressure, or source/detector geometry) which vary significantly from those for which the instrument is designed, the instrument should be adjusted, calibrated, and used only for the special conditions. When an instrument is calibrated for special conditions, a special condition identification label shall be attached (in addition to any required calibration labels) to indicate its applicability for this special use only. However, if the instrument is also to be used within its design limits, the adjustments made during primary calibration (see 4.2) shall remain the same, and instrument readings for the special conditions shall be corrected using correction factors obtained from appropriate tables or graphs. Only one parameter should be varied at a time during calibration for the special conditions, but the interrelationships of the variables should be known."

SITE REQUIREMENT SOURCE: ANSI-N323 Section 5.1

"Calibration Equipment Required

Calibration Standards. Instruments should be calibrated either against

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National Standards or with Derived Standards. If National or Derived Standards are not available, Laboratory Standards, obtained in one of the following ways should be used:"

SITE REQUIREMENT SOURCE: ANSI-N323 Section 5.1, Last Paragraph

"A calibration source or sources preferably should be of a radiation energy similar to that with which the instrument will be used and of a radiation exposure rate sufficient to reach full scale of any instrument to be calibrated. If the source is a radionuclide, the half-life should be long, preferable greater than several years to minimize corrections and errors. The uncertainty of source calibration shall be no greater than ± 2 percent with respect to U.S. National Standards."

SITE REQUIREMENT SOURCE: ANSI-N323 Section 5.1.1)

"Comparison of the radiation field from a user's source with the radiation field from a National or Derived Standard source in the same geometry, using a 'transfer instrument' with a reproducibility of ± 2 percent. The transfer calibration shall utilize a calibration curve for the transfer instrument taken with the National or Derived source over a range that covers both the National or Derived source measurement and the user source measurement. (Such a curve reduces to a single point if the transfer calibration procedure is such that the transfer instrument readings are identical for both measurements.)"

SITE REQUIREMENT SOURCE: ANSI-N323 Section 5.1.2)

"Calibration of a user's transfer instrument with a National or Derived Standard source, followed by evaluation of a user's source with the same transfer instrument. The transfer instrument shall have a reproducibility of ± 2 percent and the procedure shall utilize a calibration curve as in 5.1(1)."

SITE REQUIREMENT SOURCE: ANSI-N323 Section 5.1.3)

"Where no National or Derived Standard exists, as in the case of specific energies or unusual sources, by establishment of a standard source or instrument with documented empirical and theoretical output or response characteristics."

SITE REQUIREMENT SOURCE: ANSI-N323 Section 5.3

"Standard Instruments. An instrument used as a Derived Standard shall have an uncertainty no greater than ± 10 percent. Calibration shall be reestablished after maintenance or repair or at intervals specified by the manufacturer but in no case at intervals greater than three years."

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SITE REQUIREMENT SOURCE: ANSI-N323 Section 6.1

"Maintenance of Quality of Calibration.

Radiation Field. Either narrow or broad beam geometry may be used to compare the response of similar instruments with that of a standardized instrument."

SITE REQUIREMENT SOURCE: ANSI-N323 Section 6.1[03]

"Alpha radiation sources shall be standardized in terms of activity or activity per unit area of the source, or both. The reference geometry, 2π or 4π , shall be stated."

SITE REQUIREMENT SOURCE: ANSI-N323 Section 6.1[04]

"Beta radiation sources shall be standardized in terms of air or soft tissue absorbed dose rate at the surface or at a specified distance from the source, or in terms of activity."

SITE REQUIREMENT SOURCE: ANSI-N323 Section 6.1[05]

"Photon-emitting radionuclide sources shall be standardized in terms of exposure rate (in roentgens per hour) at a specified distance from the source. "

SITE REQUIREMENT SOURCE: ANSI-N323 Section 6.1[07]

"For photon and neutron monitoring instrument calibrations, the source-to-detector distance shall be the distance measured between the effective center of the radioactive source and the effective center of the radiation detector. Either this distance shall be greater than seven times the maximum dimension of the source or detector, whichever is larger, or suitable corrections shall be used."

SITE REQUIREMENT SOURCE: ANSI-N323 Section 6.1[08]

"The exposure rate or the flux density of the radiation field shall be known with an estimated uncertainty no greater than ± 10 percent. A continuous monitor or other device should be used to determine whether the radiation field has changed."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 555.5

"Air monitoring equipment shall be routinely calibrated and maintained at a frequency of at least once per year. Continuous air monitors should be capable of measuring 1 DAC when averaged over 8 hours (8 DAC-hours) under laboratory conditions."

RELATED REFERENCES

1. DOE/EH0256T Article 555

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 561

"Instrumentation and Calibration

Standardization

Standardization using commercially available radiological instrumentation in the DOE is highly encouraged. In support of standardization, DOE intends to establish a formal program to evaluate and test each type of radiological instrumentation used throughout the DOE complex."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 562.1

"Inspection, Calibration and Performance Tests

Radiological instruments shall be used only to measure the radiation for which their calibrations are valid. DOE 3480.4 mandates the requirements contained in ANSI N323 for radiological instrumentation calibration. Calibrations shall use National Institute of Standards and Technology (NIST) traceable sources."

RELATED REFERENCES

1. DOE/EH0256T Article 562

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 562.2

"Calibration procedures should be developed for each instrument type and include frequency of calibration, precalibration requirements, primary calibration requirements, periodic performance test requirements, calibration record requirements and maintenance requirements."

RELATED REFERENCES

1. DOE/EH0256T Article 562

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 562.3

"Pocket and electronic dosimeters and area radiation monitors should be calibrated at least annually and in accordance with Article 562.1."

RELATED REFERENCES

1. DOE/EH0256T Article 562

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 562.4

"Radiation instrumentation response to interfering ionizing and non-ionizing radiation and environmental conditions should be determined. The effects such interfering radiation has on an instrument should be known prior to use."

RELATED REFERENCES

1. DOE/EH0256T Article 562

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 562.5

"Functional tests should be used to assess instrumentation designs that include alarms or that involve a process control. A functional test should be developed to test all components involved in an alarm or trip function and performed at least annually."

RELATED REFERENCES

1. DOE/EH0256T Article 562

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 562.6

"In unusual and limited situations it may be necessary to use an instrument in an application other than that envisioned by the manufacturer. Special calibrations should be performed for use of instrumentation outside manufacturer's specifications. The instrument should be adjusted, calibrated and labeled to identify the special conditions and used only under the special conditions for which it was calibrated."

RELATED REFERENCES

1. DOE/EH0256T Article 562

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 562.7

"Instruments should bear a label or tag with the date of calibration and date calibration."

RELATED REFERENCES

1. DOE/EH0256T Article 562

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 562.8

"Instruments whose "as found" readings indicate that the instrument may have been used while out of calibration shall be reported to the Radiological Control Organization. The Radiological Control Organization should review surveys performed with the instrument while it was out of calibration."

RELATED REFERENCES

1. DOE/EH0256T Article 562

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 563.1

"Maintenance

A program for preventive and corrective maintenance of radiological instrumentation should be established and documented."

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RELATED REFERENCES

1. DOE/EH0256T Article 563

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 563.2

"Preventive and corrective maintenance should be performed using components and procedural recommendations at least as stringent as those specified by the manufacturer of the instrument."

RELATED REFERENCES

1. DOE/EH0256T Article 563

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 563.3

"Radiological instruments shall undergo calibration prior to use following any preventive or corrective maintenance or any adjustment that voids the previous calibration. A battery change is not normally considered maintenance."

RELATED REFERENCES

1. DOE/EH0256T Article 563

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 564.1

"Calibration Facilities

Calibration facilities should perform inspections, calibrations, performance tests, calibration equipment selection and quality assurance in accordance with the recommendations of ANSI N323 and take the following actions:

- a. Locate activities in a manner to minimize radiation exposure to operating personnel and to personnel in adjacent areas;
- b. Minimize sources of interference, such as backscatter and non-ionizing radiation, during the calibration of instrumentation and correct for interferences as necessary;
- c. Operate in accordance with the referenced standards;
- d. Generate records of calibration, functional tests and maintenance in accordance with the referenced standards."

RELATED REFERENCES

1. DOE/EH0256T Articles 562 & 564

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 564.2

"For organizations that do not possess or use their own calibration facilities, contracted calibration services should be performed in accordance with the referenced standards."

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RELATED REFERENCES

1. DOE/EH0256T Articles 562 & 564

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.7.16

"16. In vivo counting equipment is calibrated and maintained on an established frequency."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8

"PERFORMANCE CRITERIA: Personnel dosimetry and radiological protection instrumentation used to obtain measurements of radioactivity should be calibrated, used, and maintained so that results are accurately determined."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.1

"*1. Instrumentation (normal and emergency) and instrumentation calibration are consistent with ANSI N42.17, ANSI N323, ANSI N320, ANSI N317, ANSI N43.1, and ANSI N42.18, as appropriate."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.10

"10. The instrument repair facility has adequately trained personnel and facilities to service the instruments in use in a prompt and safe manner."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.11

"11. Methods have been established to periodically test overload response, temperature sensitivity, linearity, and stability."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.12

"12. If special conditions exist, such as radio frequency fields, magnetic fields, etc., that would require special instruments, these instruments have been tested to ensure a lack of susceptibility to these factors."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.16

"16. The calibration facility can calibrate the high ranges and tests for overload response and is done periodically."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.2

"*2. Instrument calibrations are traceable to a recognized standard (NIST)."

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.4

" 4. Instruments are properly tested and calibrated periodically, and adequate records of servicing and calibration are maintained by the site/facility."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.5

" 5. Technically based criteria are used to determine the frequency of calibration and tests for operation."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.7

" 7. Instruments have current calibration stickers with appropriate correction factors, and an adequate system for instrument recall has been established."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.8.9

" 9. The calibration facility (onsite or vendor) has well-characterized dose rate profiles of the full range and type of sources needed to calibrate instruments for the situations encountered in the facility or on the site, and is periodically quality-control checked."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.9.13

"13. Procedures for calibration of air monitors are documented. Included are source check, stability check, electronics check, and air flow calibration."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.9.3

"*3. Routine air monitor calibrations include minimum detectable activity; energy dependence; efficiency; precision; response time; stability, alarm threshold accuracy and stability; air flow accuracy and stability; air in-leakage; and effects of temperature, humidity, and ambient pressure."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.9.8

" 8. The calibration procedures (and frequency) for the air sampling and monitoring equipment are based on appropriate technical criteria."

SITE REQUIREMENT SOURCE: DOE5480.5 Section 13.b(3)

"Documented periodic inspections, in situ tests, and preventive maintenance shall be performed at designated frequencies to assure that the safety systems and components necessary for criticality control, fire control, radiation detection, and environmental monitoring, as well as their alarm systems, are being properly maintained in readiness for use."

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FACILITY REQUIREMENT SOURCE: DOE6430.1A Section 1300-6.5.1

"All monitoring systems shall be calibrated annually with appropriate national standards to ensure validity of reported values. Environmental monitoring is discussed in Section 1300-9, Effluent Control and Monitoring. All radiation monitoring, alarm, and warning systems that are required to function during a loss of normal power shall be provided with an emergency UPS (internal or external on-line) unless it is demonstrated that they can tolerate a temporary loss of function without losing needed data and they are provided with standby or emergency (switched) power. Determination of the power supply type and quality shall be based on the safety classification of the monitoring system or device. The sampling motivation (vacuum) shall be installed to the same requirement."

11.9

EXPOSURE REDUCTION AND ALARA

The Exposure Reduction/ALARA element includes those requirements related to reducing radiation exposure (primarily external exposure) and for maintaining exposure to radiation As Low As Reasonably Achievable (ALARA). The concept of ALARA is to manage and control exposures (both individual and collective) to the work force, and to the general public at levels as low as is practical, taking into account social, technical, economic, practical, and public policy considerations. ALARA is a process, which has the objective of attaining doses as far below applicable regulatory limits as is reasonably achievable and is the premise on which DOE bases its RP Policy. Specific requirements for reducing radiation exposure are included with ALARA requirements as they are an integral part of the overall ALARA program and are the main methods by which ALARA requirements are implemented. Although limiting contamination (Section 11.5, Contamination Control), the monitoring of radiation (Section 11.2, Facility Monitoring and Surveys) and Entry and Exit Control (Section 11.4, Entry and Exit Control) are also integral parts of the overall ALARA program, requirements relating to these specific subjects are included in the individuals sections of the facility RID.

SITE REQUIREMENT SOURCE: 10CFR20 Part 20.1.c

"In accordance with recommendations of the Federal Radiation Council, approved by the President, persons engaged in activities under licenses issued by the Nuclear Regulatory Commission pursuant to the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974 should, in addition to complying with the requirements set forth in this part, make every reasonable effort to maintain radiation exposures, and releases of radioactive materials in effluents to unrestricted areas, as low as is reasonably achievable. The term "as low as is reasonably achievable" means as low as is reasonably achievable taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to the utilization of atomic energy in the public interest."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 311

**"Planning Radiological Work
Requirements**

Technical requirements for the conduct of work, including construction, modifications, operations, maintenance and decommissioning, shall incorporate radiological criteria to ensure safety and maintain radiation exposures ALARA. To accomplish this, the design and planning processes should incorporate radiological considerations in the early planning stages. The checklist in Appendix 3A is helpful in reducing occupational radiation exposure."

RELATED REFERENCES

1. DOE/EH0256T Article 311

SITE REQUIREMENT SOURCE: DOE-PNL-6577 Section 1.1, Paragraph 1

"The purpose of this document is to provide assistance to those who are responsible for developing, implementing, and/or evaluating ALARA programs. Because each DOE facility has needs, specific and critical to its individual radiation protection program, no single set of specific and detailed criteria can be decreed as a prescription for achieving ALARA goals. However, guidance such as defining elements of an ALARA program and identifying techniques for implementation can be coupled with site-specific criteria to assist in developing a formally structured ALARA program."

SITE REQUIREMENT SOURCE: DOE-PNL-6577 Section 1.3, Paragraph 1

"The basic ALARA philosophy simply stated in a single phrase is "limiting personnel and environmental radiation exposures to the lowest levels commensurate with sound economic and social considerations." This basic statement presupposes that no radiation exposure should occur without a positive net benefit, considering technological, economic, and societal factors. Implicit in the ALARA philosophy is the cautious assumption that any radiation exposure, however small, carries with it some detriment or probability of detriment (i.e., risk), which should be balanced by an offsetting benefit. Indeed, this is the heart of the ALARA philosophy, and it implies that one should not stop looking for ways to incur less dose for a given output of work, as long as the cost of the consideration does not exceed the possible equivalent cost of the potential dose saving."

SITE REQUIREMENT SOURCE: DOE-PNL-6577 Section 3

"One of the components of the system of dose limitation recommended in the Internal Commission on Radiological Protection (ICRP) Publication 26 is that "all exposures shall be kept as low as reasonably achievable, economic and social factors taken into account" (ICRP 1977). In ICRP Publication 37 (ICRP 1983), this component was referred to as "the optimization of radiation protection." "

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SITE REQUIREMENT SOURCE: DOE-PNL-6577 Section 6.1.3

"Operational measures for controlling occupational exposures must be applied to assure that any work with radioactive materials is carried out in the safest manner that is reasonably achievable."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.11

"PERFORMANCE OBJECTIVE: A formally structured, auditable program should be in place with established milestones to ensure that exposures are maintained as low as reasonably achievable (ALARA)."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.11.1

"*1. A documented ALARA program incorporating the guidance contained in DOE/EV/1830-T5 as appropriate is established and audited on a specified frequency."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.a

"Maintaining Radiation Exposures As Low As Reasonably Achievable (ALARA). It is DOE's policy that exposures to radiation resulting from DOE operations be maintained within limiting values given in paragraph 9 and as far below all limiting values as reasonably achievable. This policy applies to annual, committed, and cumulative dose equivalents. Plans and programs used to assure that occupational radiation exposures are maintained ALARA shall be documented. The DOE publication PNL-6577, "Health Physics Manual of Good Practices for Reducing Radiation Exposure to Levels that are As Low As Reasonably Achievable (ALARA), "presents a guide on useful practices for achieving the objective of the ALARA process."

11.2.1

Exposure Controls

This element includes requirements relating to techniques for controlling and minimizing personnel exposure. Examples include requirements for use of shielding, logs between shifts/logs between other RP personnel, use of communication equipment, etc.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 314.1

"Temporary Shielding

The installation, use and removal of temporary shielding should be controlled by procedure."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 314.2

"The effects of the additional weight of temporary shielding on systems and components should be evaluated and established to be within the design basis prior to installation."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 314.3

"Installed temporary shielding should be periodically inspected and surveyed to verify effectiveness and integrity."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 314.4

"Radiation surveys should be performed during the alteration or removal of installed temporary shielding."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 314.5

"Installed temporary shielding should be visibly marked or labeled with the following or equivalent wording: "Temporary Shielding - Do Not Remove Without Permission from Radiological Control.""

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 314.6

"Installed temporary shielding should be periodically evaluated to assess the need for its removal or replacement with permanent shielding."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 314.7

"Site procedures may identify specific shielding applications, such as the shielding of low activity sources or samples, that fall outside the recommendations of this Article."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 342.8

"Where practicable, parts and components should be removed to areas with low dose rates to perform work."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 342.9

"Upon identification of radiological concerns, such as inappropriate work controls or procedural deficiencies, workers should immediately report the concern to line supervision or the Radiological Control Organization."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 343.1

"Logs and Communications
Radiological Control personnel should maintain logs to document radiological occurrences, status of work activities and other relevant information."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 343.2

"During continuous or extended daily operations, oncoming Radiological Control personnel should review logs and receive a turnover briefing from the personnel they are relieving."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 343.3

"Communication systems required by the Radiological Work Permit or technical work document should be checked for operability before being brought into the work area and periodically during work."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 343.4

"Workers should keep Radiological Control personnel informed of the status of work activities that affect radiological conditions."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 344.2

"Radiological Control personnel should conduct frequent tours of the workplace to review the adequacy of radiological work practices, posting and area controls."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 513.4

"Routine work on a Radiological Work Permit shall be stopped when supplemental dosimeter readings indicate total exposure or rate of exposure substantially greater than planned. The Radiological Control Organization shall be consulted prior to continuation of work."

RELATED REFERENCES

1. DOE/EH0256T Article 513

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.11.10

"10. The site has been surveyed to locate any sources of non-productive, low-level radiation exposure and such sources have been eliminated."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.4

"PERFORMANCE OBJECTIVE: External radiation exposure controls should minimize personnel radiation exposure."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.4.1

"*1. Effective exposure control methods are in use, which include:

- Determining the boundaries of radiation and high radiation areas, and posting entry requirements based on accurate and timely radiation level information. The boundaries of these areas are clearly identified and posted (see RP.3 POSTING);
- Clearly posting "Hot spots;"
- Using radiation work permits or similar controls to control exposures associated with specific jobs (see RP.3 PROCEDURES);

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- Controlling personnel exposures in work areas involving high exposure rates by a combination of special tools, shielding, timekeeping, and monitoring of accumulated exposure;
- Routing personnel traffic through lower exposure rate areas, and establishing waiting, staging, and office areas in low background areas; and
- Using controls to protect personnel from transient high radiation levels such as those involved in moving radioactive materials."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.4.4

- " 4. The radiation exposure reduction program includes the following:
- Planning for the work,
 - Work scheduling that provides for completion of exposure reduction efforts prior to and during work and ensures the order of work provides the lowest exposures,
 - Basing job goals upon estimates made using facility and industry experience, and
 - Determining job goals that are realistic but stringent enough to encourage improvements."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.4.6

- " 6. Analysis of current practices and comparison with industry-wide exposure controls are ongoing actions to achieve minimum exposures."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.6

"PERFORMANCE OBJECTIVE: Internal radiation exposure controls should minimize internal exposures."

11.9.2

Exposure Control Requirements for Specific Work Activities

This element includes specific requirements for controlling the exposures related to specific work activities. Examples include work at sample stations, benchtop work, work with fume hoods, etc.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 347.1

"A Radiological Work Permit (RWP) should be issued to control radiological work in localized benchtop areas, laboratory fume hoods, sample sinks, and gloveboxes."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 347.2

"The following controls apply to localized benchtop and laboratory fume hood operations:

- a. Protective clothing shall, at a minimum, include labcoats and gloves. Gloves should be secured at the wrist as necessary.
- b. Shoecovers should be considered based on the potential for floor contamination;
- c. Workers should periodically monitor their hands during work;
- d. Upon completion of work or prior to leaving the area, workers shall monitor those areas of their body that are potentially contaminated. At a minimum, this includes hands, arms, and front portions of the body. Workers should perform a whole body frisk."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 347.3

"The following controls apply to sample station operations:

- a. Protective clothing shall, at a minimum, include labcoats and gloves. Gloves should be secured at the wrist as necessary;
- b. Shoecovers should be considered based on the potential for floor contamination;
- c. If there is a potential for splashing or airborne radioactivity, such as when taking pressurized samples, additional controls such as rubber aprons, face shields, full PCs, or respiratory protection should be instituted;
- d. Workers should periodically monitor their hands during work.
- e. Upon completion of work or prior to leaving the area, workers shall monitor those areas of their body that are potentially contaminated. At a minimum, this includes hands, arms, and front portions of the body. Workers should perform a whole body frisk."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 365.5

"Control requirements for radiographic devices are:

- a. On-site operations with devices containing sealed sources should be conducted in accordance with the requirements contained in Title 10 CFR Part 34 entitled, "Licenses for Radiography and Radiation Safety Requirements for Radiographic Operations."
- b. DOE 5480.4 mandates the use of ANSI N593 entitled, "General Safety Standard for Installations Using Non-Medical X-Ray and Sealed Gamma-Ray Sources, Energies up to 10 MeV," for on-site operations with devices other than sealed sources.
- c. On-site operations conducted by off-site contractors shall be approved by line management in coordination with the site Radiological Control Organization. This process shall ensure the contractor has a valid Nuclear Regulatory Commission or Agreement State license and that the operational and emergency procedures are current and available."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 365.6

"Safety devices and interlocks at fixed installations shall be operational

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prior to and during generation of a radiation field. Operational status shall be verified by testing."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 371

"Construction and Restoration Projects

Construction and restoration projects, including decontamination and decommissioning (D&D), remedial action, or other actions involving materials which contain low levels of radioactivity may present special problems and require site-specific or program-specific control methods. Health and Safety Plans are normally developed to specify controls for all types of restoration programs including Formerly Utilized Sites Remedial Action Program (FUSRAP), Uranium Mill Tailings Remedial Action (UMTRA) and other restoration projects."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 371.1

"Performance goals and indicators appropriate to remedial activities."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 371.11

"Evaluation of outdoor air monitoring methodologies that take into account dust loading, environmental factors, and supplemental breathing zone sampling."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 371.2

"Personal Protective Equipment requirements and practices to accommodate other hazards on the site."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 371.3

"Use of respiratory protection as normal conduct of operation due to lack of engineering controls and temporary nature of the work."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 371.4

"Use of Contamination Reduction Corridors to accommodate movement of personnel and heavy equipment through a variety of decontamination stations."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 371.5

"Methods to obtain representative samples for release of equipment and material from the work areas."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 371.6

"Surveying of materials released from Soil Contamination Areas that exhibit significant contamination transfer properties."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 371.7

"Precedence of state and Federally mandated soil cleanup criteria over surface contamination criteria that otherwise apply."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 371.8

"Monitoring and survey frequency for inactive facilities or large areas that are infrequently occupied."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 371.9

"Outdoor storage of uncontained, bulk radioactive materials such as contaminated soil."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 371[02]

"Requirements

Radiological operations and work activities at construction and environmental restoration projects shall be conducted in accordance with this Manual. In light of the special nature of these activities, which typically involve low-levels of radioactivity and the use of heavy construction or earth-moving equipment, these projects require some radiological considerations different from other activities governed by this Manual.

For the following specific subject areas, the radiological requirements of this Manual may be modified by the limited application of the provisions of Article 113.3. The Radiological Control Manager is authorized to change mandatory "shall" requirements to "should" to facilitate implementation of radiological controls in the following specific subject areas. The contractor has the responsibility to document the technical equivalency of alternative solutions."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.4.5

" 5. Specific job-related exposure reduction efforts are incorporated into work procedures, including the following, where appropriate:

- Using temporary or permanent shielding,
- Using special tools,
- Flushing and decontamination, as appropriate,
- Pre-operational and post-operational briefings of personnel,
- Specialized training and "dry runs" on mock-up equipment,
- Utilizing auxiliary lighting and a working environment with comfortable temperature and humidity and adequate space, where feasible,

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- Providing adequate communication capabilities, and
- Assigning to the job site only the minimum number of personnel needed to perform the work."

11.9.3

Emergency Exposure Control Requirements

This element addresses requirements relating to exposure received or which may be received during emergency operations such as rescue or recovery operations. Many of these requirements may also be included in the Emergency Preparedness RID, however, emergencies are not always declared prior to initiating emergency operations.

The Emergency Preparedness Functional Area contains much more detailed and extensive requirements concerning emergency exposures. Although many of these the activities associated with these requirements would be carried out by Radiation Protection personnel and Radiation Protection would have responsibilities for compliance with these requirements, Emergency Preparedness related requirements are included in the Emergency Preparedness Functional Area as they are more closely associated with that subject.

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.p(2)(a)

"General Considerations

- (a) Controlling exposure to radiation during rescue and recovery actions is extremely complex. Multiple hazards and alternate methods are to be taken into account; and prompt, sound judgment and flexibility of action are crucial to the success of any emergency actions. The risk of injury to those persons involved in the rescue and recovery activities should be minimized, to the extent practical. However, the control of radiation exposures should be consistent with the immediate objectives of saving human life, recovering deceased victims, and/or protection of health and property."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.p(2)(b)

"To avoid unnecessarily restricting action, a rigid upper limit of exposure for lifesaving action is not specified; rather, judgment is left up to the officials in charge to evaluate any proposed action involving further radiation exposure. The evaluation should consider risk versus benefit, i.e., weighing the risks of radiation insults, actual or potential, against the benefits [social, economic, etc.] to be gained. Essential elements in risk determinations include potential exposure, biological consequences related to the exposure, and the number of people involved."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.p(2)(c)

"These instructions also recognize that accident situations involving the saving of lives will require different basis for action than those required to recover deceased victims or to protect property. In the latter instances,

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the amount of exposure expected to be received by persons should be controlled as much as possible within occupational exposure limits."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.p(2)(d)

"Any rescue action that might involve substantial personal risk should be performed by volunteers. When feasible, volunteers should be evaluated with respect to age and previous exposure history. Each emergency worker should be advised of the known or anticipated hazards prior to participation by the person onsite having the emergency action responsibility."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.p(3)

"Emergency Situations. Specific dose criteria and judgment factors are set forth for the three types of emergency action: Type 1, saving of human life; Type 2, recovery of deceased victims; and Type 3, protection of health and property."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.p(3)(a)1

"Saving of Human Life.

- 1 Attempts to rescue victims of an incident should be regarded in the same context as any other emergency action involving the rescue of victims, regardless of the type of hazard involved."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.p(3)(a)2

"If the victim is considered to be alive, the course of action should be determined by the person onsite having the emergency action responsibility."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.p(3)(a)3

"The potential amount of exposure to rescue personnel for each specific Type 1 emergency action shall be evaluated by the person onsite having the emergency action responsibility. The emergency situation should be immediately evaluated and an exposure objective should be established for the rescue mission. The evaluation of the inherent risks should consider:

- a The reliability of the prediction of radiation injury from measured/estimated dose rates. In this context, consideration should be given to the uncertainties associated with the specific instruments and techniques used to estimate the dose rate. This is especially crucial when the estimated dose approximates 100 rad (1 gray) or more.
- b The effects of acute external and/or internal exposure.
- c The capability to reduce risk through physical mechanisms such as the use of protective equipment, remote manipulation equipment, or similar means.
- d The probability of success of the rescue action."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.p(3)(b)1

"Recovery of Deceased Victim.

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- 1 The recovery of deceased victims should be well planned. Except as provided in subparagraph 3 below, the amount of radiation exposure received by persons in recovery operations shall be controlled within existing occupational exposure limits."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.p(3)(b)2

"When fatalities are located in inaccessible areas due to high direct radiation fields, and when the recovery mission would result in exposure in excess of occupational exposure limits specified in this chapter, special remote recovery devices should be used to retrieve bodies, as appropriate."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.p(3)(b)3

"When it is not feasible to recover bodies without personnel entering the area, the official in charge may determine it necessary to exceed the occupational exposure limits specified in this chapter. The planned exposure of an individual participating in the recovery should not exceed 10 rem (0.1 sievert) per year."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.p(3)(c)

"Protection of Health and Property. When the risk (probability and magnitude) of the radiation hazard either bears significantly on the state of health of people, or may result in loss of property, so that immediate remedial action is needed, the following criteria should apply:

- 1 When the official in charge deems it essential to reduce a potential hazard to protect health or prevent a substantial loss of property, a planned exposure objective not to exceed 10 rem (0.1 sievert) per year may be permitted for individuals participating in the operation. However, under special circumstances, the official in charge of emergency action at the incident may elect to permit volunteers an emergency exposure objective not to exceed 25 rem (0.25 sievert) in any year.
- 2 When the risk of radiation following the incident is such that life might be in jeopardy, or that there might be severe effects on health or the public or loss of property inimical to the public safety, the criteria for saving of human life shall apply."

11.9.4

Radiological Work Planning

This element addresses the requirements relating to radiological work planning. Radiological work planning is a primary method for reducing exposures and ensuring that exposures are maintained ALARA. As a result of work planning, other exposure reduction/ALARA techniques are often identified and then utilized during work activities. Because of this relationship and because work planning is a major vehicle to ensuring appropriate exposure reduction techniques are included in the work process, it is included as a separate element.

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 312.1

"Planning for Maintenance, Operations and Modifications
Maintenance and modification plans and procedures shall be reviewed to identify and incorporate radiological requirements, such as engineering controls and dose and contamination reduction considerations. Performance of this review is the responsibility of line management, with support and concurrence from the Radiological Control Organization."

RELATED REFERENCES

1. DOE/EH0256T Article 312

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 312.2

"For routine tasks, such as surveillance, tours and minor non-radiological maintenance, performance of the above review and documentation of identified radiological requirements may be conducted as part of the Radiological Work Permit process (see Article 321)."

RELATED REFERENCES

1. DOE/EH0256T Article 312

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 313.1

"Infrequent or First-Time Activities
At those facilities with routine, recurring process operations, special management attention should be directed to radiological activities that are infrequently conducted or represent first-time operations. Planning for such activities should include:
Formal radiological review in accordance with Article 312.4"

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 313.2

"Senior management review directed toward anticipation of concerns and emphasis and specification of protective measures"

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 313.3

"Review and approval by the ALARA Committee"

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 313.4

"Enhanced line and Radiological Control management oversight during the initiation and conduct of the work."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 315.1

"Technical Work Documents

Technical work documents, such as procedures, work packages, or job or research plans, should be used to control hands-on work with radioactive materials. Technical work documents are not required for incidental or routine work activities that involve a low potential of worker exposure or workplace contamination, such as the collection of trash or used protective clothing."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 315.2

"Technical work documents used to control radiological work activities should be reviewed and approved by the Radiological Control Organization."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 315.3

"Radiological Control Hold Points should be incorporated into technical work documents for steps that require action by the Radiological Control Organization to prevent radiation exposures in excess of Administrative Control Levels, high airborne radioactivity concentrations, or the release of radioactivity to the environment."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 324.1

"Pre-Job Briefings

At a minimum, pre-job briefings should be held prior to the conduct of work anticipated to exceed the trigger levels identified in Article 312.3."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 324.2

"At a minimum, the pre-job briefing should include:

- a. Scope of work to be performed;
- b. Radiological conditions of the workplace;
- c. Procedural and RWP requirements;
- d. Special radiological control requirements;
- e. Radiologically limiting conditions, such as contamination or radiation levels that may void the RWP;
- f. Radiological Control Hold Points;
- g. Communications and coordination with other groups;
- h. Provisions for housekeeping and final cleanup;
- i. Emergency response provisions."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 324.3

"Pre-job briefings should be conducted by the cognizant work supervisor."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 324.4

"Workers and supervisors directly participating in the job, cognizant Radiological Control personnel, and representatives from involved support organizations should attend the briefing."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 324.5

"A summary of topics discussed and attendance at the pre-job briefing should be documented. This documentation should be maintained with the technical work document."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 341.1

**"Radiological Work Controls
Requirements**

Radiological work activities shall be conducted as specified by the controlling technical work document and Radiological Work Permit."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 341.2

"Prerequisite conditions, such as tag-outs and system isolation, should be verified in accordance with the technical work documents before work is initiated."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 342.6

"The identity of components and systems should be verified prior to work."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 342.7

"Work activities and shift changes should be scheduled to prevent idle time in radiation areas."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 534

"Heat Stress

Heat stress may result from working in areas of high heat, 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 anti-contamination clothing or plastic suits were in use or strenuous work was required. The planning stages for work in hot environments should address heat stress controls. Recommended work time limits and use of body cooling devices should be considered to reduce heat stress. Job supervisors should inform their personnel of heat stress precautions prior to work on job assignments in hot environments. If a person begins to feel symptoms of heat illness, the person should immediately notify the nearest co-worker, exit the area, remove personal protective equipment, notify the supervisor and rest in a cool area. In such cases, medical assistance should be provided."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 551.11

"Monitoring results should be made available to line management and used in support of pre- and post-job evaluations, ALARA preplanning, contamination control and management of radiological control operations."

RELATED REFERENCES

1. DOE/EH0256T Article 551

SITE REQUIREMENT SOURCE: DOE-PNL-6577 Section 6.1.3, Paragraph 3

"The need for comprehensive and detailed operational procedures is dictated by the need to think through and understand each task on a step-by-step basis. Each step in a procedure should be fully thought out and its impact on exposure rigorously evaluated. Shielding, remote operation, distance, specialized tools, protective equipment, manpower requirements, exposure rates, exposure times, and alternative procedures should be carefully considered. The procedures should also convey a clear picture of what needs to be done to accomplish the task while keeping the exposures ALARA. The procedures can then be used as a component of a worker's training and as a basis for practicing the tasks. The final, complete procedure should be the result of cooperation and agreement among radiation protection specialists, management, and workers."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.2
ACCIDENTS/INCIDENTS.9

- " 9. Adequate prejob planning is performed to reduce or minimize the potential for an accident."

11.9.5

ALARA Reviews

This element addresses requirements specific to the performance of ALARA reviews. ALARA reviews are required for certain types of work, for certain levels of exposure and under certain specific situations. Although related to work planning, ALARA reviews are a formal process for demonstrating that appropriate tasks which meet procedurally required criteria have been reviewed. Those tasks have additional reviews (beyond normal work planning), up to and including reviews by the facility ALARA Committee to identify additional controls and/or processes to reduce exposure.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 312.3

"The Site-Specific Radiological Control Manual shall establish trigger levels requiring formal radiological review of non-routine or complex work activities. These appropriate trigger levels should include:

- a. Estimated individual or collective dose greater than preestablished values;
- b. Predicted airborne radioactivity concentrations in excess of preestablished values;

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- c. Work area removable contamination greater than 100 times the values in Table 2-2;
- d. Entry into areas where dose rates exceed 1 rem/hour;
- e. Potential radioactive releases to the environment."

RELATED REFERENCES

- 1. DOE/EH0256T Article 312

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 312.4

"Tasks with the potential to exceed the above trigger levels shall undergo a formal, documented radiological or ALARA review. At a minimum, this review should consider the following:

- a. Inclusion of Radiological Control Hold Points in the technical work documents;
- b. Elimination or reduction of radioactivity through line flushing and decontamination;
- c. Use of work processes and special tooling to reduce time in the work area;
- d. Use of engineered controls to minimize the spread of contamination and generation of airborne radioactivity;
- e. Specification of special radiological training or monitoring requirements;
- f. Use of mock-ups for high exposure or complex tasks;
- g. Engineering, design and use of temporary shielding to reduce radiation levels;
- h. Walkdown or dry-run of the activity using applicable procedures;
- i. Staging and preparation of necessary materials and special tools;
- j. Maximization of prefabrication and shop work;
- k. Review of abnormal and emergency procedures and plans;
- l. Identification of points where signatures and second party or independent verifications are required;
- m. Establishment of success or completion criteria, with contingency plans to anticipate difficulties;
- n. Development of a pre-job estimate of collective exposure to be incurred for the job;
- o. Provisions for waste minimization and disposal."

RELATED REFERENCES

- 1. DOE/EH0256T Article 312

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 312.5

"Radiological requirements identified as part of the above radiological review should be documented in the job plans, procedures or work packages."

RELATED REFERENCES

- 1. DOE/EH0256T Article 312

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 344.1

"Review of Work in Progress

As part of their normal work review, work supervisors should periodically review ongoing jobs to ensure prescribed radiological controls are being implemented."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 352

"Post-Job Reviews

Performance should be reviewed after completion of non-routine radiological work. Requirements for post-job reviews should be delineated in the Site-Specific Radiological Control Manual."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 353

"Lessons Learned

Lessons learned are available from post-job reviews and reports of past radiological events on site and at other facilities. The Radiological Control Organization, in conjunction with line management, should evaluate lessons learned, provide prompt distribution, and incorporate the lessons into the Site Radiological Control Program, the radiological training program and related operations."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.11.7

" 7. ALARA reviews are routinely performed prior to issuing radiation work permits."

11.9.6

ALARA Dose Goals

This element addresses requirements relating specifically to ALARA program dose goals.

SITE REQUIREMENT SOURCE: DOE-PNL-6577 Section 4

"In principle, ALARA is the goal and other goals should not be necessary. In practice, however, subtler goals are required to assist in assuring that the primary goal, ALARA, is achieved. Goals for the ALARA program should be established at the outset of the ALARA program and re-established periodically thereafter. Typically, goals are established and achievement is evaluated at least annually. The goals should be related to specific characteristics of operations or programs and should correspond to real problems. Setting practical ALARA goals depends on how well the ALARA program is understood and can be characterized."

SITE REQUIREMENT SOURCE: DOE-PNL-6577 Section 4.3

"An ALARA program should be evaluated in terms of achievement of goals. In general, goals should be evaluated annually. However, certain goals need to be evaluated more frequently. For example, if an ALARA goal is specific to a

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short-duration high-exposure job, the goal should be evaluated at the completion of the job. In addition to periodic evaluation of ALARA goals, the entire ALARA program including organization and training should be evaluated annually."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.4.2

"*2. Exposure trends are monitored and actual exposures are compared to established ALARA goals (see RP.11). Actions are initiated to correct a problem or adjust the goals as appropriate."

11.9.7

ALARA Performance and Training Requirements

This element addresses requirements relating to training which is conducted to train workers on the ALARA program or training which is conducted as part of specific ALARA actions. It also includes requirements for training individuals who are active in the facility ALARA program and requirements to document training for workers on the ALARA or exposure reduction activities associated with individual jobs.

SITE REQUIREMENT SOURCE: ANSI-N13.6-1966 Section 4.10

"Radiation Work Orientation and Training. The employer should record the date, number, and the subject matter of orientation discussions and formal on-the-job training sessions on the radiation protection aspects of the work. The consolidated record file for the individual should include reference to his participation in these activities."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 652

"Technical Support Personnel

Appropriate technical support personnel (engineers, schedulers, procedure writers) should be trained in the principles of ALARA, basic ALARA techniques and dose reduction techniques. They should also participate in selected portions of job-specific and specialized training, particularly in situations using mock-ups."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 654.4

"Radiological support personnel who are responsible for implementing the site ALARA program shall receive ALARA training."

SITE REQUIREMENT SOURCE: DOE-PNL-6577 Section 2.1.3, Page 2.10, Paragraph 2

"In addition to the radiation protection orientation required for all employees, on-the-job training for operating personnel in specifics related to ALARA is essential, and whenever possible should include assigning inexperienced personnel to work with experienced staff. Training should include the description, demonstration, and practice of specific actions necessary for radiation control. In addition, each worker should receive

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some basic information regarding the company's radiation protection programs, along with an introduction to the philosophy and purposes of the ALARA program. Special training sessions in exposure reduction techniques may be especially beneficial to operating and maintenance personnel who routinely enter radiation areas. Training sessions should be personalized and include the introduction of key radiation protection personnel .. Finally, optional additional education and training in radiation protection should be made available to all who desire it."

SITE REQUIREMENT SOURCE: DOE-PNL-6577 Section 2.1.3, Page 2.6, Paragraph 2

"Specific ALARA training should be provided to selected groups to ensure effective participation in implementing the ALARA program. Included in the groups that should receive specific ALARA training are the ALARA and radiation protection staff, managers, supervisors, planners and schedulers, design engineers, and radiation workers."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.11.3

" 3. The ALARA program and its results reflect management commitment to ALARA. The radiation workers are convinced of management's commitment to ALARA. The radiation workers themselves are committed to ALARA."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.11.4

" 5. The methods and procedures to evaluate ALARA data on a specified frequency are established."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.11.6

" 6. The ALARA data can be used to identify operations and activities that may need extra attention."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.11.8

" 8. ALARA is discussed in training given to radiation workers. Specific methods are described for limiting exposure."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.11.9

" 9. Meetings are held to discuss complex radiation work with high exposure potential. Dry runs are conducted with "cold" systems."

11.9.8

ALARA Committee and Staffing

This element addresses requirements relating to the staffing of and actions of the facility ALARA Committee. The ALARA Committee is an integral part of the ALARA program as it includes members from various departments/groups of the facility. It is the direct link to involvement in ALARA by all groups and persons at the facility.

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 138

***138 ALARA Committee**

The As-Low-As-Reasonably-Achievable (ALARA) process of reducing radiation exposures is a fundamental requirement of every radiological control program. There is considerable leeway in determining how far is reasonable. Reducing exposure is desirable because of the direct relation to the health and safety of workers and the public. Reducing radiation exposure improves the quality of the workplace and in the long run saves resources. An ALARA Committee should be established. The membership should include managers and workers from the line, the technical support organization and the Radiological Control Organization. It is more effective if a line manager, such as Director of Operations, Research, or Maintenance serves as the Charter. This Committee may be part of a general safety or radiation safety committee whose functions include ALARA activities and possibly be combined with the Radiological Awareness Committee (see Article 132) for smaller facilities.

The ALARA Committee should make recommendations to management to improve progress toward minimizing radiation exposure and radiological releases. The Committee should evaluate items such as construction and design of facilities and systems, planned major modifications or work activities, as well as experimental test plans for exposure, waste and release minimization. The Committee should also receive, as a minimum, the results of all reviews and audits, both internal and external, and should review the overall conduct of the Radiological Control Program."

RELATED REFERENCES

1. DOE/EH0256T Article 138

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 312.6

"Radiological tasks anticipated to exceed individual or collective dose criteria established in the Site-Specific Radiological Control Manual should be reviewed and approved by the ALARA Committee."

RELATED REFERENCES

1. DOE/EH0256T Article 312

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.11.2

- " 2. An ALARA Coordinator or other staff has been designated with specific ALARA responsibilities. These responsibilities are documented and integrated into the radiological protection program."

11.9.9

Dose Tracking and Trending

This element addresses requirements relating to the tracking and trending of dose and the use of that tracked data as part of the overall facility exposure reduction/ALARA program.

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 344.3

"During the performance of jobs for which a pre-job dose estimate was made, the Radiological Control Organization, in cooperation with line periodically monitor collective dose accumulation and management, should periodically monitor collective dose accumulation and compare it with the pre-job dose estimate. Differences should be reviewed to identify causes and assess the need for corrective actions."

SITE REQUIREMENT SOURCE: DOE-PNL-6577 Section 2.1.2, Paragraph 5

"Management procedures should include a system for assuring that trend analysis and radiation dose tracking are performed. Trend analyses and dose tracking can be instrumental in identifying locations and activities which could benefit from an in-depth ALARA evaluation, even in low-exposure facilities (Mahathy, Bailey, and Lay 1984). Preparing and analyzing control charts for department and individual exposures and analyzing radiation monitoring data are just two of their many uses."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.11.11

"11. Trend analysis is performed for both routine and repetitive operations. Management reviews these analyses on a specified frequency and takes appropriate action."

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.5, Last Paragraph

"Operations supervisory personnel should periodically review exposure trends of operating personnel under their supervision. Emphasis should be placed on determining the adverse factors that contribute to personnel exposures and minimizing those factors to keep exposures as low as reasonably achievable."

11.9.10

ALARA Design Requirements

This element addresses requirements relating to use of the ALARA principle when designing facilities and systems. These requirements do not include specific requirements for specific pieces of equipment, rather overall requirements to ensure that ALARA is included as a consideration during design processes.

The Engineering and Design functional area interfaces with Radiation Protection when performing facility or facility equipment engineering or design. Specific requirements for specific types of Radiation Protection equipment have been identified and are part of the requirements database. Personnel performing design relating to Radiation Protection Systems or Equipment must ensure that these requirements are reviewed and complied with when performing design. The ALARA Design element includes the requirements for ensuring that Radiation Protection is included in the review/approval of engineering and design activities which may impact the exposure to plant personnel or the general public. The Radiation Protection Organization is

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required to ensure processes for appropriate ALARA reviews of Engineering and Design functions are effected. The Engineering and Design Organization is responsible to comply with ALARA Design requirements.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 128.1

"Facility Modifications and Radiological Design Considerations
Radiological control performance is affected by human performance and engineered design features. This Manual primarily addresses the way people operate and use existing facilities and sites. Designs for new facilities and major modifications to existing facilities should be based on the following additional radiological control design criteria:

- a. Individual worker dose should be ALARA and less than 500 mrem per year;
- b. Discharges of radioactive liquid to the environment are covered by the provisions of DOE 5400.5 and should not degrade the groundwater;
- c. Control of contamination should be achieved by containment of radioactive material;
- d. Efficiency of maintenance, decontamination and operations should be maximized;
- e. Components should be selected to minimize the buildup of radioactivity;
- f. Support facilities should be provided for donning and removal of protective clothing and for personnel monitoring, where appropriate;
- g. Neutron quality factor of 20 should be used for design purposes."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 128.2

"Facilities currently under construction should be evaluated and the above criteria applied where practicable."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 128.3

"Existing facility designs that have office space and lunchrooms or eating areas within Radiation Areas, High and Very High Radiation Areas, Contamination and High Contamination Areas, Airborne Radioactivity Areas, Radioactive Material Areas and Radiological Buffer Areas require priority attention. Generally:

- a. Locating lunch rooms or eating areas, restrooms, drinking fountains, showers and similar facilities and devices is strongly discouraged within these areas;
- b. Locating office spaces within these areas is strongly discouraged; to the extent that such space is essential to support radiological work, steps should be taken to preclude unnecessary occupancy."

SITE REQUIREMENT SOURCE: DOE-PNL-6577 Section 5

"The basic design criteria for ALARA is the optimization concept itself. If ALARA (optimization) is implemented throughout the design of a facility, no other radiation protection design criteria should be required beyond that necessary to keep exposures below the regulatory limits."

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SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.j

"Design and Control. Radiation exposure rates in controlled workplace areas should be reduced to as low as reasonably achievable by proper facility design and control. The primary means for maintaining exposures as low as reasonably achievable are to be through physical controls, e.g., confinement, ventilation, remote handling, and shielding. Administrative controls and procedural requirements are to be considered supplemental means to achieve control."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.j(1)(a)

"Design. During the design of facilities, the following objectives shall be applied:

(a) Optimization. Optimization principles, as discussed in ICRP Publication 37, are to be utilized in developing and justifying facility design and physical controls."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.j(1)(b)

"External Radiation Exposure. The design objectives for personnel exposure from external sources of radiation in continuously occupied controlled areas are ALARA and not exceeding 0.5 mrem (5 μ Sv) per hour on average. The design objectives for exposure rates for potential exposure to a radiation worker where occupancy is generally not continuous are ALARA and not exceeding 20 percent of the applicable standard in paragraphs 9.b.(1) and (2)."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.j(1)(c)

"Internal Radiation Exposure. As a design objective, exposure of personnel to inhalation of airborne radioactive materials is to be avoided under normal operating conditions to the extent reasonably achievable. This will normally be accomplished by confinement and ventilation."

FACILITY REQUIREMENT SOURCE: DOE5480.11 Section 9.j(1)(d)

"Maintenance, Decontamination, and Decommissioning. Ease of maintenance and decontamination and decommissioning is to be considered in facility design and selection of materials."

SITE REQUIREMENT SOURCE: DOE6430.1A Section 1300-1.3

"General Requirements. Objectives. The design of special facilities shall minimize exposures of personnel and the general public to hazardous materials by emphasizing ALARA concerns during all design, construction, and operational phases of special facilities."

SITE REQUIREMENT SOURCE: DOE6430.1A Section 1300-1.3[02]

"Occupational exposure to radiation shall be limited according to DOE 5480.11. Design goals shall be established to maintain radiation exposure of employees ALARA. The nature of the hazardous materials in the facility, including

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radionuclides, shall be considered in the assessment of potential employee exposures."

SITE REQUIREMENT SOURCE: DOE6430.1A Section 1300-1.4.1

"General. The confinement of hazardous materials produced, processed, or stored in special facilities shall be designed to minimize dose to a maximally exposed member of the public."

11.9.11

Cost-Benefit Analysis

This element addresses those requirements relating to cost/benefit analysis as part of the overall ALARA program. The concept of ALARA includes cost/benefit analysis as an integral concept to ensure that resources are used in an appropriate manner to obtain optimum reduction of exposures while considering social and economic costs.

SITE REQUIREMENT SOURCE: DOE-PNL-6577 Section 3.2, Paragraph 1

"Cost-benefit analysis is thoroughly described in ICRP Publication 37 (ICRP 1983) and is the preferred optimization method if sufficient data are available for its use. Cost-benefit analysis involves the quantification of all variables in monetary terms to determine the net benefit of a radiation protection practice."

SITE REQUIREMENT SOURCE: DOE/EH0256T Article 312, Item 7

"Optimization techniques, including cost-benefit analysis, represent a fundamental part of radiological design analysis and work review. For review of minor activities with low associated doses, a cost-benefit evaluation is an intrinsic part of the engineering review process and a detailed evaluation is not necessary. For review and planning of major tasks involving higher collective dose expenditures, a detailed and documented evaluation should be performed."

11.9.12

ALARA Audits

This element addresses the requirements for conducting audits of the ALARA program. These audits may be performed by the Quality Control Organization or by some other organization, however, these requirements are specific to ALARA audits and do not apply to other types of audits which may be performed by these groups or by Radiation Protection personnel.

SITE REQUIREMENT SOURCE: DOE-PNL-6577 Section 2.2, Paragraph 1

"Management responsibilities for reviewing, auditing, and evaluating the ALARA program shall be clearly documented. Documentation should include descriptions of the purpose, scope, and frequency of ALARA program reviews and of techniques for these reviews. Documentation should be clearly auditable."

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SITE REQUIREMENT SOURCE: DOE-PNL-6577 Section 2.2, Paragraph 2

"Evaluation of the ALARA program shall be conducted by an individual or individuals who have no direct responsibility for implementing the program. In some instances, this responsibility may be assigned to the radiation protection or ALARA committee, as long as provisions are made to ensure an objective and unbiased evaluation. The evaluation should be commissioned by senior management. Personnel conducting it should, for the purpose of the evaluation, report directly to them. The use of independent team for large and complex radiation facilities. The individual or the team members conducting the evaluation should, individually or jointly, have knowledge of and experience in health physics, facility operations, design, management systems, and ALARA. A formal report on the evaluation should be issued to senior management. The report should contain an overall assessment of the program and include the findings of the evaluation, areas of strengths and weaknesses, and recommendations for changes and improvements."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.11.1

"*1. A documented ALARA program incorporating the guidance contained in DOE/EV/1830-T5 as appropriate is established and audited on a specified frequency."

11.10

OCCURRENCES AND INVESTIGATIONS

This element addresses requirements relating to occurrences at the facility and the reporting and investigation of those occurrences. Occurrences are abnormal events which have specific requirements to demonstrate that the facility has appropriately responded to the event, reported the event to appropriate groups, agencies or individuals, has thoroughly investigated the event and has taken appropriate actions to prevent a recurrence of the event.

This element includes requirements relating to the appropriate response to events and occurrences which are radiological in nature. These requirements are specific to radiological events/occurrences but may or may not be handled by the Radiation Protection Organization. The Compliance Assessment and Resolution functional area includes general requirements for ensuring compliance and resolution regardless of the functional area source and may also include specific requirements for radiological events.

11.10.1

Occurrences/Events

This element addresses the requirements which identify occurrences which must be responded to by the Radiation Protection Organization and general requirements for responding to occurrences and events.

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.m(1)

"ALARA. Records of ALARA programs shall be maintained by field organizations and operating contractors to demonstrate the adequacy of the ALARA plans and programs and their implementation."

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11.10.2

Occurrence Notifications

This element addresses the requirements for making appropriate notifications to groups, agencies or individuals in a timely and appropriate manner following occurrences at the facility.

11.10.3

Occurrence Investigations and Critiques

This element addresses the requirements for performing investigations and critiques following an occupancy at the facility. These investigations and critiques are aimed at identifying the causes of occurrences and identifying appropriate actions to prevent recurrence.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 127

"Critiques

It is the Department's desire and expectation, based on concern for the safety and well-being of workers and the general public, that radiological work practices be continually scrutinized and questioned so that opportunities for improvement can be identified, assessed and incorporated into this Manual and the Site-Specific Manuals.

A formal process should be established to obtain pertinent facts following an unusual radiological situation or at the satisfactory conclusion of a new or unusual operation involving radiological controls. This process complements the Occurrence Reporting System of DOE 5000.3A. The process should be used to quickly establish facts in chronological order so that the underlying reasons or causes for the success or failure are well understood. Work force participation should be encouraged. Critiques are a management tool and should not be used to "fix blame" or "shoot the messenger."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 351

"Evaluation of Performance

During the conduct of radiological work and the handling of radioactive materials, abnormal events may occur which 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."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 351.1

"Conduct of Critiques

Critiques are meetings of the personnel knowledgeable about an event (either a success or an abnormal event) to document a chronological listing of the facts. The purpose of the critique is not to assign blame, but to establish and record the facts. Critiques should be conducted for successes and abnormal events."

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 351.2

"Critique leaders should be trained in the required elements of the critique process and the appropriate methods of conducting and controlling the critique."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 351.3

"Critique meetings should be conducted as soon as practicable after the event or situation is stabilized, or after a successful evolution is completed. Critiques of abnormal events should preferably be conducted before involved personnel leave for the day."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 351.4

"At a minimum, the general critique process should include the following elements:

- a. Formal meetings, chaired by a critique leader;
- b. Attendance by all who can contribute;
- c. Personal statement forms completed by selected personnel before the meeting;
- d. Attendance records;
- e. Minutes, recorded and signed by the critique leader and all contributors;
- f. Personal statements, signed and attached to the meeting minutes;
- g. A listing of the facts in chronological order;
- h. Supporting materials, including documents, records, photographs, parts and logs, maintained by the critique leader."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 351.5

"Evaluation of complex evolutions or events may require multiple critiques."

11.10.4

Occurrence Reports

This element addresses requirements for reports which are generated following occurrences or investigations/critiques of occurrences. These requirements ensure that actions taken following the event are appropriately documented and communicated to groups, agencies and/or individuals.

11.11

OCCURRENCE REPORTS

This element addresses the requirements for maintaining records related to radiation protection activities and for generating reports. Records and reporting requirements are established for the RP Program to document the radiological protection measures applied to general and specific work activities and to demonstrate RP compliance with requirements during audits, inspections and evaluations. Exposure records and reports are a necessary element for demonstrating compliance and for informing management, visitors, personnel, terminated employees, and regulatory groups of both the individual and collective exposures. Finally, these records may be used to demonstrate

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the radiological protective activities taken by the facility in response to any civil or criminal actions brought against individuals or agencies associated with the facility.

The Records Management element includes requirements which are specific for the maintenance of Radiation Protection records and for generating required Radiation Protection Reports. The Document Control and Records Management functional area under Management Systems provides overall requirements for maintaining records and the Document Control Organization will likely take responsibility for the long term handling and control of Radiation Protection records using the requirements contained in the Management Systems Functional Area. Additionally, there may be Document Control and Records Management requirements from the Management Systems functional area which Radiation Protection (and other functional areas) are responsible for complying with.

SITE REQUIREMENT SOURCE: ANSI-N13.6-1966 Section 7.1

"Retention and Storage of Records.

Retention Period for Records. The symptoms of radiation-caused injury or disease may not become for years after the radiation exposure has occurred. The symptoms of excessive radiation exposure may be pathologically similar to the symptoms for a disease or injury that was not caused by radiation exposure. The retention periods for the more significant records must necessarily be of long duration in view of the following two factors:

- (1) The requirements for retention imposed by applicable regulations affecting certain radiation records
- (2) The possible future need for certain records to provide information for workmen's compensation programs or for conduct of litigation which may transpire many years in the future.

In some states, the statute of limitations may provide that a claim must be filed within a prescribed time from the employee's awareness of the disease or injury and its relationship to his employment. In other states, the rule may be different.

In view of these factors, and in recognition of the recommendations of authoritative bodies, the following records should be retained until the year in which the individual would have reached the age of 75 years or until 10 years after the known death of the individual.

- (1) Records of assessment of radiation exposure, both internal and external, received by the individual
- (2) Records of control and calibration data associated with evaluation of the individual's exposure data
- (3) Records of procedures and methods used for interpretation and evaluation of the individual's exposure data
- (4) Records describing unusual occurrences in which the individual was involved.

Records other than the foregoing (e.g., radiation surveys) may be equally valuable in establishing the radiation exposure of an individual and their retention may be desirable, depending on the circumstances, for a similar period of time. All records described in this standard should be retained for a minimum of 5 years. In any event, the employer should seek legal advice before effecting the destruction of"

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SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 711

***Requirements**

Purpose

This chapter contains the prescribed practices for preparing and retaining radiologically related records. Radiological control records are needed to demonstrate the effectiveness of the overall program. The work force and management are required to use records to document radiological safety afforded to personnel on-site. Records of radiological programs may be required to support worker health studies and future disputes or claims. Therefore, these records should be high quality, readily retrievable and managed for the prescribed retention period. Consideration should be given to cross-referencing related records to aid retrievability. Records should be handled such that personal privacy is protected."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 712.1

***Records Management Program**

A radiological records management program shall be established. This program shall ensure that auditable records and reports are controlled through the stages of creation, distribution, use, arrangement, storage, retrieval, media conversion (if applicable) and disposition. The records management program should include the following:

- a. Radiological Policy Statements;
- b. Radiological Control Procedures;
- c. Individual Radiological Doses;
- d. Internal and External Dosimetry Policies and Procedures (including Bases Documents);
- e. Personnel Training (course records and individual records);
- f. ALARA Records;
- g. Radiological Instrumentation Test, Repair and Calibration Records;
- h. Radiological Surveys;
- i. Area Monitoring Dosimetry Results;
- j. Radiological Work Permits;
- k. Radiological Performance Indicators and Assessments;
- l. Radiological Safety Analysis and Evaluation Reports;
- m. Quality Assurance Records;
- n. Radiological Incident and Occurrence Reports (and Critique Reports, if applicable);
- o. Accountability records for sealed sources;
- p. Records for release of material to Controlled Areas;
- q. Reports of loss of radioactive material."

RELATED REFERENCES

1. DOE/EH0256T Article 712

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 712.2

"Where radiological services (for example, dosimetry and laboratory analyses) are purchased, there should be a clear agreement regarding records

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responsibility during performance of the service. Records of results should reside in the custody of the originating contract organization."

RELATED REFERENCES

1. DOE/EH0256T Article 712

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 713.1

"Recordkeeping Standards

Radiological control records shall be accurate and legible. The records should include the following:

- a. Identification of the facility, specific location, function and process;
- b. Signature or other identifying code of the preparer and date;
- c. Legible entries in black ink;
- d. Corrections identified by a single line-out, initialed and dated;
- e. Supervisory signature to ensure review and proper completion of forms."

RELATED REFERENCES

1. DOE/EH0256T Article 713

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 713.2

"It is suggested that the Radiological Control Organization maintain a file of names, signatures and initials for future identification of the person who signed or initialed a record."

RELATED REFERENCES

1. DOE/EH0256T Article 713

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 713.3

"Radiological control records should not include:

- a. Opaque substances for corrections;
- b. Shorthand or other nonstandardized terms."

RELATED REFERENCES

1. DOE/EH0256T Article 713

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 713.4

"Similar procedural standards should be established for computerized records."

RELATED REFERENCES

1. DOE/EH0256T Article 713

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.12.1

"*1. Comprehensive records related to occupational radiation exposure are systematically generated and maintained consistent with ANSI N13.6. The records include:

- Radiation records related to an individual, e.g., prior exposure history, bioassay data, dose assessment methodology, personnel dosimetry results, etc.;
- Radiation records related to the status of work areas, e.g., radiation surveys, air sampling result, etc.;
- Records that describe the technical and administrative basis for radiological protection programs, e.g., standards, policies, procedures, methods of dose evaluations, etc.; and
- Records of unusual occurrences, accidents, and incidents, e.g., investigations, corrective action, follow-up, etc."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.12.4

" 4. Records are maintained in a centralized location, protected from loss, such that the level of effort required to retrieve all the records relevant to a given incident (including field monitoring records, air sampling data, bioassay analysis, in vivo measurement, dose assessments, etc.) would be minimal."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.m

"Records. As a minimum, the records specified below of the radiation protection program and dosimetry records for all individuals for whom monitoring is provided shall be generated and maintained, commencing with the effective date of this Order. Information and data developed pursuant to this Order shall be retained consistent with the requirements of DOE 1324.2A, RECORDS DISPOSITION."

SITE REQUIREMENT SOURCE: INPO-88-010 Chapter III, Section C(3)(5)

"Records that document the important activities associated with this chapter should be maintained in a retrievable, legible form. Examples of such records include the following:

- radiation survey record records
- radiation survey instrument calibration records
- external radiation dose records for each individual monitored
- results of area monitoring dosimeters when used to confirm that unmonitored personnel do not require dosimetry
- records of dosimetry device calibration, testing, and quality control checks
- dose assessments

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- timekeeping records
- radiation work permits"

SITE REQUIREMENT SOURCE: INPO-88-010 Chapter VI, Section C.4

"Records that document the important activities associated with this chapter should be maintained in a retrievable, legible form. Examples of such records include the following:

- contamination survey records
- contamination survey instrument calibration documentation
- information relating to the setup, testing, calibration, and response checks performed for whole-body or hand/foot contamination monitors
- reports of skin, clothing, and area contamination-Skin contamination reports should be filed in the individual's radiation exposure records. A central file of all reports should be maintained for review by radiological protection personnel."

11.11.1

Personnel Exposure Records

This element addresses requirements for maintaining personnel exposure records. These records include documented information concerning external and internal exposures and are an integral part of demonstrating compliance with other programmatic requirements relating to the Radiation Protection functional area.

SITE REQUIREMENT SOURCE: ANSI-N13.6-1966 Section 3.2.3

"Individual Personnel Records. Since one of the primary purposes of the radiation records system is to be able to state the exposure status of an individual, the employer should establish and maintain a consolidated record for each individual. Radiation records specifically related to the exposure of an individual should be accumulated and retained in a single record file."

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 722.1

"Personnel Radiological Records

Radiation dose records shall be maintained for all contractor, subcontractor and Federal employees who are part of the personnel dosimetry program at DOE facilities."

RELATED REFERENCES

1. DOE/EH0256T Article 722

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 722.2

"Radiation dose records shall contain information sufficient to identify each person, including social security or employee number."

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RELATED REFERENCES

1. DOE/EH0256T Article 722

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 722.3

"Routine and special records related to radiation doses shall be retained for each person monitored. This shall include records of zero dose. Procedures, data and supporting information needed to reconfirm a person's dose at a later date should be maintained."

RELATED REFERENCES

1. DOE/EH0256T Article 722

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 722.4

"External dose records should include the following:

- a. Extremity, skin, eye and whole body dose results measured with personnel dosimeters, including all multiple dosimeter badging results.
- b. Evaluations resulting from anomalous dose results such as unexpected high or low doses.
- c. Dose reconstructions from lost or damaged dosimeters, or for unbadged workers.
- d. Evaluations of nonuniform radiation doses."

RELATED REFERENCES

1. DOE/EH0256T Article 722

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 722.5

"Internal dose records should include the following:

- a. Whole body and lung counting results (including chest wall thickness measurements where applicable);
- b. Urine, fecal and specimen analyses;
- c. Dose assessment, as required."

RELATED REFERENCES

1. DOE/EH0256T Article 722

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 722.7

"Records of authorization to exceed Administrative Control Levels shall be retained."

RELATED REFERENCES

1. DOE/EH0256T Article 722

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.12

"PERFORMANCE OBJECTIVE: Records related to occupational radiation exposure should be maintained in a manner that permits easy retrievability, allows trend analysis, and aids in the protection of an individual and control of radiation exposure."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.12.2

"*2. Records related to occupational radiation exposure are adequate to demonstrate compliance with DOE 5480.1B, Chapter XI to meet the reporting requirements of DOE 5484.1A for employees and visitors, and the records retention requirements of DOE 1324-2."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.m(2)(a)

"Internal Exposure.

- 1 Annual effective dose equivalent received during the year from radioactive material deposited in the body;**
- 2 Annual dose equivalent to organ or tissue of concern received during the year from radioactive material deposited in the body;**
- 3 Committed effective dose equivalent from intakes occurring during the year;**
- 4 Committed dose equivalent to organ or tissue of concern from intakes occurring during the year."**

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.m(2)(b)

"External Exposure.

- 1 Annual effective dose equivalent from external sources of radiation received during the year.**
- 2 Annual dose equivalent to the lens of the eye.**
- 3 Annual dose equivalent to the skin.**
- 4 Annual dose equivalent to the extremities received during the year, including: (1) hands and forearm below the elbow and (2) feet and legs below the knee."**

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.m(2)(c)

"Summation of Internal and External Dose Equivalents.

- 1 Summation of the annual effective dose equivalents received from external and internal sources during the year.**
- 2 Cumulative annual effective dose equivalent received from external and internal sources while employed at the facility, since the effective date of this Order."**

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.m(2)(d)

"Programs to Determine Individual Exposures. Data necessary to support or re-calculate doses at a later date shall be maintained pursuant to Section 4 of ANSI N13.6-1972."

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11.11.2

Personnel Previous Exposure Records

This element addresses requirements relating to the collection and maintenance of previous exposure records for personnel working at the facility. Because facilities are required to evaluate previous exposures when determining appropriate future exposures, these requirements are an important part of the overall facility exposure control program.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 721

"Employee Records

Employment History

Records detailing an employee's preemployment and employment history and the associated radiation dose shall be maintained. Where practical, the association between the radiation dose and job function should be preserved for trending purposes and future worker health studies. The following information should be maintained:

1. Previous work history detailing radiological work assignments, to the extent practical, and yearly doses at other DOE and non-DOE facilities.
2. Nuclear Regulatory Commission Form 4 or equivalent that documents previous occupational radiation doses.
3. Ongoing work history documenting work assignments and radiation doses; the facility and occupational codes defined in DOE 5484.1 should be used for this process.
4. When issued, DOE standardized forms to document previous and ongoing radiation doses."

RELATED REFERENCES

1. DOE/EH0256T Article 721

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE DOSIMETRY.11

"11. Personnel exposure histories are readily available to those who are responsible for exposure control (e.g., radiation protection and operational supervisors)."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.m(2)

"Individual Occupational Dose Records. Individual occupational internal and external dose records and records of the programs used to assess individual doses shall be generated and maintained sufficient to provide appropriate reports to the employee, management, and those required by DOE 5484.1. Efforts should be made to obtain records of occupational exposure received prior to employment at the site. Records should be readily available for all current employees."

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11.11.3

Personnel Exposure Reports

This element addresses requirements for reporting exposures received at the facility to personnel after they have entered or worked at that facility. Reporting requirements interface with exposure records requirements as the facility must maintain accurate and complete exposure records in order to comply with requirements for reporting exposures.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 781

**"Radiological Reporting
Reports to Individuals**

Personnel who are monitored by the personnel dosimetry program shall be provided an annual report of their dose. This requirement does not apply to visitors covered by Article 732. Upon request, a person should receive a current radiation dose record. Terminating employees shall be provided a report, within 90 days of the last day of employment, that summarizes radiation dose for the total period of employment at the reporting facility."

RELATED REFERENCES

1. DOE/EH0256T Article 781

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 782

"Annual Radiation Report

DOE 5484.1 provides reporting requirements for the "Annual Radiation Dose Summary." This report includes internal and external radiation dose results for monitored DOE and DOE contractor employees, and for monitored visitors."

RELATED REFERENCES

1. DOE/EH0256T Article 782

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.12.6

" 6. Employees are provided with an annual report of their occupational exposure history."

**SITE REQUIREMENT SOURCE: DOE/EH0135 RP.5 ROUTINE
DOSIMETRY.17**

"17. Records of personnel exposures and methods of determining exposures at the site are permanently maintained and retrievable."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.n

"Reports to Employees. Records of exposure should be made available to all occupational workers on an individual basis and should be provided to terminated employees as soon as the data is available but within 90 days of

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termination. A summary of annual, cumulative, and committed effective dose equivalent shall be provided to each radiation worker on an annual basis. The cumulative effective dose equivalent is the sum of the annual effective dose equivalents recorded for each year of employment since the effective date of the Order. Detailed information concerning a worker's exposure shall be made available to the worker upon the request of the worker, consistent with the provisions of the Privacy Act (5 USC 552a)."

SITE REQUIREMENT SOURCE: DOE5484.1 Chapter IV, Section 3.c

"Report of Radiation Exposures to Headquarters Employees. Report all recorded external and internal radiation exposures that occur during a visit by Department of Energy Headquarters employees to a field element or contractor facility. Complete appropriate portions of DOE F 5484.8, and submit it to the System Safety Development Center (SSDC), EG&G Idaho, Inc., within 30 days after the individuals's date of visit or within 30 days after his or her exposure has been determined, whichever is later. "

11.11.4

Visitor Exposure Records and Reports

This element addresses requirements relating to the maintenance of exposure records for visitors to the facility and for reporting visitor exposures to groups, agencies and individuals.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 731

"Visitors

Record Requirements

For visitors entering an area where radiation monitoring is required, the following records shall be maintained:

1. Documentation of completion of Radiological Orientation.
2. Radiation dose records, including zero dose."

RELATED REFERENCES

1. DOE/EH0256T Article 731

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 732

"Reports

All non-zero radiation doses shall be reported within 30 days of the dose determination, but no later than 90 days after the end of the visit, to each visitor who received a dose. It is desirable that all visitors who receive zero dose also be provided a report. Zero dose reports shall be provided to those visitors who request a report."

RELATED REFERENCES

1. DOE/EH0256T Article 732

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SITE REQUIREMENT SOURCE: DOE/EH0135 RP.12.2

"*2. Records related to occupational radiation exposure are adequate to demonstrate compliance with DOE 5480.1B, Chapter XI to meet the reporting requirements of DOE 5484.1A for employees and visitors, and the records retention requirements of DOE 1324-2."

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.12.3

"*3. Visitors are provided information with respect to their exposure in accordance with DOE 5484.1."

SITE REQUIREMENT SOURCE: DOE5484.1 Chapter IV, Section 3.d(1),(2)

"Report of Radiation Exposures to Visitors.

- (1) Report all positive external and internal radiation exposures recorded for visitors during the period of their visit to a Department of Energy or contractor facility. Complete the appropriate portions of DOE F 5484.8 and submit copies of these reports to the visitor's employer (or to the visitor if he or she has no employer) within a period of 30 days after the date of the visit or within 30 days after the visitor's exposure has been determined, whichever is later. For visitors who are employees of the Department of Energy or Department of Energy contractors, a report should be submitted only to the visitor's employer.**
- (2) Any radiation exposure in excess of the radiation dose equivalent standards established by DOE 5480.1B, Chapter XI, shall be reported within 24 hours after the exposure or within 24 hours after the exposure has been determined, whichever is later, to the visitor and his employer by telephone or teletype message. If the initial report is made by telephone, a written report shall follow within 30 days. "**

11.11.5

Reports of Personnel Exposure Events

This element addresses requirements relating to the reporting of exposures received as part of an event/occupance. These requirements are specific to events which involve significant exposures (normally in excess of allowable levels). These requirements are in addition to requirements for reporting and documenting Occurrences/Events which are contained in Section 11.10, Occurrences and Investigations.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 723.1

"Other Personnel Radiological Records

The complete records of radiological incidents and occurrences involving personnel dose shall be retained."

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RELATED REFERENCES

1. DOE/EH0256T Article 723

SITE REQUIREMENT SOURCE: DOE5484.1 Chapter II, Section 1.e(4)

"All radiation exposures of individuals which in one calendar quarter exceed the following shall be reported by memo to the Operational and Environmental Safety Division:

- (a) 3 rem to whole body.
- (b) 5 rem to skin of whole body or thyroid.
- (c) 10 rem to forearms.
- (d) 25 rem to hands or feet."

11.11.6

Survey Records/Radiological Work Control Records

This element includes requirements relating to monitoring and/or surveys of radiation (including contamination, airborne radiation, etc.). These requirements ensure that the facility can demonstrate that appropriate monitoring has been performed to comply with the requirements of Section 11.2, Facility Monitoring and Surveys. Additionally, the requirements in this element address records to demonstrate that areas which are radiologically protected have been appropriately controlled to protect workers and to maintain exposures ALARA.

SITE REQUIREMENT SOURCE: ANSI-N13.6-1966 Section 5.6

"Airborne Radioactive Material Monitoring Records The records of analyses of airborne radioactive material should include:

- (1) Period (date and time) of sampling
- (2) General location of the air-sampling station, i.e., building and room
- (3) Specific location where the air sample was collected
- (4) Purpose of sample collected, e.g., routine air sampling or air sample for special evaluation
- (5) Type of sample collection equipment used, e.g., filter, impactor, or evacuated ionization chamber
- (6) Collection efficiency of sampling system
- (7) Flow rate, duration of sampling, and total volume of air sampled
- (8) Identification of sample analysis equipment used
- (9) Counting data; background, source count, gross count, net count, counting time
- (10) Reference to calculated correction factors, e.g., back scatter, self absorption and efficiency of analytical equipment
- (11) Calculated airborne radioactive material concentration
- (12) Identity of the air contaminant, if determined
- (13) Identification of the individual performing the analysis
- (14) Type of instrument, e.g., fixed filter or moving tape

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- (15) Tape and chart speed
- (16) Identity of scale or range of operation
- (17) Specific calibration and relationship between the chart divisions and the concentration of the airborne radioactive material depending on the tape speed and flow rate of moving filter unit, or the flow rate of a fixed filter unit.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 741

"Radiological Control Procedures

Policies, Procedures and Radiological Work Permits

Records of the Radiological Control Program should consist of policy statements, procedures, Radiological Work Permits and supporting data. The records should be maintained in a chronological sequence that will allow correlation with the corresponding support information. For example, procedures for performing radiation surveys should be identifiable with the survey results. Completed Radiological Work Permits should be maintained."

RELATED REFERENCES

- 1. DOE/EH0256T Article 741

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 751

"Radiological Surveys
Requirements

Radiological Control Programs require the performance of radiation, airborne radioactivity and contamination surveys to determine existing conditions in a given location. Maps with sufficient detail to permit identification of original survey and sampling locations should be maintained. Records should contain sufficient detail to be meaningful even after the originator is no longer available. Radiological surveys should be recorded on appropriate standard forms and include the following common elements:

- 1. Date, time and purpose of the survey.
- 2. General and specific location of the survey.
- 3. Name and signature of the surveyor and analyst.
- 4. Pertinent information needed to interpret the survey results.
- 5. Reference to a specific Radiological Work Permit if the survey is performed to support the permit."

RELATED REFERENCES

- 1. DOE/EH0256T Article 751

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 752

"Radiation Surveys

In addition to the elements provided in Article 751, records of radiation surveys shall include, at a minimum, the following information:

- 1. Instrument model and serial number.
- 2. Results of the measurements of area dose rates."

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RELATED REFERENCES

1. DOE/EH0256T Article 752

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 753

"Airborne Radioactivity

In addition to the elements provided in Article 751, records of airborne radioactivity shall include, at a minimum, the following information:

1. Model and serial number of the sampler and laboratory counting instrument; locations of fixed samplers may be used as identifiers where model and serial numbers are not available.
2. Air concentrations in general airborne areas and breathing zones.
3. Supporting parameters, including collection efficiency, flow rate, duration of sampling, correction factors and filter medium."

RELATED REFERENCES

1. DOE/EH0256T Article 753

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 754

"Contamination Surveys

In addition to the elements required by Article 751, records of contamination surveys shall include, at a minimum, the following information:

1. Model and serial number of counting equipment.
2. Contamination levels (using appropriate units) and supporting parameters including counting efficiency, counting time, correction factors, type of radiation and whether the contamination was fixed or removable.
3. Location of areas found to contain hot particles or high concentrations of localized contamination.
4. Follow-up survey results for decontamination processes cross-referenced to the original survey."

RELATED REFERENCES

1. DOE/EH0256T Article 754

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.m(3)

"Monitoring and Area Control Records. Records that establish the conditions under which individuals were exposed, such as facility radiological conditions (as generated by the monitoring programs) and surveys for the release of personal property and workplace surfaces, shall be kept to provide a chronological, historical record pursuant to Section 5 of ANSI N13.6-1972."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.m(4)

"Monitoring Methods Records. Records shall be kept to document the appropriateness, quality, and accuracy of monitoring methods, techniques, and procedures in use during any given period pursuant to Section 6 of

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ANSI N13.6-1972. Changes in equipment techniques, and procedures are to be documented and the documents maintained."

11.11.7

Material and Equipment Release Records

This element includes requirements related to records of surveys performed in conjunction with the release of equipment and material. These records are maintained to demonstrate compliance with the requirements for release of material and equipment contained in Section 11.6, Radioactive Materials Management.

FACILITY REQUIREMENT SOURCE: DOE5400.5 Chapter II, Section 5.c, Item (5), a-f

"The records of released property shall include:

- (a) A description or identification of the property;
- (b) The date of the last radiation survey;
- (c) The identity of the organization and the individual who performed the monitoring operation;
- (d) The type and identification number of monitoring instruments;
- (e) The results of the monitoring operation; and
- (f) The identity of the recipient of the released material."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.i(4)

"The records for release of potentially contaminated material and equipment shall describe the property, the date of the last monitoring operation, the identity of the individual who performed the monitoring operation, the type and identification number of the monitoring instrument used, and the results of the monitoring operation."

11.11.8

ALARA Review/Program Records

This element addresses the requirements related to records of the ALARA reviews and ALARA program activities. These records document demonstrated compliance with the requirements included in Section 11.9, Exposure Reduction and ALARA.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 742

"ALARA Records

Records of As-Low-As-Reasonably-Achievable (ALARA) plans and goals shall be maintained to demonstrate the adequacy of the ALARA Program. These records should include the minutes of ALARA committees and other committees where radiological safety issues are formally discussed."

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RELATED REFERENCES

1. DOE/EH0256T Article 742

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.12.7

" 7. Records are used to determine if ALARA programs are being effective to reduce radiation exposures."

SITE REQUIREMENT SOURCE: DOE5480.11 Section 9.m(1)

"ALARA. Records of ALARA programs shall be maintained by field organizations and operating contractors to demonstrate the adequacy of the ALARA plans and programs and their implementation."

SITE REQUIREMENT SOURCE: INPO-88-010 Chapter V, Section C.4

"Records that document the important activities associated with this chapter should be maintained in a retrievable, legible form. Examples of such records include the following:

- pre-job exposure reduction reviews and planning sheets
- post-job exposure reduction reviews"

11.11.9

Radiation Protection Equipment Records

This element addresses requirements related to the maintenance of records for Radiation Protection Equipment. Records for radiation protection equipment are maintained to demonstrate that the equipment has been properly calibrated and maintained and to provide confidence in the accuracy of the data obtained using that equipment.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 761.1

"Instrumentation and Calibration Records

Calibration and Operational Checks

Records of calibration and periodic operational checks of fixed, portable and laboratory radiation measuring equipment shall be maintained and include frequencies, method, dates, personnel, training and traceability of calibration sources to National Institute of Science and Technology or other acceptable standards."

RELATED REFERENCES

1. DOE/EH0256T Article 761

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 761.2

"Calibration records should be maintained for the following equipment:

- a. Portable survey instruments;
- b. Bioassay measurement equipment;

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- c. Laboratory, counting room and fixed radiation measuring equipment;
- d. Process and effluent monitors and sampling equipment;
- e. Radiation area monitors;
- f. Portal monitors and other personnel contamination monitors;
- g. Pocket and electronic dosimeters;
- h. Air sampling equipment;
- i. Tool and waste monitoring equipment;
- j. Protective clothing and equipment monitors."

RELATED REFERENCES

- 1. DOE/EH0256T Article 761

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 761.3

"Maintenance histories, including the nature of any defects and corrective actions taken, and calibration results for each instrument should be created and retained."

RELATED REFERENCES

- 1. DOE/EH0256T Article 761

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 762

"Special Calibration Records

Records of additional tests and checks of instrumentation used in conjunction with a suspected overexposure, questionable indication or unusual occurrence should be retained. In addition, records of special instrument calibrations and modifications made in accordance with Article 562.6 should be retained."

RELATED REFERENCES

- 1. DOE/EH0256T Article 762

11.11.10

Training and Qualification Records

This element addresses the requirements for documenting training and qualification within the Radiation Protection functional area. It does not include those requirements which are general to all personnel at the facility or which are required under the Training functional area.

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 725.1

"Radiological Training and Qualification Records

Records of training and qualification in radiological control shall be maintained to demonstrate that a person received appropriate information to perform the work assignment in a safe manner. Qualification standard records shall be retained for on-the-job and practical factor training as well as for formal classroom training."

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RELATED REFERENCES

1. DOE/EH0256T Article 725

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 725.2

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

RELATED REFERENCES

1. DOE/EH0256T Article 725

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 725.3

"Personnel training records shall be controlled and retained. At a minimum, these records shall include the following:

- a. Course title;
- b. Attendance sheets with instructor's name;
- c. Employee's name, identification number and signature;
- d. Date of training;
- e. Identification of the examination or evaluation form, including sufficient data to identify which test each person completed;
- f. Verification document or record confirming satisfaction of the training requirement;
- g. Documentation related to exceptions for training requirements and extensions of qualification;
- h. Quizzes, tests, responses and acknowledgements of training, with the date and signature of the person trained;
- i. Special instructions to females, their supervisors and coworkers concerning prenatal radiation dose, acknowledged by the worker's signature."

RELATED REFERENCES

1. DOE/EH0256T Article 725

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 725.4

"Records shall be retained for the following types of training:

- a. General employee radiological training;
- b. Radiological Worker training;
- c. Periodic retraining;
- d. Respiratory protection training;
- e. Training of radiological control personnel;
- f. Instructor training;
- g. Qualifications for special tests or operations;
- h. Orientation and training of visitors;
- i. Training of emergency response personnel."

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RELATED REFERENCES

1. DOE/EH0256T Article 725

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 725.5

"The following instructional materials shall be maintained:

- a. Course name, with revision and approval date;
- b. Instructor's manuals, course content, or lesson plans containing topical outlines;
- c. Video and audio instructional materials, including the dates and lessons for which they were used;
- d. Handouts or other materials retained with the master copy of the course;
- e. Job-specific training documents, such as instrument use, radiological procedures, Radiological Work Permit special training requirements, pre-job briefings and mock-up training."

RELATED REFERENCES

1. DOE/EH0256T Article 725

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 725.6

"Documentation of training and qualification received at another DOE location need not be duplicated. Such records should be provided to the person's home office for retention."

RELATED REFERENCES

1. DOE/EH0256T Article 725

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.2
ACCIDENTS/INCIDENTS.10

"10. Training of workers is documented for the high-risk jobs to promote a safety awareness attitude."

11.11.11

Misc. Radiation Protection Records

This element includes requirements for maintenance of misc. types of records which are covered in other functional areas (e.g., quality assurance, health and safety, etc.) but which include specific requirements relating to the Radiation Protection functional area. It also includes requirements for maintenance of Radiation Protection program records that are misc. in nature (e.g., documentation of employee concerns).

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 722.6

"Counseling of persons about radiological concerns should be documented and this documentation retained. It is desirable that the counseled person sign the documentation to acknowledge participation."

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RELATED REFERENCES

1. DOE/EH0256T Article 722

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 723.2

"Records of employee radiological safety concerns that have been formally investigated and documented should be maintained."

RELATED REFERENCES

1. DOE/EH0256T Article 723

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 724.1

"Medical Records
Preemployment medical records, if available, and reports of periodic medical examinations should be maintained."

RELATED REFERENCES

1. DOE/EH0256T Article 724

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 724.2

"Physical examination reports and fit testing results for respirator use should be maintained for respirator users."

RELATED REFERENCES

1. DOE/EH0256T Article 724

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 724.3

"Medical evaluations and treatment performed in support of the radiological program should be documented."

RELATED REFERENCES

1. DOE/EH0256T Article 724

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 724.4

"Maintenance of records of nonoccupational radiation doses, such as therapeutic or large amounts of diagnostic radiation doses for medical purposes, is encouraged. Where practical, maintenance of records of preemployment nonoccupational radiation doses is encouraged."

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RELATED REFERENCES

1. DOE/EH0256T Article 724

SITE REQUIREMENT SOURCE: DOE-N5480.6 Section 743

"Quality Assurance Records

Records of quality assurance reviews and audits developed for Radiological Control functions shall be retained to ensure that sufficient records are specified, prepared, reviewed, approved and maintained to accurately reflect completed work. DOE 5700.6C provides additional information regarding quality assurance records."

RELATED REFERENCES

1. DOE/EH0256T Article 743

SITE REQUIREMENT SOURCE: DOE/EH0135 RP.1.10

"10. Auditable reports of inspections, audits, and resulting corrective actions taken, are maintained."

11.12

Key Interfaces

To the extent practicable, all functional areas should consider their potential interface to Radiation Protection to ensure that plans and activities are reviewed based on the ALARA principle, and that potential releases to the environment are considered when radioactive materials are handled. Specific interface areas which have been identified are included as sub-elements.

11.12.1

Management Systems

An interface to Management Systems is needed to ensure that a commitment to radiation protection and ALARA is incorporated into every aspect of operations at the highest management level.

11.12.2

Quality Assurance

An interface to the Quality Assurance Functional Area is needed to ensure that all requirements for the radiation protection of the workers and the general public and all reporting requirements are properly incorporated into operations.

11.12.3

Configuration Management

Activities in the Configuration Management Functional Area must interface to the RP Functional Area to ensure that current radiation protection systems are not compromised by modifications, and that new activities receive the proper review in case new systems are needed.

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11.12.4

Training and Qualifications

An interface to Training and Qualifications is necessary to ensure that the specific RP training requirements are included in the worker training profiles.

11.12.5

Emergency Planning

Because of the potential for emergency situations involving radioactive material and potential exposure of emergency response personnel, an interface to Emergency Planning is required.

11.12.6

Engineering Program

The Engineering Program should ensure that an ALARA interface is defined and established for the routine review of new construction and modifications.

This review should include a cost/benefit analysis for radiation exposure reduction features beyond those required by regulatory exposure limits.

11.12.7

Operations

An interface to the Operations Functional Area is needed to ensure that radiation protection and the ALARA principle is incorporated into daily exercise.

11.12.8

Maintenance

An interface with the Maintenance Functional Area is needed because the monitoring systems used for radiation protection must have a maintenance plan, and because other areas of maintenance must be aware of potential radiation hazards.

11.12.9

Packaging and Transportation

Physical management of radioactive materials requires an interface to the Packaging and Transportation Functional Area to ensure proper labeling, packaging and transportation of those materials.

11.12.10

Research and Development and Experimental Activities

The Research and Development Functional Area must interface to the RP Functional Area so that current or proposed experimental activities are conducted within personnel radiation protection guidelines and environmental protection standards.

11.12.11

Nuclear Safety

Because of the Nuclear Safety Functional Area encompasses the operation of nuclear facilities from design through decommissioning, it should interface with

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the RP Functional Area to ensure that radiation protection standards are incorporated into the nuclear safety program.

11.12.12

Environmental Protection

Because of the requirements for limiting release of radioactive materials to the environment, the RP Functional Area should interface to the Environmental Protection Functional Area to ensure a consistent approach to application of environmental protection requirements.

WESTINGHOUSE HANFORD COMPANY

REQUIREMENTS

IDENTIFICATION

DOCUMENT

FACILITY:

HIGH LEVEL WASTE STORAGE
TANK FARMS/242-A
EVAPORATOR

FUNCTIONAL AREA:

Operations

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9.0 OPERATIONS

INTRODUCTION

SCOPE

The Operations Functional Area encompasses all aspects of site and facility operations as detailed in DOE Order 5480.19, Conduct of Operations for DOE Facilities. The functional area does not deal directly with the technical details and requirements of operations, but rather sets standards for a consistent approach to disciplined and safe operations. The requirements established by DOE Order 5480.19 are equivalent to and firmly based on industry standards. Many sections of the Order are verbatim excerpts from the Institute of Nuclear Power Operations (INPO), "Guidelines for the Conduct of Operations at Nuclear Power Stations."

This Requirements Identification Document (RID) describes an operations program for the Tank Farms Facility as defined through the application of relevant DOE Orders, regulations, industry codes and standards, industry guidance documents, and as appropriate, good industry practices. The definition of a program as specified by this document is intended to address Defense Nuclear Facilities Safety Board Recommendations 90-2 and 91-1, which call for the strengthening of DOE facility activities through the identification and application of relevant standards which supplement or exceed requirements mandated by DOE Orders.

This RID includes those functional area elements/sub-elements and requirements necessary to maintain an operation that minimizes the risk to personnel, the facility, and the environment while maintaining safe, efficient, and productive operation. The specific focus of this RID is the identification of the regulatory requirements and the industry standards relevant to the activities typically performed at the Tank Farms. It should be recognized that the requirements identified in this RID are not equally applicable throughout the Tank Farms facility because of the unique physical arrangement, level of activity and mission in different areas of the facility, and the diverse nature of the activities carried out. For example, the requirements relating to Control Area Activities will be applicable only at the 242A Evaporator control room and not at individual equipment operating stations throughout the facility, such as those in the various compressor and instrument buildings. The latter are not continuously manned and are not considered to be control areas. The 242-A Evaporator control room is a control area, but is a control area only for the evaporator itself; other widely distributed facility operations such as sampling and pumping tanks are controlled from the Shift Manager's office which is an administrative office area. Actual tank operations are performed locally at the individual tank valves and at local motor control centers.

This RID applies to the activities, personnel, structures, systems, components, and programs involved in operating the facility and executing the mission of the Tank Farms. The physical boundaries within which the requirements of this RID apply are the Single Shell Tank Farms, Double Shell Tank Farms, 242-A Evaporator-Crystallizer, 242-S,T Evaporators, Liquid Effluent Retention Facility (LERF), Purgewater Storage Facility (PWSF), and all interconnecting piping, valves, instrumentation, and controls. Also included is all piping, valves, instrumentation, and controls up to and including the most remote valve under Tank Farms control at any other Hanford Facility having an interconnection with Tank Farms. The boundary of the structures, systems, components, and programs to which this RID applies, is defined by those that are dedicated

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to and/or under the control of the Tank Farms Operations Department and are specifically implemented at the Tank Farms.

This Functional Area impacts all aspects of operating a site or facility. The technical aspects of the operations are addressed in other functional areas; for example, the maintenance DOE Order 4330.4A addresses the specifics for the Maintenance Functional Area; however, the principles and discipline of this Operations Functional Area are directly applicable to the conduct of maintenance. This applies to all aspects of operations, such as training. The Operations Functional Area uses the chapter structure of DOE Order 5480.19 to identify the following elements:

1. Operations Organization and Administration
2. Shift Routines and Operating Practices
3. Control Station Activities
4. Audible Communications
5. Control of On-The-Job Training
6. Investigation of Abnormal Events
7. Notifications
8. Control of Equipment and System Status
9. Lockouts and Tagouts
10. Independent Verification
11. Log Keeping
12. Operations Shift Turnover
13. Operations Aspect of Facility Chemistry and Unique Processes 14.
Required Reading
15. Timely Orders to Operations
16. Operations Procedures
17. Operator Aid Postings
18. Equipment and Piping Labeling

Requirements that apply to Operations organization and administration in general may be found in the Management/Administration area of the Management Systems RID. Requirements that are applicable only to the Tank Farms Operations area or statements relative to non-applicability of general requirements are found in this RID.

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9.1

PROGRAM MANAGEMENT

The organization and administration of the Tank Farms Operations Department should ensure that a high level of performance in Operations is achieved through effective implementation and control of Operations activities. Operations management philosophy, policies, procedures, and activities should recognize that safety, environmental protection, and productivity are compatible goals. Policies describe the philosophy of standards of excellence under which the facility is operated. Clear lines of responsibility for normal and emergency conditions should be established. Effective implementation and control of operating activities may be achieved by establishing written standards for Operations, periodically monitoring and assessing performance, and holding personnel accountable for their performance. This element includes the policies, resources, monitoring, and accountability needed in Tank Farms Operations. INPO 84-021 (Good Practice OP-204), Conduct of Operations, is an example program that can be of assistance in implementing the intent of some of the guidelines of this element.

Requirements for operations organization and administration may be found in the Management/Administration section of the Management Systems RID.

9.1.1

Operations Organization Policies

Tank Farms operations management should communicate a firm commitment to the safety, health, and general welfare of employees and the general public and the protection of the surrounding environment through the development, distribution, and implementation of formal policy statements. These policy statements should describe the philosophy and standards of excellence under which operations activities are conducted.

The requirements relative to operations organization and policies can be found in the Management/Administration Functional Area of the Management Systems RID.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter I, Section C.1

"Procedures or other definitive documentation should specify policies that are to be applied for operations. These documents should also provide for the types of controls necessary to implement policies as discussed in this and other chapters of the guidelines. Operations procedures should support facility and DOE guidance for operations. Responsibilities for implementing these policies, including the responsibility of shift personnel, if applicable, should be clearly defined. Operations personnel should clearly understand their authority, responsibility, accountability, and interfaces with other groups. Physical security should be in accordance with DOE 5630.11."

SITE REQUIREMENT SOURCE: DOE5480.19 Section 4

"It is the policy of the Department that the conduct of Operations at DOE

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facilities be managed with a consistent and auditable set of requirements, standards, and responsibilities and that, consistent with the requirement of this Order:

- a. Operations at DOE facilities be managed, organized, and conducted in a manner to assure an acceptable level of safety;
- b. Operators at DOE facilities have procedures in place to control the conduct of their operations;
- c. Line organizations review existing and planned programs important to safe and reliable facility operations; and
- d. Line organizations assess the effectiveness of corporate directives, plans, or procedures at facilities under their cognizance."

SITE REQUIREMENT SOURCE: DOE5480.19 Section 5.a

"Each DOE contractor shall use this Order and Attachment I in the review and development of existing and proposed directives, plans, or procedures relating to the conduct of operations at DOE facilities."

SITE REQUIREMENT SOURCE: DOE5480.19 Section 5.b

"A graded approach shall be used in the application of the guidelines provided in Attachment I to assure that the depth of detail required and the magnitude of resources expended for operations are commensurate with each facility's programmatic importance and potential environmental, safety, and/or health impact."

SITE REQUIREMENT SOURCE: DOE5480.19 Section 5.c

"Conformance with the requirements of the Order shall be documented. However, it is not necessary to develop a separate manual or plan. As a minimum, a document (e.g., a matrix) shall be prepared in coordination with the Head of the Field Element and the cognizant Program Secretarial Official(s) that:

- (1) Indicates whether a specific guideline applies to a facility;
- (2) Indicated where and how each of the guidelines (Attachment I) of this Order are applied within the contractor's existing policies and procedures; and
- (3) Identifies any deviations or exemptions from the guidelines.

This document shall, as a minimum, be approved by the Head of the Field Element."

9.1.2

Resources

The Tank Farms Operations Department should be staffed by a team of highly qualified and experienced personnel to achieve safe, reliable, and efficient operations. A long range staffing plan should be developed to ensure continuation of required staffing levels. Additionally, material resources should be provided to ensure safe, reliable, and efficient operations.

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Requirements relative to Operations organization resources may be found in the Management/Administration Section of the Management Systems RID.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter I, Section C.2

"The Operations supervisor for DOE facilities should be provided with sufficient resources in materials and personnel to accomplish assigned tasks without requiring excessive overtime by the operations staff. These resources should include technical personnel needed to support the operations. A long-range staffing plan that anticipates personnel losses should be developed and implemented."

SITE REQUIREMENT SOURCE: DOE5480.20 Chapter I, Section 15

"LIMITATIONS FOR OVERTIME WORKED. Administrative procedures shall be developed and implemented to limit the working hours of operating organization personnel who perform safety-related functions (e.g., certified operators and supervisors, non-certified supervisors, radiation protection technicians, chemistry technicians, qualified operators, and maintenance craftpersons and supervisors, both facility force and construction).

- a. Adequate shift coverage shall be maintained without heavy use of overtime. However, in the event that unforeseen problems require substantial amounts of overtime to be used (such as during extended shutdown periods for refueling, major maintenance, major facility modifications, technical problems, or weather related occurrences), the following requirements shall be applied on a temporary basis:
 - (1) A person shall not be permitted to work more than 16 consecutive hours, excluding shift turnover time;
 - (2) A person shall not be permitted to work more than 24 hours in any 48 hour period, excluding shift turnover time;
 - (3) A person shall not be permitted to work more than 72 hours in any 7-day period, excluding shift turnover time;
 - (4) A person shall not be permitted to work more than 14 consecutive days without having two consecutive days off; and
 - (5) Except during extended shutdown periods, brief pre- or post-shift training sessions, or weather-related occurrences, the use of overtime shall be considered on an individual basis and not for the entire shift crew.
- b. Any deviation from the overtime requirements shall be authorized on a case-by-case basis in advance by the Plant/Facility Manager or his or her designee in accordance with established procedures and with documentation of the basis for granting the deviation. Individual overtime shall be reviewed monthly by the Plant/Facility Manager or his or her designee to assure that excessive hours have not been worked.

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- c. If a person is required to work in excess of 12 continuous hours, his or her duties should be carefully selected. It is preferable that this person not be assigned any task that could possibly endanger the safe operation of the facility."

FACILITY REQUIREMENT SOURCE: DOE5480.20 Chapter IV, Section 4

"The operating organization shall ensure that minimum staffing requirements are met for safe and reliable operations. Any temporary deviation from these requirements must be justified by facility-specific analysis and approved by the Head of the Field Organization.

- a. Overall staffing shall be based on the facility Safety Analysis Report and Operational Safety Requirements. Facility operation shall be contingent upon meeting the criteria contained in these documents.
- b. A list of facility personnel by name, title, and work and home telephone numbers shall be readily available in the control room or other appropriate central location within the facility for use by the operating crew. The list shall include:
 - (1) Management personnel;
 - (2) Radiation safety personnel; and
 - (3) Technical support personnel."

9.1.3

Monitoring of Operating Performance

Performance monitoring of Tank Farms operations personnel through frequent direct observations by supervisors and managers is essential to performance improvement. Operating problems should be documented, evaluated, and corrective actions implemented to improve performance. Performance goals should be established and performance indicators used as a management tool for improving performance and for measuring operating effectiveness. These goals should be measurable, realistic, challenging, and auditable. Goals should consider and include applicable environmental issues associated with Tank Farms operations.

Requirements relative to monitoring operating performance may be found in the Management/Administration Functional Area, and Corrective Action Management elements of the Management Systems RID; the Quality RID; and the Self Assessment RID.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter I, Section C.3, Paragraph 1

"Operating problems should be documented and evaluated. Based on assessments of these problems, corrective actions should be taken to improve the performance of operations department performance. Additionally, frequent

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direct observation of operations activities by supervisors and managers is essential to performance of monitoring operations."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter I, Section C.3, Paragraph 2

"Safety, Environment, and Operating goals should be used as a management tool for involving cognizant groups or individuals in improving operating performance and for measuring operating effectiveness. Operating goals in areas such as the following should be established:

- minimizing the unavailability of safety systems;
- minimizing personnel errors;
- As-Low-As-Reasonably-Achievable (ALARA);
- minimizing lost facility capability;
- minimizing the number of unscheduled facility shutdowns per year;
- timely completion of scheduled surveillance;
- minimizing the amount of overtime;
- achieving and maintaining complete staffing and training of shift positions; - minimizing waste; and
- minimizing the number of lighted annunciators."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter I, Section C.3, Paragraph 3

"Goals should be auditable, measurable, realistic, and challenging. Meeting goals should require a definite set of actions or an action plan. The action plan should be developed with input from personnel involved in conduct of operations, reviewed by the operations supervisor at DOE facilities, and approved by management. The progress toward completing the action plan and achieving goals should be monitored periodically. If results show a significant variance from the desired progress in achieving goals, management should review the action plan to ensure that it is adequate and is being executed. An audit of performance relative to operating goals should be provided to facility management and DOE. This summary should include an explanation of performance and actions planned to improve future performance."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter I, Section C.3, Paragraph 4

"Operating and safety goals should be set and used as motivators for improvement, not as ends in themselves. The purpose is not simply to meet a numerical goal; rather, the purpose is to improve and monitor operating performance. Meaningless goals (i.e., goals that are easy to meet with little action) should not be used."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter I, Section C.3, Paragraph 5

"Inspections, audits, reviews, investigations, and self-assessment are a part of the checks and balances needed in an operating program. Line managers and

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supervisors should perform routine observations of personnel performing operating activities. Deficiencies identified should be documented, trended, and corrected. Also, other groups, such as Quality Assurance, should periodically review and assess operation performance."

9.1.4

Accountability

Tank Farms operations personnel should be held accountable for their performance through supervisory counseling, performance appraisals and, when necessary, disciplinary measures. Remedial training may be provided when appropriate. Performance appraisals for, and consideration for promotion of supervisory personnel should include an assessment of operating performance.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter I, Section C.4

"Workers and their supervisors should be held accountable for operating performance. Personnel involved in significant or frequent violations of operating practices should be counseled, retrained, and disciplined, as appropriate. Supervisor performance appraisals and promotions should include an assessment of operating performance."

9.1.5

Management Training

Formalized supervisory and management training should be incorporated into plant training programs for Tank Farms operations personnel. This is especially important to the first line supervisors to aid them in managing shift operations.

The requirements relative to management training in operations may be found in the Training and Qualification Functional Area RID.

The requirements relative to management training may be found in the Management/Administration Functional Area RID.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter I, Section C.5

"Formalized supervisory and management training shall be incorporated into training programs. This is especially important to the first-line supervisors on shift and should aid them in managing shift activities."

9.1.6

Planning for Safety

Tank Farms management should develop and implement a program that requires and describes planning requirements for all operations activities. This program should detail the role of safety analysis reviews, job safety analysis, and handling of safety matters. All operations personnel should be knowledgeable of the safety planning requirements.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter I, Section C.6

"Facility guidance should exist which describes safety preplanning requirements for all operational activities. The guidance should explain the role of safety analysis reviews, job safety analyses, and the handling of safety

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matters. All operations personnel should understand the safety planning requirements."

9.2

SHIFT ROUTINES AND OPERATING PRACTICES

Standards for the professional conduct of Operations personnel should be established and followed to ensure operator performance meets the expectations of Tank Farms management and the DOE. All operational activities should be conducted in a precise, formal, and professional manner that achieves safe and reliable operation of all components within the Tank Farm facility. This level of operational excellence operation may be achieved through the development of shift routines and operating practices that are deliberate, uniform and proceduralized. The requirements specified in this element comprise the expectations of Operations personnel relative to shift routines and operating practices. Requirements, routines and practices with a more specific focus are delineated in Section 9.3, Control Station Activities and Section 9.4, Audible Communications.

9.2.1

Status Practices

Operations personnel must continually maintain awareness and control of the status of all Tank Farms facility systems and equipment and should be aware of the effect of non-operational systems and equipment on continued operations. This awareness is maintained through personal observation of equipment, equipment instrumentation and alarms, through timely and accurate logkeeping, and through the reports of status information provided by others in the facility. The operator(s) responsible for the facility should be promptly notified of all changes in facility status, abnormalities, or difficulties encountered in performing assigned tasks. The operator(s) should notify the shift supervisor of unexpected situations. This notification is to ensure that proper attention is given to changing and/or off-normal conditions.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.1

"The operator responsible for the facility should be promptly notified of all changes in facility status, abnormalities, or difficulties encountered in performing assigned tasks. Similarly, the operator should notify the shift supervisor (or cognizant manager for research and test facilities) of any unexpected situations."

9.2.2

Safety Practices

Operations management and personnel shall assume responsibility for conduct of shift activities and functions in a manner which emphasizes overall safety, including awareness of and compliance with the facility industrial safety program. Proper hearing, eye, head, foot, and respiratory protection should be worn in designated areas to reduce the potential for injury. Ladders or other approved means should be used to access equipment located in the overhead when permanent steps or catwalks are not available, thus minimizing the potential for accidents. Personnel should not routinely climb or walk on facility components and insulation, thus minimizing the potential for personnel injury and damage to equipment. Personnel should exercise appropriate precautions when entering or working in or around energized electrical panels or equipment.

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This sub-element provides general requirements for safety practices in Operations. Specific requirements may be found in the Occupational Health and Safety Functional Area RID.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.2

"Operations personnel should adhere to the requirements of the facility industrial safety program. Proper hearing, eye, head, foot, and respiratory protection should be worn in designated areas to reduce the potential for injury. Similarly, ladders or other approved means should be used to access equipment located in the overhead when permanent steps or catwalks are not available, thus minimizing the potential for accidents. Operators should not routinely climb or walk on facility components and insulation, because this could result in personnel injury or damage to equipment. Operators should exercise appropriate precautions when entering or working in or around energized panel or equipment. For example, operators should ensure that electrical panel closures are securely fastened prior to making the breakers operable to energize equipment. This reduces the potential for personnel injury if a fault causes breaker arcing during operation."

9.2.3

Operator Inspection Tours

Operator inspection tours are important in the maintenance of safe plant operations, equipment reliability, operational efficiency and personnel safety. Each operator should conduct a thorough tour of all areas within his/her responsibility, making appropriate equipment inspections at designated times at least once per shift. Operator tours should be of sufficient detail to ensure that the status of equipment is known. The operations supervisor may designate specific areas to be inspected less frequently or more frequently than once per shift. This designation should be based on the degree of risk due to adverse radiological or other industrial safety considerations balanced with known or suspected component and system problems and their potential impact on the operation of the facility.

An inspection tour is normally made early in the shift in order to allow the operator to become familiar with the status of his or her equipment. During the tour, equipment should be inspected to ensure it is operating properly or, in the case of standby equipment, that it is fully operable. Operators should take appropriate action to correct or report deficiencies noted during tours. Equipment deficiencies should also be documented in accordance with the facility maintenance work request system.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.3, Paragraph 1

"Operator tours should be of sufficient detail to ensure that the status of equipment is known. Each operator should conduct a thorough tour of all areas within his/her responsibility, making appropriate equipment inspections at designated times at least once per shift. However, the operations supervisor may designate specific rooms to be inspected less frequently because of adverse radiological or equivalent personnel safety conditions, or more frequently if problems have been encountered. In these cases, the operations supervisor (or cognizant manager for research test facilities) should specify an alternate inspections schedule. Plant security concerns should not

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override operator safety assessment duties. A tour normally should be made early in the shift, before the operator attends to other duties, so that he/she can become familiar with the condition and status of equipment for which he/she is responsible. During the tour, equipment should be inspected to ensure that it is operating properly or, in the case of standby equipment, that it is fully operable."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.3, Paragraph 1, Sentence 8

"In addition, the following activities should be conducted in conjunction with the tour:

- a. The status of equipment (i.e., operating, standby, work in progress, or out-of-service) should be determined so that the operator will be best able to respond to problems he/she may face during his/her shift.
- b. Components, such as electrical panels, alarm panels, auto-start standby equipment, breakers should be inspected for abnormal or unusual

conditions. Unexpected conditions such as equipment vibrations, unusual noises or smells, or excessive temperatures should be reported to the control room so that supervisors will be aware of the conditions and be able to direct repairs, troubleshooting, or additional operator action, as necessary.

- c. Equipment panel alarm light bulbs and annunciators should be periodically checked to ensure satisfactory operation of visual and audible abnormal conditions indicators.
- d. Each operator should inspect all areas for which he/she is responsible and note any deficiencies that may be present. These deficiencies may include steam, oil, or water leaks; fire and safety hazards or radiological problems; seismic concerns such as open electrical panels and mobile objects; clogged floor drains; housekeeping or cleanliness problems; and building deficiencies such as imperative lighting, roof leaks, or doors that do not close properly."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.3, Paragraph 2

"Operators should take appropriate action to correct or report deficiencies noted during tours. Equipment deficiencies should also be documented in accordance with the facility maintenance work request system."

2.2.4

Round/Tour Inspection Sheets

Round inspection sheets are an effective method for providing operators with guidance on the extent to which equipment and areas should be inspected during routine tours. They should be developed and approved by the operations supervisor or higher authority. The round inspection sheets should include guidance for the monitoring of all areas within a particular shift position and for the recording of important parameters for facility equipment. Where appropriate, maximum/minimum values or expected operating ranges of equipment parameters should be included to enable operators to recognize abnormal

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readings quickly. Parameters exceeding the specified maximum/minimum values should be circled or otherwise highlighted by the operator. Safety limits derived from Technical Specifications or Operational Safety Requirements should be highlighted.

A narrative section should be included for operators to document major evolutions, causes of abnormal conditions, and actions taken to correct abnormal conditions. A narrative log book may be substituted for the narrative section on the round inspection sheet. The round inspection sheets should be constructed in a logical order corresponding to a normal tour of the operator's assigned area. Data should be recorded at the times specified or a notation explaining the reason for deviation should be included. Supervisory personnel should review all round inspection sheets each shift to detect trends or abnormal readings and to verify the completeness of the data. Additionally, supervisory personnel should periodically accompany operators on their rounds to ensure that comprehensive tours that satisfy the expectations of Tank Farms management are being conducted.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.4, Paragraph 2

"Round inspection sheets should be developed and approved by the operations supervisor (or cognizant managers for test and research facilities.) They should include areas located within the particular shift position and important parameters for equipment. Where appropriate, equipment parameters should include maximum/minimum values or expected operating ranges to enable operators to recognize abnormal readings quickly. Safety limits derived from Technical Specifications or Operational Safety Requirements should be highlighted. Equipment should be listed on round sheets in the same order that it would be encountered during a normal tour of the operating station, and the round sheets should include a narrative section."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.4, Paragraph 3

"Operators should use the narrative section to document major evolutions, causes of abnormal conditions, and actions taken to correct abnormal conditions. A narrative log book may be substituted for the narrative section on the round sheet. Data should be recorded on round sheets at the times specified by the operations supervisor. When round sheet data is not obtained within one hour of the specified time, the actual time the data was obtained should be noted on the round sheet."

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.4, Paragraph 4

"Parameters exceeding the specified maximum/minimum values should be circled or otherwise highlighted on the round sheet and promptly reported to the control room and/or the cognizant operations manager. The causes of abnormal indications should be promptly investigated with supervisors becoming involved as appropriate. The round sheet data should be reviewed by a supervisor each shift to identify trends or abnormal readings and to verify that data has been properly recorded."

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**SITE REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.4,
Paragraph 5**

"Operator rounds should be periodically monitored by supervisory personnel to ensure that comprehensive tours continue to be conducted, including, as necessary, periodic inspections of equipment and areas not listed on the round sheets."

2.2.5

Personnel Protection

Operations personnel should be appropriately qualified to follow good personnel protection practices. A formal program should exist to maintain personnel exposure as low as reasonably achievable (ALARA) to hazardous materials, including radiation, chemicals, electrical magnetic fields, toxic materials, etc. Tank Farms operations supervisory personnel should periodically review exposure trends of operating personnel under their supervision. The purpose of this review is to identify and minimize adverse factors that contribute to personnel exposures in order to maintain exposures ALARA.

This sub-element provides general requirements for personnel protection in operations at the Tank Farms facility. Specific requirements relative to qualification and protection practices are found in the Training and Qualification Functional Area RID.

**SITE REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.5,
Paragraph 1**

"Operations personnel should be appropriately qualified to follow good personnel protection practices to maintain personnel exposure as low as reasonably achievable (ALARA) to radiation (DOE 5480.11), chemicals, electromagnetic fields, toxic materials, or other personnel hazards. In particular, operations personnel should observe the following requirements:

- a. Operators should adhere to all posted personnel protection requirements and observe proper practices and precautions while in controlled areas.
- b. Operator should correctly utilize appropriate monitoring instruments when required.
- c. Operators should be cognizant of their own exposure levels and take appropriate action to minimize exposures.
- d. Operators should be knowledgeable of the proper use of radiation work permits, safe work permits, or inhalation limits, where applicable.
- e. Operators should promptly report protection deficiencies and hazards to the control personnel and/or appropriate protection personnel. In addition, operators should take appropriate immediate actions to reduce or correct the hazards.
- f. Appropriate protection personnel should be informed prior to evolutions or activities that have a potential to significantly change conditions in the facility."

**SITE REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.5,
Paragraph 2**

"Operations supervisory personnel should periodically review exposure trends of operating personnel under their supervision. Emphasis should be placed on

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determining the adverse factors that contribute to personnel exposures and minimizing those factors to keep exposures as low as reasonable achievable."

2.2.6

Response to Indications

The Tank Farms operations department must establish an operating philosophy, through training and procedural guidance, which emphasizes that operators are to believe their instrument readings and treat them as accurate unless proven otherwise. This operating philosophy will require that, in situations of operator doubt, operators will act to achieve facility, personnel, and environmental safety above facility production. Ignoring an unusual reading because the operator believes an instrument is faulty can cause abnormal conditions to be undetected. Prompt action should be taken to investigate the cause of abnormal or unexpected indications so that prompt corrective action can occur.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.6

"Operators should believe instrument readings and treat them as accurate unless proven otherwise. Ignoring an unusual reading because the operator believes an instrument is faulty can cause abnormal conditions to be undetected. In general, operators should check other indications if possible, when unexpected readings are observed. Prompt action should be taken to investigate the cause of abnormal or unexpected indications so that prompt corrective action can occur. When malfunctioning or inaccurate instruments are discovered, they should be appropriately identified to prevent subsequent confusion and instrument and control personnel should be notified to effect repairs. In situations of operator doubt, operators should be instructed to achieve facility, personnel, and environmental safety above facility production."

2.2.7

Resetting Protective Devices

Tank Farms operations management should develop formal controls to ensure operations personnel are knowledgeable in the proper handling of protective devices such as circuit breakers and fuses. Because the consequences of resetting tripped devices varies widely from component to component, considerable judgement is required in determining when to reset a device. In the case of a tripped device, the operator should attempt to understand the cause of the trip before it is reset. Additionally, the operator should ensure no abnormal condition exists that would preclude reset.

This sub-element provides a general requirement for resetting protective devices in Operations. Specific requirements relative to occurrence reporting if the trip relates to an unplanned event are found in the Occurrence Reporting Functional Area in the Management Systems RID.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.7

"When protective devices trip (e.g., circuit breakers, fuses, reactor protection channels where multichannel logic exists), an attempt should be made to understand the cause of the trip before the device is reset. Normally, before action is taken, an operator should ensure no abnormal condition exists that would preclude reset. However, because the consequences of inappropriately resetting protective devices vary considerably, good

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judgment and specific guidance are necessary in this area. The operations management should provide the appropriate guidance so that tripped protective devices will be properly addressed.

Facility trips and unplanned forced shutdowns require a thorough investigation in accordance with the guidance of Chapter VI."

9.2.8

Load or Process Rate Changes

The shift supervisor and control room lead operator are accountable for safe, reliable, and efficient operation of the Tank Farm facility during their shifts. Additionally, they are the persons most knowledgeable of problems that may occur as a result of the starting, stopping, or changing of process rates in the facility. Therefore Operations management should establish an operating philosophy and administrative controls necessary to ensure that all process rate changes be approved by the shift supervisor or control room lead operator. These controls should recognize that other shift operators are authorized to decrease or terminate processes without approval if necessary to respond to a facility emergency in accordance with facility emergency procedures.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.8

"The shift supervisor, the control room lead operator, or the cognizant manager for a test and research facility should approve all power or process rate changes because these persons are held accountable for safe operation. Additionally, they will probably be the persons most knowledgeable of problem that occur as a result of load changes. However, the operator could decrease load or rate without approval, if necessary, to respond to a facility emergency situation in accordance with the facility's emergency procedures."

9.2.9

Authority to Operate Equipment

Operating policies and procedures should be established to ensure that the overall operation of the Tank Farm facility is directed by the operations supervisor. Controls should be developed to ensure that only properly trained and qualified personnel operate and/or direct the operation of facility equipment. The operator and the shift supervisor should be aware of all activities affecting equipment and systems within the Tank Farms. Support personnel should be made aware of the critical need to obtain operations authorization for all equipment manipulations. Additionally, operations should be kept informed of planned evolutions involving equipment removal/restoration to service. The operations supervisor should establish formal guidance regarding those general activities that may be performed without informing the operator or shift supervisor. All personnel should be trained to place facility safety over production for off normal and emergency conditions. In the event of an emergency, operators may take necessary immediate actions required to ensure personnel, facility, and environmental safety without obtaining prior approval. However, the appropriate supervisor(s) should be informed as soon as possible of the actions taken.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.9

"Operations management should ensure that only trained and qualified personnel operate plant equipment. In general, the operator and the operations supervisor should be aware of all activities affecting equipment. The operations supervisor should specify those

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general activities that may normally be performed without informing the supervisor and should amplify these specifications as appropriate. However, nonroutine operation of controls should not be made without specific approval for the shift supervisor.

In addition, during emergencies, operators may take necessary immediate actions required to ensure personnel, plant, and environmental safety without obtaining prior approval; however, appropriate supervisors should be promptly informed of these actions. Operators should be instructed that plant safety should be achieved over facility production for off normal and emergency facility conditions."

9.2.10

Operating Bases

The operating base is the facility area where an operator returns when he is not performing in-plant duties. An operating base should be established for each shift position within the Tank Farms. Each operating base should be equipped with appropriate office equipment for the operator to maintain necessary procedures and references and to conduct administrative duties such as shift turn over. Necessary communication equipment should be available at the operating base. The operating bases should be located at a convenient place within the area of responsibility for that shift position.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.10

"The operating base is the facility area where an operator returns when he is not performing in-plant duties. An operating base should be established for each shift position. Each operating base should be equipped with appropriate office equipment for the operator to maintain necessary procedures and references and to conduct administrative duties, and necessary communication equipment should be available at the operating base. Shift turnovers should be conducted within those facility areas assigned to the operations department and typically at the operating base. The operating bases should be located at a convenient place within the area of responsibility for that shift position."

9.2.11

Potentially Distractive Written Material and Devices

Controls should be established to ensure that the use of written material that does not relate to Tank Farm operations and entertainment devices such as radios, televisions, tape players, and video games are prohibited from use by on-duty personnel. Because of their distractive potential, such material and devices should not be brought to work stations within the Tank Farms facility.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter II, Section C.11

"Written material that does not relate to operation and entertainment devices (such as radios, televisions, tape players, and computer games) should be prohibited from use by on-duty operations personnel in order to minimize distractions from their responsibilities. Written material and entertainment devices should not be brought to work stations. However, operators may read training bulletins, technical manuals, or operating experience information or review other written, audible, or visual materials that relate to operator duties. Judgment should be used to ensure the operators' primary duties are not compromised.

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The operations supervisor (or equivalent) should provide guidance to the shift crews for the use of potentially distractive materials and devices."

9.2.12

Team Work

Tank Farms management should recognize the importance of training personnel as a team, stressing team communications and interaction, where job functions require team solutions and activities.

Requirements for team training may be found in the Training and Qualification RID.

SITE REQUIREMENT SOURCE: DOE5480.20 Chapter I, Section 7.a(1), Sentence 2

"The concept of training personnel as a team, stressing team communications and interaction, shall be used where job functions require team solutions and activities."

9.3

CONTROL STATION ACTIVITIES

The control area or control room is the most critical facility operating base and the coordination point for all important facility activities. Therefore control area activities must be conducted in a manner that achieves safe and reliable facility operations. Activities in the control area or control room must be businesslike, and a professional atmosphere conducive to safe and efficient operation must be maintained. In addition, control area operators should not be overburdened with administrative responsibilities, and control area access should be limited so that operators will not be distracted from properly monitoring facility parameters. The only area considered to be a control room or control area at the Tank Farms is the control room for the 242-A Evaporator/Crystallizer. Other Tank Farms equipment is operated locally or from motor control stations such as those contained in compressor buildings and instrument shacks. These locations are not manned on a continuous basis and are therefore not considered to be control rooms or control areas.

9.3.1

Control Station Access

Control area access should be limited to those persons on official business only. The "at-the-controls" area of the control room should be clearly identified, and its boundary should be understood by all persons who are granted access to the control room. Access to the "at-the-controls" area should be restricted to persons who need to be in the area. Entry into this area should be granted by designated individuals, and persons who might need to enter this area should know who can grant access.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter III, Section C.1

"Control area access should be limited to those persons on official business only. The "at-the-controls" area of the control room should be clearly identified, and its boundary should be understood by all persons who are granted access to the control room. Access to the "at-the-controls" area should be restricted to persons who need to be in the area.

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Entry into this area should be granted by designated individuals, and persons who might need to enter this area should know who can grant access."

9.3.2

Professional Behavior

Professional behavior should be displayed in the control area at all times. Only activities essential to supporting operation and activities authorized by management should be conducted in the control area. Potentially distracting activities (such as radio listening, game playing, and horseplay) should be prohibited. Non-job-related discussions should be minimized so as not to interfere with conduct of the shift or monitoring of key parameters.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter III, Section C.2

"Professional behavior should be displayed in the control area at all times. Only activities essential to supporting operation and activities authorized by management should be conducted in the control area."

9.3.3

Monitoring the Main Control Panels

Tank Farms management should instill an operating philosophy that ensures operations personnel are attentive to control board indications and alarms. Operators should be alert, should monitor their control panels frequently, should trend indications to detect potential problems early, should take prompt action to determine the cause and correct abnormalities, and should respond to and correct alarming conditions. Because of their distracting effect on operations, management should ensure take action to ensure nuisance alarms are not allowed to become chronic. Additionally, the number of evolutions in progress concurrently should be controlled to ensure the operators' ability to control the evolutions safely and to detect and respond to abnormal situations is not compromised.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter III, Section C.3

"Operators should be alert and attentive to control panel indications and alarms. Control panel indications should be monitored frequently, and prompt action should be taken to determine the cause of and correct abnormalities. Emphasis should be placed on closely monitoring and trending to detect problem situations early. Operator response to alarms should be timely, and actions should be taken to address and correct the alarm causes. All reasonable action should be taken to clear alarming conditions. The number of evolutions affecting control panel indications that are performed concurrently should be limited so that the operators' ability to detect and respond to abnormal conditions will not be compromised. If computer or automated systems are in place, there should be an appropriate backup to those systems."

9.3.4

Control Station Operator Ancillary Duties

Administrative tasks assigned to Tank Farms operators should be minimized to avoid interfering with their ability to monitor and respond to facility control station indications and their ability to control ongoing activities. When administrative functions are necessary on shift, management should ensure a second qualified operator is available to monitor control area activities or, arrangements should be made to perform the administrative functions away from the at-the-controls area.

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SITE REQUIREMENT SOURCE: DOE5480.19 Chapter III, Section C.4

"Duties assigned to operators should not interfere with their ability to monitor facility parameters. Activities such as preparation of tagging orders, reviews of operating procedures, required reading, and review of maintenance work activities should not comprise a major portion of these operator' shift responsibilities. The administrative workload of operators responsible for monitoring and operating the control board should be minimized. If one operator is involved in administrative tasks, other operators should assume responsibility to monitor the unit. Some administrative activities are better performed away from the "at-the-control" area by an operator who is not responsible for operating the main control panel."

9.3.5

Operation of Control Station Equipment

Only those persons specifically authorized by the administrative procedures of the Tank Farms operations department should operate control area equipment.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter III, Section C.5

"Only persons specifically authorized by the administrative procedures of the operations department should operate control area equipment. When trainees operate this equipment, they should be supervised and controlled by the operator who normally would perform the operations."

9.3.6

Control Room Appearance, Habitability, and Equipment

Controls should be established to ensure that the control room and control areas are maintained in a clean and orderly condition to promote safe and efficient operations. All dusting and cleaning of control consoles should be performed by Tank Farms shift operating personnel to minimize the likelihood of inadvertent control actuation.

SITE REQUIREMENT SOURCE: INPO-84-021 6.10

"The control room will be clean and orderly to promote safe and efficient operations. All dusting and cleaning of control consoles, instrument panels, and computer consoles will be performed by shift operating personnel using approved material and techniques."

9.4

AUDIBLE COMMUNICATIONS

Accurate and precise communications are essential to the safe and efficient operation of the Tank Farms facility. Audible communications are used to transmit routine operating and emergency information throughout the facility. Because of the potential consequences of miscommunication, Tank Farms operations management should implement formal programs to ensure accurate and precise audible communications that are free of ambiguity. Audible communications include, face-to-face, telephonic, radio, page system use, and alarms. The controls should address requirements for repeating back of instructions, use of abbreviations, use of a phonetic alphabet, priority for emergency communications, and measures to ensure public address systems are not used in such a manner that they disrupt normal operations.

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9.4.1

Emergency Communication Systems

It is essential that a system to promptly notify Tank Farms personnel and others who may be in the facility of emergency situations. Those areas where the public address system and other audible alarms cannot be heard should be identified and alternate means of alerting personnel in these areas should be provided.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IV, Section C.1

"Methods should be implemented to ensure all facility personnel are promptly alerted to facility emergencies. When personnel are working in areas where the public address system or emergency signals cannot be heard, alternate methods for alerting these persons should be utilized. Flashing lights, personal pagers that vibrate and can be felt, and persons dedicated to notifications are examples of alternate methods that might be effective.

Emergency communications systems should be periodically tested to ensure that they are functional. Control areas should have the capability of overriding other users of the public address system for emergency announcements."

9.4.2

Public Address System

Administrative controls for the 242-A Evaporator public address system are essential to ensure that the system retains its effectiveness in contacting facility personnel. Casual use of the system, where more appropriate means of communication, such as telephones or radios are available should be controlled to ensure the impact of important announcements is not compromised.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IV, Section C.2

"Use of the facility public address system (page) should be administratively controlled to ensure it retains its effectiveness in contacting plant personnel. Excessive use of the public address system for paging of personnel and unnecessary announcements should be avoided because excessive use can reduce the impact of important announcements and can be distracting. Facility telephones and other point-to-point communications channels should be used in lieu of the public address system whenever practical. Consideration should be given to dedicating certain paging system channels to specific groups or functions, (e.g., dedicated channel for routine operations or a dedicated channel used only for emergencies)."

9.4.3

Contacting Operators

The Tank Farms Shift Manager and other personnel in control areas should be able to quickly contact operators throughout the facility. Operators throughout the facility should be provided with the means to quickly communicate with supervisory personnel and those in control areas.

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SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IV, Section C.3

"Methods should be implemented to ensure that control areas can quickly contact on-shift operators or supervisors. Examples cited above in item 1, Emergency Communications Systems, for communication in high-noise areas may be effective in accomplishing this function. However, to avoid operator confusion, distinction should be made between routine and emergency notifications."

9.4.4

Radios and Telephones

Administrative controls should be developed to ensure that the use of portable radios is effective and does not adversely affect sensitive electronic equipment within the facility. The dedication of specific frequencies to specific groups, activities, or areas may improve the effectiveness of communications. Additionally, the dedication of certain telephone circuits for critical functions or areas may improve effectiveness.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IV, Section C.4

"Portable radios can be an effective means of providing mobile point-to-point communications and may be used for this purpose. However, radios usage should not be allowed in areas where electronic interference with plant equipment may result. Areas where radio use is prohibited should be delineated. Instructions regarding frequencies (channels) and postings should be provided. Consideration should be given to dedicating certain radio channels to specific groups or functions e.g., a dedicated channel for security or dedicated channel employed integrated surveillance tests)."

9.4.5

Abbreviations and Acronyms

Tank Farms management should develop a list of approved acronyms and abbreviations to improve the clarity and preciseness of communications. Use of the approved list should be used for both spoken and written communications.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IV, Section C.5

"Only abbreviations and acronyms obtained from an approved list should be used in facility communications. Both written and spoken terms should be proscribed in the list."

9.4.6

Audible Instructions and Informational Communications

Oral communications should be carried out in a formal manner that ensures the clear and concise transmission of information from one person to another. In all communications, the identity of the sender and the receiver should be established and verification that the communication was received and understood should be provided by the recipient. Tank Farms management should establish administrative controls addressing the need to repeat back instructions when the communications relate to the operation of facility equipment. Additional guidance should be provided to ensure that facility operations communications which are complex or lengthy are communicated in writing.

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SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IV, Section C.6

"Oral instructions should be clear and concise. In all communications, the sender and intended receiver should be readily identifiable. Instructions involving the operation of equipment should be repeated by the receiver to the extent necessary for the sender to ensure the instructions are correctly understood."

9.5

CONTROL OF ON-THE-JOB TRAINING

Implementation of on-the-job training within the Tank Farms facility should be in accordance with strict administrative controls to ensure maximum benefit to the trainee while maintaining strict control of all operations by qualified operators. Controls should be established to ensure those operators assigned to conduct on-the-job training are themselves trained in the techniques of on-the-job training. The program should be structured to ensure the trainee is able to satisfactorily complete all requirements of the program. The requirements of this element establish the standard for training activities conducted by the Tank Farms Operations Department.

9.5.1

Adherence to Training Programs

Tank Farms on-shift training should be conducted in accordance with formally defined training programs that specifically identify items the trainee must accomplish on shift. The knowledge requirements for each item should be defined as well as what the trainee must do to demonstrate mastery of the item. For example, the trainee may be required to actually perform a task; simulate performance of a task (walk-through); observe the instructor performing the task or; discuss the task with the instructor. Both the instructor and the trainee should understand what is required for the successful completion of each training item.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter V, Section C.1

"On-shift training should be conducted in accordance with training programs that specifically identify items the trainee must accomplish on shift. The knowledge requirements for each item should be defined as well as what the trainee must do (perform, simulate, observe, or discuss). Both the instructor and the trainee should understand what is required for each training item."

9.5.2

On-The-Job Instructor Qualification

On-shift instruction may be conducted by Operations Department personnel or by training department instructors. In either case, the instructors should have completed appropriate instructor training requirements for on-shift training. A number of factors should be considered when selecting on-shift instructors including verbal communications skills, technical knowledge, and ability to provide the trainee with hands-on experience while maintaining control of facility operations.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter V, Section C.2

"On-shift training should be conducted by qualified operators. This may require the successful completion of appropriate instructor training requirements for on-shift training. However, operator-qualified training department personnel may also be used. The on-shift

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instructors should be specifically selected, taking into account communication skills, technical knowledge, and ability to provide trainees with hands-on experience. In many cases, the trainees will actually be operating equipment; this requires special instructor techniques in order to prevent misoperation or damage of equipment."

9.5.3

Qualified Operator Supervision and Control of Trainees

Trainees should always be observed by qualified on-shift instructors to ensure the trainee does not make an error that would affect Tank Farms operations. Close monitoring of trainees should extend to data collection activities to ensure the accuracy of data collected. On-shift instructors should always be alert to intervene in activities conducted by trainees to ensure the actions taken by the trainees will not adversely affect facility operations.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter V, Section C.3, Paragraph 1

"Whenever trainees operate equipment, a qualified operator serving as an on-shift instructor should observe the trainee in order to ensure the trainee does not make an error that could adversely impact the facility. Until the trainee has demonstrated reasonable proficiency in an operation, he/she should discuss the procedure steps, cautions, and notes with the instructor. Trainees should also demonstrate actions to be performed by pointing to the control switch, valve, breaker, etc., that will be manipulated."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter V, Section C.3, Paragraph 2

"On-shift instructors should not become complacent with trainees. Just because a trainee has performed a task once does not mean he is aware of all problems that could occur. The instructor should always monitor the trainee closely and remain in a position to intervene or assume control, if necessary."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter V, Section C.3, Paragraph 3

"When trainees record equipment parameters on official round sheets (as opposed to practice round sheets) or logs, the on-shift instructor should verify that the recorded information is correct. In addition, the trainee and on-shift instructor should discuss any out-of-specification readings and the consequences of allowing such trend to continue."

9.5.4

Operator Qualification Program Approval

The operator qualification program should be approved by the Tank Farms operations supervisor. Changes to the program should be coordinated with the Training Department.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter V, Section C.4

"The operator qualification program should be approved by the operations supervisor, and changes to the program should be coordinated with the training department. For operating positions requiring certification, qualifications should be based on one-to-one instruction at that station."

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2.5.5

Training Documentation

Tank Farms management should establish administrative controls to ensure that the successful completion of operator training programs is properly documented. These controls should require that classroom training and written examinations be documented by the training department, and on-the-job training be documented by the operations department. Upon successful completion of all training program requirements, the Tank Farms operations supervisor should certify the trainee to perform a specific job position.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter V, Section C.5

"Completion of the operator qualification program should be formally documented. Classroom requirements and written exam results should be documented by training department instructors. On-shift training and system checkouts should be documented by on-shift instructors."

2.5.6

Suspension of Training

On-shift training of Tank Farm operator trainees should be immediately suspended during unanticipated, or abnormal events, accident conditions, or whenever the on-shift instructor deems suspension is prudent to support the safe operation of the facility. Trainees should assist qualified operators during abnormal or emergency conditions only at the discretion of the qualified operator.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter V, Section C.6

"Trainee operation of equipment should be immediately suspended during unanticipated or abnormal events, accident conditions, or whenever the operations personnel or on-shift instructor believes suspension is necessary to ensure safe and reliable facility operation. During abnormal or accident conditions, trainees should provide assistance at the discretion of the qualified operator."

2.5.7

Maximum Number of Trainees

Administrative controls should be established to ensure that the maximum number of operations department trainees permitted to simultaneously participate in a particular on-shift training evolution is controlled. These controls are necessary to ensure effective instruction for all trainees and to limit the potential adverse impact on the Tank Farms facility should the qualified operators become distracted.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter V, Section C.7

"The maximum number of trainees allowed to simultaneously participate in any particular training evolution needs to be considered. Consideration should be given to training effectiveness and to the potential for adverse effects on the facility. A maximum limit for the trainee-to-instructor ratio will ensure that the trainee is provided with the most effective instruction and will ensure that the instructor is not distracted by having too many trainees at once. Shift supervisors should ensure that established limits are observed."

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9.5.8

Use of Trainees to Support Operations

The Tank Farms operations supervisor may develop administrative controls to permit trainees to support shift operations by operating equipment or systems once they have successfully completed the training and qualifications for that system. Controls must ensure that trainees are not assigned unsupervised work for which they are not qualified.

FACILITY REQUIREMENT SOURCE: INPO 85-017 General

"4. Use of Trainees to Support Operations The operations superintendent or shift supervisor may direct that trainees can support the on-shift crews by operating equipment or systems once the trainee has completed the training and qualification requirements for that system. This provision should be addressed in the operator qualification program and should specify how supervisors are to ensure a trainee has completed a particular qualification requirement before he is assigned to a task on that system. Supervisors should be cautioned not to use unsupervised trainees to conduct operations that require licensed operators. Additionally, use of a trainee to perform shift tasks should be done with consideration of the trainee's need to make progress in his training work."

9.6

INVESTIGATION OF ABNORMAL EVENTS

A program for the investigation of abnormal events ensures that facility events are thoroughly investigated to assess the impact of the event, determine the root cause of the event, ascertain whether the event is reportable to DOE (in accordance with DOE Order 5000.3B, Occurrence Reporting and Processing of Operations Information) or to other regulatory agencies, and identify corrective actions to prevent recurrence of the event. The program should include the investigation of "near miss" situations, thus reducing the probability of a similar situation recurring as an "actual" facility event. Abnormal events are not unique to the Tank Farms Operations organization. Additionally, not all events that affect operation are totally controlled by Operations. Therefore, the guidelines of this element may have applicability in other functional areas.

The requirements of this element may be found in the Occurrence Reporting System section of the Management Systems Functional Area RID. Required notifications associated with abnormal events are addressed in Section 9.7, Notifications, and in DOE Order 5000.3B. This element covers important aspects of the abnormal event investigation program. INPO 84-029 (Good Practice OP-211), Post-Trip Reviews, and INPO 85-020 Rev. 1, (Good Practice OE-902), In-House Operating Experience Review, are example programs that can be of assistance in meeting the intent of some of the guidelines of this element. This element interfaces with the element of Occurrence Reporting System in the Management System Functional Area and with the Safeguards and Security Functional Area.

9.7

NOTIFICATIONS

Timely notification of site management, appropriate DOE personnel, and other agencies ensures that the Tank Farms facility is responsive to public safety and health concerns. This element provides guidelines to ensure uniformity, efficiency, and thoroughness of these notifications to meet requirements that are consistent with DOE 5000.3A. INPO 84-021 (Good Practice OP-204), Conduct of Operations, is an example program that can be of assistance in meeting the intent of the guidelines of this element. This element

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interfaces with element of Occurrence Reporting System in the Management Systems Functional Area and with the Emergency Preparedness and Management Functional Area.

9.7.1

Notification Procedures

Administrative controls should be developed to ensure that notifications to all personnel and agencies are made in a timely manner. These controls should address responsibility for notification; events requiring notification; time requirements for notification and; record keeping requirements.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter VII, Section C.1

"Procedures should be developed to address appropriate notifications and should include the following elements:

- a. Specific responsibilities for notifications;
- b. Identification of events and conditions requiring notifications;
- c. Identification of primary and alternate personnel to be notified for various situations;
- d. Establishment of time requirements for notifications that are consistent with the facility emergency plan; and
- e. Definition of recordkeeping requirements that documents the reason for notifications, the time of notifications, and the person notified."

9.7.2

Notification Responsibility

Operations management should develop administrative controls to ensure that abnormal events are classified and notifications are made to all agencies and individuals in a timely manner.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter VII, Section C.2

"The operations supervisor should ensure that all appropriate personnel receive notification when required. The actual notification of specific individuals or agencies may be accomplished by other individuals."

9.7.3

Names and Phone Numbers

Those individuals at the Tank Farms facility who are responsible for making notifications should be provided with an up to date listing of all required names and phone numbers in order to ensure the timeliness and accuracy of notifications.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter VII, Section C.3

"Names of primary and alternate contacts and current phone numbers and page codes should be readily available to the person assigned to make the notifications."

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9.7.4

Documentation

A formal record of all notifications should be maintained. This task may be expedited through the use of fill-in-the-blank forms developed prior to need.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter VII, Section C.4

"All notifications should be documented. Fill-in-the-blank forms for different types of situations might be useful as a checklist and for providing necessary documentation. In any case, a formal record of notifications should be maintained."

9.7.5

Communication Equipment

Tank Farms management should ensure that adequate communications equipment is provided and maintained in an operable condition to support operations activities.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter VII, Section C.5

"Adequate communication equipment should be maintained in the main control area to meet the objectives of this chapter."

9.8

CONTROL OF EQUIPMENT AND SYSTEM STATUS

Good operating discipline will ensure that the Tank Farms facility and process configuration is maintained in accordance with design requirements, and will ensure that the operating staff knows the status of the facility, process equipment, and system alignments, (especially alignments with respect to tank transfer jumpers), at all times. In addition, configuration management should be applied in the administration of projects, activities, facilities, systems, equipment, and software which meet the criteria for configuration management applicability as discussed in the Configuration Management Functional Area. Specific applications of equipment control are addressed below in Section 9.9, Lockout/Tagouts; Section 9.10, Independent Verification; Section 9.11, Log Keeping; and Section 9.12, Operations Shift Turnover. This element provides an overall perspective on control of equipment and system status. INPO 84-021 (Good Practice OP-204), Conduct of Operations, is an example program that can be of assistance in meeting the intent of some of the guidelines of this element.

9.8.1

Operations, Testing, and Status Change Authorization and Reporting

The Tank Farms Shift Manager should be aware of the status of all systems and components within the facility. Administrative controls should be developed to ensure that the Shift Manager either personally authorizes equipment operations and configuration changes or delegates this authority in accordance with written guidance. The shift office should be the focal point of system operations, and controls should be in place to ensure that all individuals making system or component line-up or status changes make the shift office aware of their activities. The 242-A Evaporator Control Room should be the focal point of evaporator operations, and controls should be in place to ensure that all individuals making system or component line-up or status changes make the shift supervisor aware of their activities. All personnel performing equipment or system testing should be thoroughly knowledgeable of the testing procedures and the overall intent of the test.

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SITE REQUIREMENT SOURCE: DOE5480.19 Chapter VIII, Section C.1

"The operations supervisor is responsible for maintaining proper configuration and should authorize status changes to major equipment and systems. Since the supervisor is typically the senior operating person on shift, he/she is tasked with maintaining a broad overview of facility operations. His/her perspective of status must necessarily be the focal point of shift operations.

Authorization of status changes to equipment and systems of lesser importance may be delegated by the operations supervisor to other cognizant shift positions. For example, radwaste operations may be assigned to a radwaste operator or to a foreman who authorizes changes in operating alignments or equipment configurations. The shift supervisor should be advised periodically of changes in status of equipment and systems so assigned.

Since the operators must be aware of equipment and system status, the supervisor should ensure that all changes in status are communicated to these persons. Typically, the control area operator is in the line-of-information flow to and from the supervisor.

Changes in the status of facility equipment and systems should be reported to the governing stations (e.g., control area) or to the individual (or his relief) who authorized the change. Typically, changes in status of safety-related equipment and systems should be authorized by the supervisor and reported to the control area."

FACILITY REQUIREMENT SOURCE: INPO-85-015 TC.6.L

"All participants in a test are thoroughly briefed as to their duties and the intent of the test."

2.8.2

Equipment and System Alignment

Tank Farms operating procedures should require that approved alignment checklists be completed, reviewed, and approved prior to placing equipment and systems into operation. Controls should be established for the periodic reverification of system alignments, such as following major maintenance activities.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter VIII, Section C.2

"Prior to first placing the equipment or system into operation, individual components for facility equipment and systems should be properly aligned or checked for proper alignment. An initial alignment of valves, switches, and breakers establishes a baseline configuration against which further operations may be measured. Once the equipment or system is properly aligned and is operating in accordance with operating procedures, frequent complete alignments of all individual components may not be necessary. Alignment checklists should be used to guide the operator in establishing the correct component positions. The alignment checklists should include provisions for equipment nomenclature that matches the nomenclature placed on the component, a location for individual documentation of the check of each component, the required alignment position for each component, and a location for annotating deviations from the required alignment. The supervisor should review and approve completed alignment checklists."

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2.8.3

Equipment Locking and Tagging

Locks may be beneficial in maintaining configuration control of Tank Farms systems and components. The use of locking devices should be administratively controlled and should be applied to only those components that must be controlled for safety or other specified criteria. A listing of locked components and the reasons for applying a locking device should be maintained. Operations personnel should be trained in the requirements of the locked valve program including specific instruction in the physical application of locking devices to ensure that the possibility of damaging equipment when applying or removing locks is minimized.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter VIII, Section C.3

"Locks and Tags should be used on those components that require special administrative control for safety or other reasons. Locks and Tags provide some security that a component will be operated only by authorized facility personnel performing required evolutions in a controlled fashion. Additionally, Locks and Tags should alert the operator of the importance of the component and remind him/her that special controls over repositioning are to be maintained. In this respect, all personnel should receive training regarding their responsibilities concerning the manipulation of locked or tagged controls."

2.8.4

Operational Limits Compliance (TSRs)

The Tank Farms Shift Manager should be cognizant of all entries into limiting conditions for operations. Administrative controls should be established to require that entries into limiting conditions for operation are documented. Additionally, documentation of actions taken to comply with the requirements of the action statements should be required. Additional administrative controls should be established to ensure that all performance checks, tests, measurements or other surveillance requirements are performed in a timely manner.

FACILITY REQUIREMENT SOURCE: DOE/EH0135 AX.8

"PERFORMANCE OBJECTIVE: Engineered Safety Systems should be reliable and available to provide protection to the facility when required."

FACILITY REQUIREMENT SOURCE: DOE/EH0135 AX.8.1

"All tests and measurements required by Technical Specification/Operational Safety Requirements are made in a timely manner and in accordance with specified Surveillance Requirements."

FACILITY REQUIREMENT SOURCE: DOE/EH0135 AX.8.4

"Start-on-demand systems are periodically checked for performance, and records of the results maintained."

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FACILITY REQUIREMENT SOURCE: DOE/EH0135 AX.8.5

"Monitoring and tests are provided to give warning of pending failure of continuously operating systems."

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter VIII, Section C.4

"Administrative controls should be established to document compliance with requirements of operational limits (limiting conditions for operation). The operations supervisor should be cognizant of action taken to comply with operational limit requirements and should ensure that the actions taken are appropriate and correct or that they mitigate any adverse consequences to the facility. Logs, status sheets, turnover checklists, or other appropriate documentation should reflect the entry conditions and actions that are taken in response to operational limits requirements. Appropriate operating personnel should be apprised of limiting conditions for operations and actions for which they may be responsible. Responsible personnel should periodically review the limiting conditions for operation and action statements in effect to ensure that the required actions are met."

2.8.5

Equipment Deficiency Identification and Documentation

A formal system enable Tank Farms personnel to identify and report equipment deficiencies should be implemented. The system should provide for equipment problems to be reported to operations personnel and identified in the work control program for resolution.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter VIII, Section C.5

"Equipment deficiencies should be noted by facility operating personnel and identified in the work control system for correction. Methods that identify deficient equipment to operating personnel should be established. Some facilities can use unique deficiency tags to identify equipment problems. Others may use logs, status sheets, shift turnover sheets, or caution tags to ensure deficiencies are communicated to personnel responsible for monitoring and operating the equipment."

2.8.6

Work Authorization and Documentation

All activities, including maintenance, that involve operations, indications, or alarms important to safety should be authorized in writing by the Tank Farms Shift Manager. To ensure that no ambiguity exists, the shift manager's authorization should be on the document that controls the work to be accomplished.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter VIII, Section C.6

"The operations supervisor or his/her designee should authorize all shift activities (including Maintenance) on equipment that is important to safety, that affects operations, or that changes control indications or alarms. This authorization should be in writing on the document controlling the work. Documentation of the status of work in progress should be available in the control area for review by operating personnel. These activities could include such things as maintenance, test, fuel movement, radiography, and others."

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9.8.7

Equipment Post-Maintenance Testing and Return to Service

Administrative controls should be established to ensure that performance testing is specified, authorized, conducted, and documented before equipment that has been removed from service for maintenance is returned to service and declared operable. This testing should ensure that the component functions properly, that the original problem has been resolved, and no new problems have been introduced. The Tank Farms Shift Manager should approve all equipment return to service authorizations.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter VIII, Section C.7

"Equipment should be tested following maintenance to demonstrate that it is capable of performing its intended function. The testing should include performance of all functions that may have been affected by the maintenance. The testing should also verify that the maintenance performed served to correct the original problem and that no new problems were introduced. Any testing following maintenance should be specified on the maintenance work order or accompanying documentation (e.g., maintenance procedure). The operations supervisor should ensure that testing appropriately proves equipment operability."

9.8.8

Alarm Status

Information regarding the status of both control room and remote panel alarms should be available to Tank Farms operations personnel. This information should include changes made to setpoints, disabled alarms, alarms that are normally lighted during normal operations, and multiple alarms that do not reflash when one input is activated.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter VIII, Section C.8

"The status of control panel and/or local panel alarms should be readily available to appropriate operating personnel. Information that should be available includes alarms that are totally disabled, alarms with individual inputs disabled, alarms with temporarily changed setpoints, alarms that are normally lighted during power operation, and multiple input alarms that do not reflash when more than one input is activated."

9.8.9

Temporary Modification Control

A program should be established for the control of all temporary modifications to any Tank Farms facility component or system. Up to date information regarding the identification, installation, and purpose of all temporary modifications should be available to operations personnel in the control area. Clear definition should be provided as to what is considered a temporary modification. Items which should be considered temporary modifications include electrical jumpers, lifted leads, pulled circuit boards, disabled annunciators and alarms, mechanical jumpers and bypasses, temporary setpoint changes, installed or removed block flanges, disabled relief or safety valves, installed or removed filters or strainers, plugged floor drains, and temporary pipe supports. Controls applied should include safety reviews, installation approval, independent verification of correct installation and removal, update of operating procedures, training, marking of installed temporary modifications, and periodic audits of outstanding temporary modifications.

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SITE REQUIREMENT SOURCE: DOE5480.19 Chapter VIII, Section C.9

"Administrative control systems should be established for installation of temporary modifications such as electrical jumpers, lifted leads, pulled circuit boards, disabled annunciators/alarms, mechanical jumpers/bypasses, temporary setpoint changes, installed or removed block flanges, disabled relief or safety valves, installed or removed filters or strainers, plugged floor drains, and temporary pipe supports. Prior to modification, these controls should provide for communicating the installation of temporary modifications to the design authority to allow for technical oversight and an evaluation of the impact on current design activities, and approval of the design modification. These control systems should make provisions for safety reviews, installation approval, independent verification of correct installation and removal, documentation of the modification, update of operating procedures and documents, training, marking of installed modifications, and periodic audits of outstanding modifications."

9.8.10

Distribution and Control of Equipment and System Documents

Administrative controls should be established to ensure that Tank Farms operations personnel are provided with and use the latest revision of engineering drawings and specifications and are made aware of all changes to these documents.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter VIII, Section C.10

"A system should be established to ensure that the operations personnel receive and utilize the latest revisions of engineering drawings and specifications. Operations personnel should be made aware of all changes to these documents. The document distribution should include all operations related activities such as procedures review groups, maintenance groups, facility safety analysis groups, and testing groups."

9.8.11

New Construction or Modification

When new construction or modifications to existing Tank Farms components or systems are made, the operations department will play an important role in terms of design input and acceptance testing. The requirements related to this activity may be found in the Configuration Management Functional Area RID.

9.9

LOCKOUTS AND TAGOUTS

An administrative control program should be established to reduce the potential for personal injury and equipment damage during operations, modification, or maintenance activities due to the inadvertent operation or activation of Tank Farms equipment. The Tank Farms Lockout/Tagout program should provide for control of equipment through component tagging or locking to prevent personnel injury; protect equipment from damage; maintain the operability of plant systems and; maintain the integrity of the facility's physical boundaries.

9.9.1

Lockout and Tagout Use

The lockout/tagout program should be used whenever controls such as valves or switches need to be controlled for either the protection of personnel or for special administrative

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reasons. Locks may be either built-in or they may be external devices such as padlocks and chains. Tags should be placed as close to the control that is to be tagged out as possible to avoid confusion.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.1

"Locks and Tags should be placed on controls when for safety or other special administrative reasons controls must be established. Tags should be placed on the control that is tagged out, or as close as possible to indicate clearly the condition."

9.9.2

Lockout and Tagout Implementation

Control of equipment for personnel or equipment safety should be by lockout where possible or at a minimum by tagout. In either case the controls should be applied by authorized and qualified Tank Farms operations personnel.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.11

"Lockout or Tagout should only be accomplished by authorized, qualified personnel."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.2

"a. If a device (e.g., for energy or toxic material isolation) has the capability of being locked out, it should be locked out.

b. If the isolating device cannot be locked out, it should be tagged out.

c. New equipment design and major modifications to existing equipment should be designed to provide the capability of being locked out.

d. The following administrative guidance is an example that could be established to outline acceptable controls over locked components:

- (1) A list of components that are required to be locked should be established and approved by the operations supervisor or appropriate manager. The list should be separate from the standard alignment checklists.
- (2) Criteria for locking of additional components and necessary authorizations should be provided.
- (3) When key operated locks are used, access to the keys should be restricted to authorized personnel. Keys should be readily available to appropriate personnel.
- (4) Specific techniques for verifying the position of locked components should be established. A hands-on physical check of critical equipment or the observation of a reliable position indicator should be used whenever possible.
- (5) When locked components must be unlocked or placed in a position

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other than the normal locked position, the deviation should be authorized and documented.

(6) Periodic checks of locked components should be performed to ensure that locking devices are properly attached and that the component is in the required position."

FACILITY REQUIREMENT SOURCE: INPO-85-017 Chapter X, Section C.11

"Clearance Tag Audits

Tagouts should be administratively reviewed at least monthly. This review verifies the continuing need for each tagout and ensures the tagout index accurately reflects all active tagouts. A licensed operator is ideal to perform the review because his knowledge of systems and equipment might be necessary to accurately evaluate the continuing need for a tagout. Input from the clearance tagout holder should be solicited as needed. This review should be documented.

An audit of randomly selected tags and tagouts should be performed at least quarterly. All tags should be checked at least annually, and a complete audit of all tags should be conducted prior to start-up from extended outages. Audits should include the following checks:

- o proper placement of each tag
- o proper position of tagged equipment
- o accuracy, completeness, and legibility of information on tags and tagout sheets

During the course of these audits, a tour of plant spaces should be made to check for the presence of unauthorized tags, superseded tags, and tags for which no record exists. These tags should be investigated and either removed (with concurrence of the individual for whom the component was tagged, if applicable) or authorized, whichever is appropriate.

Deficiencies noted in the audits should be documented and corrective action taken. If a significant number of deficiencies were found, the extent of the audit should be increased to provide statistical assurance that the remaining tagouts are in order."

9.9.3

Protective Materials and Hardware

The materials and equipment used for tagout and lockout of equipment within the Tank Farms facility should be diverse in nature, as necessary to ensure application to the diverse equipment installed within the facility. The materials and equipment used should be durable, standardized (at least with regard to color, shape, or size) in order to provide distinction as locking and tagging devices, substantial, identifiable as to controlling individual or organization, and should provide an appropriate warning message.

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SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.3

- "a. Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware should be provided for isolating, securing, or blocking machines or equipment from energy sources.
- b. Lockout and Tagout devices should be singularly identified (i.e., should be the only devices used for controlling energy and should not be used for other purposes) and should meet the following requirements:
- (1) Durable
 - (2) Standardized
 - (3) Substantial
 - (4) Identifiable
 - (5) Warning"

9.9.4

Lockout and Tagout Program

The Tank Farms lockout and tagout program should consist of administrative controls procedures that establish positive control of energy sources and that provide for the training and qualification of operators to perform tagouts and lockouts.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.4

"A Lockout/Tagout program should be established consisting of procedures to control potentially hazardous energy and materials and personnel training. This program should ensure that potentially hazardous energy or toxic material sources are isolated and rendered inoperative during servicing or maintenance or in any case where unexpected energizing, startup, or release of stored energy or toxic material can cause injury."

9.9.5

Procedures For Lockout and Tagout

Administrative controls should clearly state the scope, purpose, authorization, rules, and techniques of the Lockout/Tagout program for Tank Farms. Additionally, requirements for documentation of the application and removal of tagouts and lockouts should be established. This documentation should normally be maintained in the control area and should be approved by the Shift Manager.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.5

"Procedures should be developed, documented, validated, and utilized for control of potentially hazardous energy or material. Procedures should clearly and specifically state the scope, purpose, authorization, rules, and techniques of the Lockout/Tagout program."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.5.a

- "a. Procedures should include, but not be limited to, the following:
- (1) Specific statement of intent of use;

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- (2) Specific procedural steps for isolating, blocking and securing machines or equipment for hazardous energy or material;
- (3) Specific procedural steps for the placement, removal, and transfer of the Lockout/Tagout device(s); and
- (4) Specific requirements to test machines and to determine and verify the effectiveness of Lockout, Tagout or other control measures.

Lockout/Tagout placement, activation and removal should be recorded including any information relevant to their occurrence. This record should be maintained by the shift supervisor or appropriate manager to ensure accuracy and completeness. The Lockout/Tagout record should be reviewed periodically by operations and maintenance personnel as guidance."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.5.c

"Lockout/Tagout placement, activation and removal should be recorded including any information relevant to their occurrence. This record should be maintained by the shift supervisor or appropriate manager to ensure accuracy and completeness. The Lockout/Tagout record should be reviewed periodically by operations and maintenance personnel as guidance."

9.9.6

Application of Lockout and Tagout

The Tank Farms Lockout/Tagout procedure should provide comprehensive guidance from application to release of the tagout/lockout. Elements that should be included in the procedure include preparation for and equipment shutdown, equipment isolation, application of locking devices or tags, release of stored energy, verification of correct installation, approval to release, and removal of the tagout/lockout devices.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.6

"The established procedure for the application of energy control (implementing Lockout/Tagout) should cover the elements and actions in the following sequence:

- a. Preparation for Shutdown
 - b. Machine or Equipment Shutdown
 - c. Equipment Isolation
 - d. Affixing Locks/Tags
 - e. Stored Energy
 - f. Verification of Installation
 - g. Release from Lockout/Tagout
-
- (1) Equipment/workspace
 - (2) Personnel
 - (3) Lockout/Tagout Device Removal"

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SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.6.g(3), Paragraph 2

"When the person who applied the Lockout/Tagout device is not available to remove it, that device may be removed under the direction of the appropriate supervisor/manager, provided that specific procedures and training for such removal have been developed and incorporated into the facility program. The supervisor should demonstrate that the specific procedure provides equivalent safety to the removal of the device by the authorized personnel who applied it.

The specific procedure should include the following elements:

- Verification by the supervisor/manager that the person who applied the device is not available.
- Assurance that all reasonable efforts are made to inform him/her that the device has been removed.
- Ensuring that all relevant personnel have this knowledge before he/she resumes work at the facility."

9.9.7

Testing or Positioning of Equipment or Components

Tank Farms operations management should discourage the temporary removal of locks and tags. However, procedures should be developed to provide for the specific sequence of events to be followed in the event a temporary lock or tag removal is required. These procedures should require application of the same controls associated with normal removal and restoration of tags.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.7

"Temporary removal of Lockout/Tagout devices should be discouraged. However, situations in which Lockout/Tagout devices must be temporarily removed and the equipment energized, the following sequence of operations should be followed:

- a. Clear the equipment of tools and materials.
- b. Remove personnel from the equipment area.
- c. Remove the Lockout/Tagout device as procedures indicate.
- d. Energize and proceed with testing or positioning.
- e. De-energize all systems and reapply the lockout/tagout."

FACILITY REQUIREMENT SOURCE: INPO 85-017 Chapter IX, Section C.10

"Temporary Removal of Clearance Tags Tags may be temporarily removed for testing or other required brief periods of equipment operation. For example, it may be necessary to remove or replace a tag several times when balancing rotating machinery. Temporary removal should not be allowed for extended periods. Normally, a temporary tag removal should not extend beyond the next shift change. When tags are temporarily removed and placed, the same controls associated with normal removal and placement of tags should be observed. For example, temporary removals and replacements should be approved,

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documented, and verified in a manner similar to those actions for initial tag placement and final removal."

9.9.8

Periodic Inspection

Tank Farms management should develop administrative controls to ensure periodic inspections are performed by qualified individuals to determine that procedures are being followed; to correct deviations and inadequacies observed and; to review the responsibilities of supervisors and other operations personnel.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.8

"Periodic inspections should be conducted by authorized personnel, supervisor, or appropriate manager, to determine whether procedures are being followed and to correct any deviations or inadequacies observed. Inspections should include a review of the responsibilities of personnel and supervisors. The supervisor or appropriate manager should certify that the periodic inspections have been performed, documenting the equipment and procedures involved, dates of inspection, personnel participating in the inspections, and personnel performing the inspections."

9.9.9

Administrative Control Tags

Use of administrative control tags (caution tags) should be limited to tagging situations that do not call for personnel protection. These tags should be used when a component or system is functional but, some precaution or information necessary for operation needs to be communicated. Management should administer the caution tag program using procedures similar to those used for the Tagout/Lockout program.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter I, Section IX.C.9.a

"Caution tags should be uniquely identifiable and different in appearance from other station tags. The following information should be included on the tags as an aid in administering the program:

- (1) caution tag number;
- (2) component name and number;
- (3) effective date;
- (4) precaution or information applicable to the particular situation and/or component or system; and
- (5) signature of authorizing individual and organization."

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter I, Section IX.C.9.b

"Situations that require special operator or maintenance precautions or amplifying information should be brought to the attention of the shift supervisor or appropriate manager. The supervisor or manager should ensure that issuing a caution tag is necessary and that the tag is not being used in place of more appropriate administrative action (such as a temporary procedure change, placing an operator aide, use of the work control system, or issuance of a safety Lockout or Tagout). The supervisor review should also

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ensure that any instruction contained in the caution tag does not deviate from established facility procedures, technical specifications, or OSR's."

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter I, Section IX.C.9.c

"A record of all active caution tags and associated amplifying information should be available to the appropriate personnel. This record and associated tags should be reviewed periodically by qualified personnel. This review should verify the continued need and applicability for each caution tag and ensure that the caution tag index accurately reflects all active caution tags. This review should be documented. Any caution tags remaining in an active status for extended periods (e.g., longer than three months, as appropriate) should be brought to the attention of the operations supervisor or manager. The operations supervisor or manager should determine what action is needed to resolve the continued use of the caution tag."

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter I, Section IX.C.9.d

"Caution tags should be placed in such a way that they do not interfere with or obscure indications, switches, or other control devices but are readily apparent to an individual prior to the operation of the tagged device. Placement of caution tags should be documented."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.9

"Caution tags should not be used for personnel protection (i.e., caution tags should not be used where it is appropriate to use a Lockout or Tagout device). Administration of caution tags could, however, be accomplished as part of the Lockout/Tagout program or it could be covered separately. The use of caution tags should be restricted to those situations in which a component or system is functional, but when some precaution or item(s) of information is necessary prior to operation."

2.9.10

Training and Communication

Training and periodic retraining should be provided to ensure that all personnel who are involved in the implementation of the tagout/lockout program and the caution tag program, and all personnel who will work under these programs understand the programs. Training should ensure the purpose of the program is understood by all; that all personnel who may enter the area recognize hazardous energy sources; all personnel understand the limitations of tags and locks relative to operating system control; and when new hazards arise.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.10

- "a. Training should be provided and documented to ensure that the purpose and function of the Lockout/Tagout program is understood by all personnel and that they have the knowledge and skills required for safe application, use, and removal of Lockouts and Tagouts.

Training should include the following:

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- (1) Recognition of applicable hazardous energy sources, type and magnitude of energy or materials involved and methods to isolate and control.
- (2) Personnel involved should be instructed in the purpose and use of the Lockout/Tagout procedures.
- (3) All personnel who may enter the area should be trained to recognize the Lockout/Tagout and to understand the procedure and prohibition relating to attempts to restart or re-energize machines or equipment."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.10.b

"b. When Tagout systems are used, personnel should be trained in the limitations of tags:

- (1) Tags are essentially warning devices and do not provide physical restraint on those devices as are provided by a lock.
- (2) When a Tag is attached, it is not to be removed without authorization of the person responsible for it, it should not be bypassed, ignored, or otherwise defeated.
- (3) Tags must be legible and understandable by all personnel.
- (4) Tags and their means of attachment should be able to withstand the environmental conditions encountered in the workplace.
- (5) Tags may evoke a false sense of security and their meaning needs to be understood.
- (6) Tags must be securely attached so they cannot be inadvertently or accidentally detached during use."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.10.c

"c. When Lockout systems are used, personnel should be trained in the limitations of Locks, especially concerning the following:

- (1) Operation of the facility may be hindered (this is significant when local component operations are necessary, such as remote shutdown or remote control).
- (2) Locks and chains installed on small instrument line isolation valves can contribute to seismic loading and may not have been considered during safety analysis."

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SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.10.d

"d. Retraining should be provided for all authorized or affected personnel whenever there is a change in job, procedures, machines, equipment or processes that present new hazards or periodic inspection determines it is needed."

9.9.11

Notification of Personnel

Tank Farms management should ensure that affected personnel are notified by supervision both before and after the removal of lockout/tagout devices.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.12

"A supervisor or appropriate manager should notify affected personnel of the application and removal of Lockout/Tagout devices. Notification should be given before the devices are applied and after they are removed."

9.9.12

Outside Contractors

When outside contractors work on Tank Farms facilities, both tank farms and the contractor's lockout/tagout programs should be communicated to the other party. Provisions should be made for any changes to either program to be communicated to the other party.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.13

"Whenever outside servicing personnel are to be engaged in activities covered by the scope of the Lockout/Tagout program, the facility and the outside contractor should inform each other of their respective Lockout/Tagout procedures and should ensure that their personnel are aware of the changes."

9.9.13

Group Lockouts or Tagouts

The Tank Farms Lockout/Tagout program should provide for lockouts and tagouts to be issued to one or more crews or departments as well as to individuals. The same level of detail in implementation and the same degree of protection should be provided for lockouts and tagouts issued to organizations as those issued to individuals.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.14

"When servicing or maintenance is performed by a crew, craft, department, or other group, they should utilize a procedure that will provide for equivalent safety provided by the personal Lockout or Tagout device."

9.9.14

Shift or Personnel Changes

The Tank Farms Lockout/Tagout program should provide for the orderly transfer of lockout/tagout information and devices between personnel and shifts.

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SITE REQUIREMENT SOURCE: DOE5480.19 Chapter IX, Section C.15

"Specific procedures should be utilized during shift of personnel changes to ensure the continuity of Lockout or Tagout protection, including provision for the orderly transfer of Lockout or Tagout devices between personnel or shifts. "

9.10

INDEPENDENT VERIFICATION

Tank Farms operations should develop and implement an independent verification program to provide for the high degree of reliability in ensuring correct facility operation and the correct position of components such as valves, pipe jumpers, switches, and circuit breakers. Independent verification is the use of a second qualified individual to check that a given operation conforms to established operational criteria, as well as checking a component position. The second check is performed independently of activities related to establishing the components position. The Tank Farms program should provide for the selective application of independent verification consistent with the impact of the operation on the safe and efficient operation of the facility. The operations manager should clearly define the circumstances and components requiring independent verification.

Related equipment status programs are discussed in Section 9.7, Control of Equipment and System Status and Section 9.9, Lockouts and Tagouts.

9.10.1

Components Requiring Independent Verification

Independent verification should be applied to those tank farms components critical to ensure safe and reliable operation of the facility. A list of components requiring independent verification should be developed and maintained using accepted safety analysis methods and/or expert opinion, as appropriate.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter X, Section C.1

"Components that are critical to ensure safe and reliable operation should receive an independent verification of their position when circumstances warrant. These components should be identified explicitly in facility procedures or other official documents so that unnecessary interpretation of requirements will be minimized. In addition, this will result in uniform practices by operations personnel. Because mispositioning of certain components that are not safety related can lead to facility shutdowns, challenges to safety-related equipment, or other undesirable effects on facility safety and reliability, independent verification should not be limited to safety-related system components. Each facility should use an accepted safety analysis method (e.g., fault-tree analysis, Probability Risk Analysis) and/or expert opinion to determine its own facility specific list of systems and components, which should receive independent verification."

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter X, Section C.1.a

"All components in systems that have safety-related functions should be considered for independent verification."

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FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter X, Section C.1.b

"Independent verifications should be performed for certain components that are not related to safety which, if mispositioned, could lead to unplanned shut-downs, challenges to safety systems, or (through interfaces with safety-related systems) cause radioactive or toxic material release."

2.10.2

Occasions Requiring Independent Verification

Written guidance should be provided to assist operators in determining when to apply the requirements of the independent verification program. Examples would include prior to returning equipment to service following maintenance, following surveillance activities, and whenever there is doubt in an individual's mind that a valve line-up is correct.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter X, Section C.2

"Occasions Requiring Independent Verification

Components should receive independent verification when the equipment they serve must be available and when a reasonable possibility exists that the components might have been mispositioned. The following guidelines describe situations where independent verification would be appropriate:

a. Returning Equipment to Service Following Maintenance or Testing.

Independent verifications should be performed to ensure that systems are properly aligned when equipment is returned to service. After maintenance activities, it is appropriate to verify independently the positions of components that have been tagged to establish an isolation boundary for the work. Also, additional components that could have been mispositioned during maintenance should be selected for verification on a case-by-case basis by the individual authorizing equipment for return to service.

Such additional items requiring verification would include any component(s) that had been worked on and might also include instrument stop valves, bypass valves, switches, and isolation valves located within the work boundary.

Failure to properly restore systems following surveillance testing has resulted in mispositionings. Selected components should therefore be independently verified during, or after surveillance tests. Surveillance tests are normally performed in strict adherence to detailed procedures that specifically address each operating component. Components not addressed by the test procedure would not be likely to be mispositioned as a result of tests, and independent

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verification would be necessary only for components that had been positioned during tests.

b. Removing Equipment From Service

To ensure that only the specific items of equipment intended to be removed from service are affected by Tagouts, independent verifications should be performed when equipment is removed from service. For example, when tagging out a pump, a verification that the redundant pump was not inadvertently affected should be performed. This might be done by checking for correct alignment of components on the redundant equipment, or this might be done by verifying that all Tags were placed on the correct components.

c. System Lineups

During extended shutdowns, it is often impractical to completely restore systems to their normal operating alignment immediately after maintenance is completed. Therefore, most facilities delay restoration of systems not needed for shutdown activities until shortly before startup. At that time, all systems whose status is questionable are checked. When system lineups are performed, the considerations of Section C1, Components Requiring Independent Verifications, should be applied to determine the need for independent verification.

d. Periodic Checks During Facility Operation

In order to verify that all associated equipment is fully functional, DOE facilities should perform routine, periodic verifications of certain critical components during normal operations. Since this check is independent from any activity that might have caused a component to be mispositioned, it can be considered an independent verification; a second check normally would not be necessary. However, if a mispositioning were discovered while the periodic check was being performed, the component position would then be corrected after review and/or approval by a qualified supervisor; an independent verification of this action would be appropriate."

RELATED REFERENCES

1. 10CFR20 Part 20.1.c

9.10.3

Verification Techniques

Many types of components are in use within the Tank Farms facility that may require independent verification of position. The techniques of independent verification are dependent on the component therefore, written guidance should be provided to explain how operators are to verify position for each type of component in use. Management

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should ensure that operators are trained in the application of the techniques described in the guidance document.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter X, Section C.3

"Operators should be trained in the appropriate techniques for verifying the positions of all facility components. In addition, a reference document should be provided explaining what an operator should do when verifying a component position. Because of the large variety of components in use in DOE facilities, it is not feasible to provide specific instructions for verification of individual component positions without facility-specific knowledge. Each facility should use its most experienced personnel to develop these instructions, using applicable manufacturer's recommendations where available. The instructions should describe the techniques for verifying manual valves, motor- and air-operated valves, solenoid-operated valves, circuit breakers, blank flanges, removable links and fuses, and the availability of control power. These instructions will help to ensure that operators use approved methods when verifying component positions and will help provide uniformity in operator performance.

The following general guidelines apply to component verification techniques:

- a. Independence
- b. Remote Position Indicators
- c. Process Parameters
- d. Throttled Valves
- e. Surveillance Testing
- f. Operations Self-Appraisal and Verification"

9.11

LOG KEEPING

The Tank Farms operations records should include a narrative log of the equipment and process status, maintained in sufficient detail and including descriptions of all significant events as required to provide an accurate history of the facility operations. As used in this context, logs are defined as a narrative sequence of events or functions performed at a specific shift position or for a specific operating purpose, as opposed to the operator round sheets that are discussed in Section 9.2, Shift Routines and Operating Practices. This element describes the features needed in the Operations logs to ensure they are properly maintained. INPO 84-001 (Good Practice OP-205), Operations Narrative Log Books, is an example program that can be of assistance in implementing the intent of some of the guidelines of this element.

9.11.1

Establishment of Operating Logs

Management should establish narrative logs for all key positions. At a minimum a narrative log should be maintained by the Shift Manager and the senior operator in the evaporator control room. Narrative log sections should be considered for each operator rounds sheet to provide for recording important component and process information.

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SITE REQUIREMENT SOURCE: DOE5480.19 Chapter XI, Section C.1

"Narrative logs should be established at all key shift positions. As a minimum, a narrative log should be maintained by the operations supervisor or the control area operator. For those shift positions that are manned on a part-time basis (e.g., radwaste operator, makeup plant, etc.) a log should be established to ensure that pertinent information is passed from operator to operator. A narrative section should be provided on round sheets when a narrative log is not used for a particular shift position."

9.11.2

Timeliness of Recordings

In order to ensure consistent, complete, and accurate log keeping within the Tank Farms facility, operations management should develop administrative controls that require the prompt recording of information in the narrative logs.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter XI, Section C.2

"Information should be promptly recorded in the logs. Delaying the recording of activities or events often leads to incomplete or inaccurate entries."

9.11.3

Information to be Recorded

The Tank Farms operations manager should develop written guidance to define the type and scope of entries for each narrative log and should provide guidance to define the scope of the entries. Narrative logs are especially useful in reconstructing the course of events, therefore as much information as possible should be recorded during abnormal and emergency situations without taking away from providing primary attention to safe operation of the facility.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter XI, Section C.3

"The operations supervisor should provide written guidance to define thoroughly the type and scope of entries for each log and the format for making entries. The following information should be recorded in at least one station log, although any one log might not contain all these items:

- a. Facility mode or condition changes (e.g., shutdown, operations, run, startup, refueling, etc.);
- b. Criticalities and appropriate critical data (for DOE reactors);
- c. Abnormal facility configurations;
- d. Status changes to safety-related and other major facility equipment;
- e. Occurrence of any reportable events;
- f. Initiation and completion of surveillance tests;

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- g. Entering and exiting operational limit actions;
- h. Security incidents;
- i. Out-of-specification chemistry or process results; and
- j. Shift reliefs."

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XI, Section C.3, Paragraph 2

"To aid in event reconstruction, as much significant information as possible should be logged during emergencies and abnormal or unexpected events. However, logkeeping should not take precedence over controlling and monitoring the facility."

9.11.4

Legibility

Log entries should be made in accordance with written Tank Farms operations instructions which require entries that are easily read, understood, and are reproducible.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter XI, Section C.4

"Log entries should be made in a manner such that they can be easily read and understood. Additionally, the log entries should be readily reproducible with standard photocopy machines. For these reasons, black, waterproof ink is recommended."

9.11.5

Corrections

Tank Farms operations management should establish written guidance for corrections to logs. Errors in logs should be corrected by drawing a single line through the entry, writing the correct entry nearby, and then initialling and dating the entry.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter XI, Section C.5

"A standardized method for correcting any erroneous entries should be established. The method chosen should not obscure the incorrect entry. Log entries should not be erased or covered up. Corrections can be made by placing a single line through the incorrect entry and writing the correct entry in a nearby space. All corrections should be initialed and dated."

9.11.6

Log Review

Log reviews are an important part of shift turnover both for the off-going operators and shift manager to ensure the logs are accurate and complete, and for the oncoming personnel to aid in their understanding of the status of plant operations. Additionally, it is important for the operations manager to review the facility logs on a daily basis.

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SITE REQUIREMENT SOURCE: DOE5480.19 Chapter XI, Section C.6

"Control area logs should be reviewed periodically by the operations supervisor and logs kept by operators outside the control area should be reviewed by the control area operator or an appropriate supervisor. These reviews should ensure that entries are accurate and adequate."

9.11.7

Care and Keeping of Logs

The disposition of completed logs should be detailed in Tank Farms procedures. Written guidance should be provided to ensure completed logs are available to operations personnel for a reasonable length of time, to provide for the secure filing of completed logs and to ensure their continued retrievability.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter XI, Section C.7

"Management should provide written guidance on the disposition of completed logs. This guidance should address the following:

- a. Making the logs available for operators who return after periods of absence from their regular duties;
- b. Storing the completed logs to ensure preservation for the expected life of the facility; and
- c. Retrieving stored logs should this become necessary."

9.12

OPERATIONS SHIFT TURNOVER

When Tank Farms operations continue into the next shift, operations shift turnovers should provide oncoming operators with an accurate picture of the overall operations status of the Tank Farms. This element complements the guidelines of Section 9.2, Shift Routines and Operating Practices, and Section 9.3, Control Station Activities, and describes the important aspects of a good shift turnover. INPO 84-008 (Good Practice OP-201), Shift Relief and Turnover, is an example program that can be of assistance in implementing the intent of some of the guidelines of this element.

9.12.1

Shift Turnover Checklists

Shift turnovers within the Tank Farms facility should be facilitated by the use of checklists. Written checklists should be used by operations personnel as part of a formal process for documenting and communicating status and other key information regarding operating systems, operating parameters, and key evolutions in progress or planned.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XII, Section C.1

"As a minimum, supervisory positions should have a turnover checklist to be used in the turnover process."

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FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XII, Section C.1.a

"Equipment operator checklists, or other formal documents, should provide for noting major components status (e.g., operating pumps, trains in service, etc.), abnormal lineups, valid alarms on all pertinent local control panels, and surveillances or evolutions planned or in progress. Provisions should also be made for documenting that a review of round sheets and narrative logs has been performed by the oncoming operator."

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XII, Section C.1.b

"Operator checklists or other documents reviewed at shift change should provide for recording vital information about the following facility status. Examples may include:

- (1) Facility power level, test status, or equivalent;
- (2) Key temperatures limit status;
- (3) Key pressures limit status;
- (4) Important tank levels;
- (5) Safety equipment status;
- (6) Operational limits in effect;
- (7) Other important parameters;
- (8) Required chemistry or process sample times;
- (9) Maintenance, surveillances, tests, or evolutions (in progress or planned);
- (10) Problems experienced with equipment and major equipment out of service;
- (11) When specific planned actions are required;
- (12) Changes in radiological or hazardous materials conditions; and
- (13) Temporary procedure changes in effect."

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XII, Section C.1.b, Paragraph 2

"Operator checklists may require documenting reviews of certain facility status documents. These may include the operator's own operating (narrative) log, the Tagout (clearance) log, the temporary modification and jumper logs, the out-of-service annunciator log, the operational limit action log, the shift

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order books, and required reading since the last shift. Each operator turnover checklist should be provided with enough space for the offgoing operator to list other important information his relief should have."

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XII, Section C.1.c

"Operations supervisory checklists or other documents reviewed at shift change should provide vital information about facility status. Examples may include:

- (1) Facility status;
- (2) Evolutions (completed, in progress, or planned);
- (3) Controlled key status;
- (4) Abnormal lineups or conditions;
- (5) Changes in radiological or hazardous substance conditions;
- (6) Surveillance tests planned or in progress;
- (7) Maintenance planned or in progress; and
- (8) Waste management status."

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XII, Section C.1.c, Paragraph 2

"Operations supervisory checklists should require documenting review of certain status documents. These can include the supervisor's own narrative log, the status log, the equipment status checklist, the emergency safeguards equipment list, shift order books, and required reading since the last shift."

9.12.2

Document Review

Written guidance should be developed to ensure operators review the documents specified on their watch station checklist prior to assuming responsibility for their shift position.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XII, Section C.2

"Oncoming operators and supervisors should review documents specified on their checklists prior to assuming responsibility for their shift position. Document review should be as intensive as necessary for the oncoming personnel to understand important history, present status, and planned events. Normally, narrative log entries for the previous 24-hour period or since his/her last shift should be reviewed. Status logs should be reviewed so that the operator and supervisors are familiar with all currently active entries, with an emphasis on what has changed since he/she last had the shift."

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9.12.3

Control Panel Walkdown

Each Tank Farms shift watchstander should perform a walkdown of the control panels in his area of responsibility to determine plant status through the observation of system lineups, switch positions, lighted annunciators, chart recorders, and status lights. Guidance should also be provided to address the timing of these walkdowns for each watchstander, including the Shift Manager.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XII, Section C.3, Paragraph 1

"Walkdowns of appropriate control panels should be conducted by each shift watchstander. The purpose of a panel walkdown is to determine plant status through observation of system lineups, switch positions, lighted annunciators, chart recorders, and status lights."

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XII, Section C.3, Paragraph 2

"Oncoming operations supervisors should walk down the main control panels before, during, or shortly after shift turnover. Oncoming and offgoing control area operators should walk down their unit's main control panel together. Equipment operators should review all pertinent local control panels, (e.g., fuel supplies, lubrication levels, makeup water treatment, and ventilation) during their tour early in the shift."

9.12.4

Discussion and Exchange of Responsibility

Offgoing and oncoming Tank Farms watchstanders should discuss all items noted on the turnover checklists to achieve understanding before the responsibility for the watchstation is transferred.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XII, Section C.4, Paragraph 1

"At a time when facility conditions are stable, the offgoing supervisor or operator should explain all items noted on the turnover checklist, and the oncoming operator or supervisor should ask any pertinent questions."

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XII, Section C.4, Paragraph 2

"When all operations personnel are satisfied that the oncoming crew is fully cognizant of the plant conditions, the oncoming operators and supervisors should state that he/she is assuming responsibility for the shift position with an entry into the log."

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9.12.5

Shift Crew Briefing

The Tank Farms shift manager should conduct a briefing for all operations watchstanders and individuals from other departments, such as planning and scheduling, and maintenance. This briefing, which should be conducted shortly after the shift manager assumes the watch should include a review of facility status, problems with components or systems, and evolutions in progress or planned for the shift. The objective of the briefing is to ensure all personnel have a good understanding of status, objectives, and priorities for the shift.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XII, Section C.5

"Crew briefing should be conducted by the operations supervisor as required and may be conducted after he has accepted responsibility for the shift. The briefing should include a review of the status, problems with equipment, and evolutions in progress or planned during the shift. In addition to shift operators, personnel from support groups (e.g., contractors, vendors, and test groups) should also attend briefings when their activities can directly affect operations. This practice results in better understanding of shift priorities and objectives among operations and support personnel."

9.12.6

Reliefs Occurring During the Shift

Written guidance should be provided to ensure that when a watch relief must occur during the shift, a turnover sufficient to ensure the oncoming person is at least as knowledgeable of the facility conditions as he would have been if the relief occurred at the normal time. The shift manager must be apprised of all shift reliefs.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XII, Section C.6

"Reliefs occurring during the shift (e.g., exchange of control supervisory function) should have a turnover to ensure that the oncoming person is at least as knowledgeable of the conditions as he would have been had a complete shift turnover process been conducted. For example, control panel walkdowns and log reviews may or may not be necessary, depending on the oncoming person's familiarity with the current conditions."

9.13

OPERATIONS ASPECTS OF FACILITY CHEMISTRY AND UNIQUE PROCESSES

Operational monitoring of Tank Farms chemistry and process data and parameters should ensure that parameters are properly maintained. Maintenance of proper processes will promote maximum component life and the safe and efficient operation of all systems that handle waste streams within the facility. Monitoring will identify problems such as improper pH, conductivity, or liquids/solids ratio in the evaporator facility, before components or safety are adversely affected. In order to enhance proper process control of systems, Tank Farms operations personnel must have an understanding of all facility

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processes and must effectively coordinate operations activities with the respective technical process support departments.

Operators should understand the responsibilities associated with their positions (both in process monitoring and control and in interface with the technical process department) so that they can identify early signs of process-related problems. Operators should also understand how equipment and operational problems affect process conditions. A good working relationship between the operations and technical process departments should be established so the facility staff can effectively control facility processes.

9.13.1

Operator Responsibilities

Evaporator operators should monitor chemistry parameters using control room instruments and other instruments related to equipment under the operations department's control. The operations manager should provide administrative controls that define each operator's specific responsibilities with respect to chemistry control. Through proper monitoring, and appropriate corrective action, the adverse affects of chemistry problems can be minimized.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter XIII, Section C.1

"The operations supervisor should define each operator's specific responsibilities with respect to process control. In general, operators should monitor chemistry or process parameters using control room instruments and other instruments related to equipment under operations control. Operators should be able to recognize out-of-specification conditions or adverse trends and be familiar with corrective actions associated with chemistry or process problems. Operators should consult and be advised by chemistry or technical process department personnel. By monitoring key parameters and taking appropriate action promptly, long-term adverse effects of chemistry or process problems can be avoided or minimized."

9.13.2

Operator Knowledge

Operators should be knowledgeable of the significance of various process chemistry parameters on the operation of Evaporator systems. This knowledge will allow the operators to respond appropriately to changes in chemistry parameters. The operations manager should ensure that these subjects are covered in training programs.

9.13.3

Operator Response to Chemistry or Process Problems

Tank farms management should ensure that each operator is capable of correctly interpreting the chemistry parameters he is responsible for monitoring and providing appropriate, timely, corrective action when required.

9.13.4

Communication Between Operations and Technical Process Support Personnel

Administrative controls should be developed to ensure that operations informs other departments when changes in process will require their support. Close

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relations between operations and supporting departments should be fostered in order to more effectively and efficiently coordinate activities.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XIII, Section C.4

"If possible, operators should inform appropriate process personnel prior to commencing evolutions that could potentially affect facility processes or require action from support technicians. Operators should receive reports from the process department on key day-to-day process results and problems."

9.14

REQUIRED READING

Tank Farms management should develop a required reading program for operations personnel that will ensure appropriate individuals are made aware of important job related information, such as procedure revisions and equipment changes. The program should provide guidance as to who is to review which documents. A deadline for document reviews should be established and operators should be instructed to seek assistance from supervision if they do not understand the material.

9.14.1

Reading File Index

The Tank Farms operations manager should develop and maintain a list of the types of documents to be included in the required reading file. Examples of documents to be included are procedure changes, equipment design changes, operating experience, and other information needed to keep operations personnel informed of current facility activities.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XIV, Section C.1, Paragraph 1

"A list of the types of documents to be included in the required reading file should be maintained. The list should include the following documents:

- a. Procedure changes;
- b. Equipment design changes;
- c. Related industry and in-house operating experience information; and
- d. Other information necessary to keep operations department personnel aware of current facility activities."

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XIV, Section C.1, Paragraph 2

"Reading material should be screened to ensure that only appropriate material is placed in the file."

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9.14.2

Reading Assignments

Written guidance should be provided to ensure the individuals filling each watchstation are aware of which documents they are responsible for reading.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XIV, Section C.2

"A method should be in place to designate which documents need to be read by the individuals filling each position, and the reading file should be readily available to those individuals."

9.14.3

Dates for Completion of Required Reading

All documents in the required reading file should have a date specified for completion of reading.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XIV, Section C.3

"A required completion date should be designated for reading each document. This date would be determined based on the nature of the material. Personnel should complete their reading assignments by the required date. Certain documents may be designated for "immediate reading." These should be read before assuming responsibility for a shift position."

9.14.4

Documentation

Documentation of the completion of each reading should be retained.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XIV, Section C.4

"Completion of reading should be documented, and the documentation should be retained."

9.14.5

Review

Administrative controls should be established to require periodic reviews to ensure that required readings are being completed by the specified date.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XIV, Section C.5

"The reading file should be periodically reviewed to ensure that all department personnel complete readings by the required dates. Material that has been read by all appropriate personnel should be removed from the active file. A "dead" file may be maintained as a reference."

9.15

TIMELY ORDERS TO OPERATORS

Operations management should communicate short-term information and administrative instructions to department personnel through an established formal process. This element provides requirements for operations orders

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relative to content and format; issuing, segregating, and reviewing orders; and removing orders. Other means of providing direction to Tank Farms operators are addressed in Section 9.16, Operations Procedures and Section 9.14, Required Reading.

9.15.1

Content and Format

Operator orders may include many types of short term information, but should not be used in place of the operating procedure change program. All information should be clearly written, timely, and should be maintained in the shift office to facilitate its use. Some examples of information that may be included are: administrative directions, special parameter logging requirements, notifications of upcoming special tests or other evolutions, and similar short-term matters.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XV, Section C.1

"Information such as special operations, administrative directions, special data-collection requirements, plotting process parameters, and other similar short-term matters can be included in operator orders. Examples of orders could include instructions on the need for and performance of specific evolutions or tests; it could also include work priorities, announcements of policy information, and administrative information. Orders should be clearly written, dated, and maintained in the control room. Information and policies intended as permanent should be incorporated into appropriate administrative procedures. The operator orders program should not be used to change operating procedures, because the changes noted in the operator orders might be missed by a procedure user. Additionally, operator orders may not receive the approval appropriate for a procedural change."

9.15.2

Issuing, Segregating, and Reviewing Orders

Operating orders may be used to provide timely information that is applicable over an extended period. In this case the operating orders should be separated into daily and standing (long term) orders in order to facilitate their review. Operators should review orders shortly after assuming their shift and should document this review.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter XV, Section C.2

"Operator orders should be issued by the operations supervisor or his/her designee whenever necessary to communicate instructions to the shift personnel. Operator orders should be segregated into daily and long-term orders in order to facilitate review by shift personnel. Daily orders that are postponed or prolonged should have daily review or updates. Reviews of long-term orders may not be required on a daily basis but should be made periodically and when changes occur. Appropriate operations personnel should review the orders early in the shift and document their review by initialing the log or notebook."

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9.15.3

Removal of Orders

Orders that are no longer applicable should be removed from the operating orders book. A periodic review by the operations manager should be performed to ensure all active orders are required.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter XV, Section C.3

"Orders that are no longer applicable or are outdated should be promptly removed or canceled. The operations supervisor should periodically review the operator orders to ensure that only applicable and current orders remain effective."

9.16

OPERATIONS PROCEDURES

Operations procedures are written to provide specific directions for Tank Farms operations staff to operate systems and equipment during normal and postulated abnormal and emergency conditions. Operations procedures provide appropriate direction to ensure that the facility and equipment is operated in accordance with its design basis and within its safety envelope (safe operating limits). They are effectively used to support safe operation of the facility. Other methods of disseminating operational information are addressed in Section 9.15, Timely Orders To Operators, and Section 9.17, Operator Aid Postings. This element describes the important aspects of operations procedure development and use. INPO 84-021 (Good Practice OP-204), Conduct of INPO 84-020 (Good Practice OP-210), Review of Operations Department Procedures, are example programs that can be of assistance in implementing the intent of some of the guidelines in this element. The requirements for operations procedure administration, approval, and use to be implemented at the Tank Farms are found in the Policies and Procedures functional area of the Management Systems RID.

9.16.1

Procedure Development

Tank Farms Operations management should provide written guidance to control the development of operations procedures. This guidance should include qualification requirements for writers and reviewers, requirements for the format to be used (writers guide), types of procedures to be developed, extent of detail to be included and for the review, verification, validation, and approval process.

9.16.2

Procedure Content

The content of operations procedures should be uniform and should be controlled by written guidelines to ensure accuracy, adequacy for intended purpose, and ease of use.

9.16.3

Procedure Changes and Revisions

Written guidance should be provided to ensure that changes and revisions to procedures receive adequate review, approval, and implementation.

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Additionally guidance should be provided to assist operators in determining when a change or revision should be made to a procedure. For example, procedure revisions should be implemented concurrently with modifications to facility systems or components.

9.16.4

Procedure Approval

Written guidance should be provided detailing the level of approval required for new procedures, for procedure revisions (they should receive the same level of approval as new procedures), for approval of changes that do not affect the intent of the procedure, and for approval of changes that alter the intent of the procedure (these should receive the same level of approval as new or revised procedures).

9.16.5

Procedure Review

Written guidance should be developed to govern the review of new and revised operations procedures. The accuracy and applicability of procedures is vital to the safe and efficient operation of Tank Farms. Procedures should therefore be reviewed prior to issue and at predetermined intervals thereafter. Reviews should consider both the technical accuracy and the administrative adequacy of the procedure.

9.16.6

Procedure Availability

Controlled copies of operations procedures should be maintained at the shift office and in other areas as needed for operation and reference by operators. Where the use of working copies is required controls should be established to ensure that outdated versions are not used.

9.16.7

Procedure Use

Tank Farms management should establish written requirement for the use of procedures. This guidance should address when the procedure must be in-hand, and when procedures may be referred to rather being in-hand for step by step execution. In addition, operators should clearly understand the requirements for procedure use at Tank Farms, and should understand their obligations to initiate a procedure change when procedures are found to be deficient.

9.17

OPERATOR AID POSTINGS

Operator Aids may be used to provide useful information to operators in performing their duties. Included among operator aids are handwritten notes, information tags, drawings and sketches, excerpts from procedures, curves, and graphs. Operator Aids should be maintained current and should not supersede or conflict with any other controlled procedure or information. This element provides the requirements necessary to develop, approve, post, use, document, and review Operator Aids at the Tank Farms.

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9.17.1

Operator Aid Development

Administrative guidance should be developed to ensure the operator aid program is understood by all employees. Normally operator aids are developed by operators but other personnel may have a need to post information. For this reason it is important that all employees understand that all operational information must be approved prior to posting. Additionally it is important that employees understand that operator aids may not be used in lieu of danger tags.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XVII, Section C.1

"Any facility employee could develop an operator aid; however, it should be approved prior to posting. Operator aids (system drawings, maintenance procedures, etc.) may often be posted by individuals other than operations personnel; therefore, all facility personnel should be informed of the importance of controlling posted information and the procedure to be followed when posting information."

9.17.2

Approval

To ensure that only accurate and necessary operator aids are posted, administrative controls should be established to require all operator aids to be approved by the Tank Farms Operations Manager.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XVII, Section C.2

"The operations supervisor, or a higher authority, should approve all operator aids. The person approving an operator aid should ensure that the aid is necessary and correct. Operator aids that alter procedures should not be approved. Instead, appropriate procedures should be changed to incorporate the necessary information."

9.17.3

Posting

Generally operator aids should be posted in close proximity to the area of expected use. Guidance should be developed to ensure that the aid does not obscure indications or interfere with controls. Additionally, the aid should be durable and constructed such that unauthorized changes will be readily noticed.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XVII, Section C.3

"Operator aids should not be posted in such a way as to obscure instruments or controls. The aids should be located in close proximity to the area of their expected use. The operator aids should, when possible, be protected (laminated) and should be securely fastened to the equipment to which they refer."

9.17.4

Use of Operator Aids

All personnel should understand that operator aids are provided as a

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convenience. They do not substitute for procedures but, rather provide amplifying information useful in certain situations.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XVII, Section C.4

"Operator aids should be viewed as a convenience to the individual using them, not a requirement. In most cases, operator aids remind users of information that might otherwise be overlooked and provide guidance that is not procedural in nature. Operator aids may supplement approved procedures, but they should not be used in lieu of approved procedures."

9.17.5

Documentation

Administrative controls should be developed to ensure that documentation of all operator aids is maintained. A list of all approved aids should be maintained along with a file copy of the aid as posted. Maintenance of a file copy of the aid will allow timely and accurate replacement should an aid be found missing or damaged.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XVII, Section C.5

"A listing of all approved operator aids should be maintained along with a copy of each aid posted in the facility. This list should be used during periodic reviews of operator aids in order to help ensure that the posted aids remain current, and to provide a reference copy should an operator aid be missing during the review. The list should be kept in the control area, the operations supervisor's office, or other appropriate location. References from which operator aids were derived, control numbers (including revision), and dates of approval should be provided."

9.17.6

Review

The Tank Farms operator aid program should provide for a periodic review of all operator aids to ensure only approved, necessary, and accurate aids are posted. Since some operator aids may be excerpts from procedures or drawings, it is important to ensure a system is in place to update the operator aid whenever its source document is revised.

FACILITY REQUIREMENT SOURCE: DOE5480.19 Chapter XVII, Section C.6

"The posted operator aids should be reviewed periodically to ensure they are still correct and necessary. In addition, an operator should audit the control area listing to ensure that only currently posted aids are recorded on the listing. Operator aids no longer posted should be removed from the listing, and missing aids should be replaced."

9.18

EQUIPMENT AND PIPING LABELING

A formally implemented and maintained program for equipment and piping labeling will help ensure that personnel are able to positively identify equipment they operate. In addition, equipment labeling is required by

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Operational Safety and Health Administration (OSHA) regulations. This element describes the important aspects of a Labeling Program which include identification of equipment and piping to be labeled; label information; label placement; and label replacement procedures for piping and equipment at the Tank Farm facility. INPO 84-007 (Good Practice OP-208), System and Component Labeling, is an example program that could be of assistance in implementing the intent of some of the guidelines of this element.

9.18.1

Components Requiring Labeling

The Tank Farms labeling program can be an important factor in decreasing the likelihood of abnormal events due to operation of the wrong equipment. The labeling program should provide an approved list of component types that require labeling. In addition to equipment, doors, hatches, and access covers should be labeled so that personnel can identify not only the room or space beyond but, if applicable, the equipment inside.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter XVIII Section C.1

"The following components should be labeled:

- a. Valves;
- b. Major equipment (e.g., tanks, pumps, and compressors);
- c. Switches;
- d. Circuit breakers (4.16KV, 480V, 120VAC/DC, etc.);
- e. Fuse blocks or fuse locations;
- f. Instruments and gauges;
- g. Busses and motor control centers;
- h. Cabinets (including internal components such as relays, terminals, etc.);
- i. Room doors;
- j. Emergency equipment (such as fire alarm stations, sound powered phone headsets, etc.); and
- k. Fire protection systems."

SITE REQUIREMENT SOURCE: DOE6430.1A Division 13, Section 1300-12.4.11, Paragraph 1

"Equipment and any parts of that equipment to be used by personnel shall be identified with appropriate labels. Equipment and equipment parts include, but are not limited to, system and subsystem component groupings, individual

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components, control positions or modes, display markings, instructions, procedure manuals, storage spaces, access panels, and tools."

9.18.2

Label Information

The Tank Farms labeling program should provide specific guidance for the information to be included on labels. All information should be consistent with the information found on approved documents such as procedures and drawings used by the operations staff. Piping should be labelled to indicate the normal direction of flow and should also indicate the fluid contained. Piping containing hazardous materials should be uniquely identified. It is also important to ensure that the materials labels are made from are durable and compatible with their application.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter XVIII, Section C.2, Paragraph 1

"Information on labels should be consistent with the information found in facility procedures, valve lineup sheets, and piping and instrument diagrams. Abbreviations and nomenclature used should be standardized and should be understood by facility personnel. Labels should be permanent, securely attached, and have distinguishable, easy-to-read information. Each component label should list a unique component number. The accompanying component noun name or description and power supply, if applicable, should also be provided. Labels may be color coded for unit, system, and/or train designation. If color coding is used, the colors should be applied consistently and have only one meaning per color or combination."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter XVIII, Section C.2, Paragraph 2

"Piping should be labeled to indicate the fluid contained and the normal flow direction. OSHA color coding for pipes could be used, and pipes containing potentially radioactive fluids, toxic fluids, or explosive gases should be uniquely marked."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter XVIII, Section C.2, Paragraph 3

"Labels should be made from materials that are compatible with their particular application. For example, chloride-free labels should be used on stainless steel piping, and temperature-tolerant labels should be used on hot components. Adhesives used for label attachment should also be verified for compatibility."

SITE REQUIREMENT SOURCE: DOE6430.1A Division 13, Section 1300-12.4.11, Paragraphs 2-5, 8-12

"The label shall indicate clearly and concisely the function and purpose of the item being labeled. Unnecessary information (e.g., information used only for manufacturing purposes) shall not be included. Hierarchical

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labeling also shall be used to facilitate component location on control panels.

The label information shall be easy to understand. Words, symbols, and other markings in a label or instruction shall be unambiguous and accurate. The terminology used shall have commonly accepted meaning for all users.

Label design shall be consistent. The use of abbreviations and acronyms shall be minimized.

Various equipment labels placed on the same or similar pieces of equipment and serving similar functions shall use the same material, color, font type, relative location to component, general format, and other configuration features to promote simplicity and avoid clutter.

Temporary labels shall be used only when necessary and shall be controlled administratively. They shall not obscure other information or equipment, and they shall be attached securely. If a temporary label is to designate a device that is out of service, the label shall be applied so that it prevents the use of that device. Other label criteria described in this section shall apply to temporary labels.

Labeling shall be legible and conform to human visual capabilities and limitations in regard to physical characteristics such as letter and symbol size, contrast, font simplicity, spacing and stroke width.

Properly designed mimic displays shall be used to improve the users understanding of the system.

Specific guidelines for addressing labeling considerations are contained in NUREG 0700, Section 6.6.; and MIL-STD-1472C, Section 5.5. See Section 1040, Identifying Devices."

9.18.3

Label Placement

Guidance should be provided for consistent placement of labels to aid operators and others in the rapid and accurate identification of components. Labels should generally be placed as close as possible to the component identified. Consideration must also be given to the possibility of obscuring other equipment such as alarm indications, or placing labels such that they obstruct access to controls when developing label placement guidelines.

SITE REQUIREMENT SOURCE: DOE5480.1, Chapter XVIII, Section C.3

"Labels should be placed on or as near as practicable to the equipment to be labeled. The label should be oriented in a manner that is easy to read and so that the correct component is easy to identify."

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SITE REQUIREMENT SOURCE: DOE6430.1A Division 13, Section 1300-12.4.11, Paragraphs 6, 7

"The terminology used for equipment, procedures, and training materials shall be the same for each case.

Permanent labels shall be attached to the specific component or equipment in such a manner that environmental conditions or usage by personnel will not remove or destroy the label. "

9.18.4

Replacing Labels

The Tank Farms labeling program should provide for the timely identification and accurate replacement of missing labels. Consideration should be given to conducting a label verification as part of maintenance closeout activities as labels are often lost in the course of maintenance.

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter XVIII, Section C.4.a

"Procedures should be established to ensure that misplaced or damaged labels are replaced. Since labels are often missing after maintenance, the post-maintenance test could require a check to ensure that the appropriate labels are attached. Another method that could be used to check for labels is to add another column to valve lineup sheets that would require the operator to verify that labels are present, readable, and undamaged."

SITE REQUIREMENT SOURCE: DOE5480.19 Chapter XVIII, Section C.4.b

"A method should exist to help ensure the prompt identification and correction of labeling deficiencies. A number of ways can be suggested to accomplish this: operators could make labels on their own, or operators could fill out forms and forward them to a central facility to have labels made. In either case, a temporary label should be attached to the component until the replacement label can be made. The replacement label should be approved by the operations supervisor (or higher authority). In most cases the presence of labeling machines on-site promotes relabeling."

9.19

KEY PROGRAM INTERFACES

The programs with which the elements and sub-elements of this RID have interfaces are the following, to the extent that they are directly related to Tank Farms operations. Specific requirement interfaces are noted at the element /sub-element level in the RID.

CONFIGURATION MANAGEMENT

Configuration management interfaces with Operations in ensuring that Design Basis drawings of Critical Structures, Systems, Components, Programmatic Policies and Procedures, and Operations Procedures reflect the current configuration and/or operational status.

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ENGINEERING

Engineering provides Design Basis drawings of Critical Structures, Systems, Components plus performs review of Work Control documents and establishes post-maintenance test procedures to ensure that facility repairs and modifications conform to the design basis.

EMERGENCY PREPAREDNESS

Emergency preparedness prescribes the topical content and directs development of facility Emergency Plans plus provides emergency response procedures to Operations.

MAINTENANCE

Maintenance provides the Work Control System for the conduct of maintenance on Operations structures, systems, and components. Procurement for spare parts for Operations structures, systems, and components is conducted by Maintenance along with the warehousing and control of spare parts.

MANAGEMENT SYSTEMS

Management Systems provides the administrative programs and procedures for control of operations such as Technical Operating Procedures, documentation of operational activities such as operational and surveillance record retention and storage, Occurrence Reporting, and operational improvement procedures such as Corrective Action and Issue Management.

NUCLEAR SAFETY

Nuclear Safety provides safety analysis of the facility design basis and develops Operational Safety Requirements for the operation of the Tank Farms including Limiting Conditions of Operation, Surveillance Requirements for Safety Systems, and Administrative Controls necessary to maintain the "Safety Envelope" for the facility.

OCCUPATIONAL HEALTH AND SAFETY

Occupational Health and Safety develops the programs and implementing procedures for identification and mitigation of industrial safety including chemical and physical hazards, industrial hygiene, and medical evaluation and treatment.

QUALITY ASSURANCE

Quality Assurance develops the Quality Assurance program that provides the requirements to be applied to activities determined to be important to quality as described in the Operations Quality Assurance Plan. Quality Assurance also provides for the performance of assurance audits and surveillances of Operations activities plus Quality Control inspections to be performed by a Quality Assurance organization.

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RADIATION PROTECTION

Radiation Protection programs and procedures establish the systems that monitor the radiation levels in the work place and in facility effluents plus monitor exposure to personnel. Radiation Protection also establishes the operational procedures necessary to protect operations personnel and the environment from exposure and uncontrolled releases.

TRAINING AND QUALIFICATION

Training and Qualification establishes the procedures and qualification requirements that control the training and/or selection of operations personnel. Training and Qualification develops training curricula and programs and provides instructional services to operations.

FIRE PROTECTION

Fire Protection establishes the requirements for surveillance of fire protection equipment such as fire extinguishers, and fire prevention activities such as proper storage and handling of flammable materials.

CONSTRUCTION

The Operations interface with Construction involves control of construction activities in Operations areas in terms of access control and control of work activities. Operations also interfaces with Construction in the acceptance testing of new construction and modifications.

SELF ASSESSMENT

Operations develops Performance Objectives and Criteria and Performance Indicators to determine the effectiveness of administrative control systems such as procedures and facility status control programs. Productivity and mission effectiveness are also used in assessing Operations performance. An additional interface is in assessing compliance with DOE Orders.

ENVIRONMENTAL PROTECTION

The Operations interface with Environmental Protection involves the timely notification of Environmental Protection in the event of a spill or release of hazardous material to the environment

OCCURRENCE REPORTING

Operations interfaces with Occurrence Reporting in the investigation and disposition of reportable occurrences.

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