

<b>RADIATION PROTECTION, SAFETY AND HEALTH, AND ENVIRONMENTAL PROTECTION PROGRAMS FOR NRC REGULATED FACILITIES</b>	Identifier: PRD-317		
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## 1. PURPOSE

This document provides the administrative requirements and guidelines for implementing the Radiation Protection, Safety and Health, and Environmental Protection Programs for nuclear facilities licensed by the Nuclear Regulatory Commission (NRC).

The NRC-licensed ISFSIs are fully committed to implementing the following: Performance Metrics and key milestones; Lessons learned; Integrated work control plan; and ICARE.

## 2. APPLICABILITY

These requirements and guidelines apply to the Three Mile Island, Unit 2 (TMI-2) and Fort St. Vrain (FSV) Independent Spent Fuel Storage Installations (ISFSI) as well as the Idaho Spent Fuel Facility (ISFF).

## 3. REQUIREMENTS

**NOTE:** *The ISFSI/ISFF Facility Safety Officer (FSO) will be responsible for all radiation protection activities at the ISFSI/ISFF with implementation performed by contractor personnel, or subcontractors working under the direction of the contractor, in accordance with approved procedures.*

### 3.1 Radiation Protection Program

**NOTE:** *There are some subtle differences between the radiation protection requirements in 10 CFR 20 and the procedures referenced in this document, which are also used to implement the radiation protection requirements of 10 CFR 835 for the Idaho Cleanup Project (ICP) at the Idaho National Laboratory (INL). When such differences are noted, and have not been addressed in this document, the requirements of 10 CFR 20 will take precedence.*

#### 3.1.1 General Provisions

The requirements in Section 3.1 of this document are standards for protection against ionizing radiation resulting from activities conducted under licenses issued by the NRC. These requirements shall apply to facilities licensed to receive, possess, use, transfer, or dispose of by-product, source, or special nuclear material under 10 CFR 72. The NRC must authorize any interpretation of the meaning of these requirements before it can be recognized as binding. Communications or

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reports concerning these requirements shall be addressed through the licensee to the NRC. The Office of Management and Budget (OMB) has approved the information collection requirements contained in Section 3.1 of this document under control number 3150-0014. (10 CFR 20, Subpart A)

**3.1.2 Radiation Protection Programs**

3.1.2.1 Section 3.1 of this document shall serve as the licensee's radiation protection program commensurate with the scope and extent of the licensed activities at the INL, and is sufficient to ensure compliance with these requirements. This radiation protection program shall be implemented through procedures specified within this document which have been developed for use at the INL to implement the requirements of 10 CFR 835, applicable sections of which shall be used to demonstrate compliance with 10 CFR 20. (10 CFR 20.1101[a])

**NOTE 1:** *The ISFSI/ISFF FSO will act as the ISFSI/ISFF representative on the INTEC As Low As Reasonably Achievable (ALARA) Committee. The ISFSI/ISFF Facility Manager and the Department of Energy (DOE) Facility Director will attend INTEC ALARA Committee meetings, either in person or via teleconference, when the respective ISFSI/ISFF is to be discussed.*

**NOTE 2:** *The ALARA program implemented at the respective ISFSI/ISFF will include the following key elements: ALARA design and procedural reviews by qualified staff and committees; pre and post job reviews including the establishment of person rem goals; planning for special tools, ventilation, shielding, services, and communications equipment; trending of radiological performance factors including worker exposures, personnel contamination, waste generation, and area contamination; ALARA Committee reviews of selected activities; training for selected jobs; and management review of radiation protection program effectiveness.*

3.1.2.2 Procedures and engineering controls shall be used to the extent practicable and based upon sound radiation protection principles, to achieve occupational radiation doses and radiation doses to members of the public (non-occupational exposure) that are as low as reasonably achievable (ALARA). Demonstration of compliance with this

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requirement shall be achieved through implementation of the ALARA program in accordance with MCP-91, “ALARA Program and Implementation,” which also adopts the guidance in NRC Regulatory Guides 8.8 and 8.10. (10 CFR 20.1101[b])

- 3.1.2.3 The content and implementation of this radiation protection program shall be reviewed annually. Demonstration of compliance with this requirement shall be achieved through implementation of MCP-8, “Performing Management Assessments and Management Reviews.” (10 CFR 20.1101[c])

**NOTE:** *The need for any constraint on air emission of radioactive materials from the ISFF will be determined prior to construction.*

- 3.1.2.4 A constraint on air emissions of radioactive material to the environment will not need to be established since, by design, no significant radioactive emissions are generated during routine fuel storage operations. For the TMI-2 ISFSI, the projected highest total effective dose equivalent to the maximum exposed individual member of the public (outside the INL boundary) is less than 10 mrem per year. For the FSV ISFSI, the maximum annual dose rate to a member of the public at the controlled area boundary is 13 mrem per year and is only attributed to direct and scattered radiation from the facility. (10 CFR 20.1101[d])

### 3.1.3 Occupational Dose Limits

**NOTE 1:** *Emergency radiation exposures will not be exempt from the occupational radiation exposure control requirements of 10 CFR 20.1201, unlike the exemption allowed in 10 CFR 835.202.*

**NOTE 2:** *Elbows and knees will be considered part of the whole body (10 CFR 20.1004), not extremities.*

- 3.1.3.1 Occupational radiation exposure shall be controlled in accordance with established federal limits. With the exception of planned special exposure, occupational radiation exposure shall be administratively limited to 20% of the limits specified in 10 CFR 20.1201. Occupational exposure shall be tracked in accordance with MCP-188, “TLD Usage and Obtaining Personnel Dose History.” MCP-189, “Multiple, Neutron and Extremity TLD

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Dosimeters,” shall be used for monitoring and reporting exposure in non-uniform radiation fields. MCP-191, “Radiological Internal Dosimetry,” shall be used for monitoring internal exposure, with the exception that 10 CFR 20.1201 allows use of the derived air concentration (DAC) and annual limit on intake (ALI) in determining an individual exposure regardless of whether or not bioassay data is available. MCP-188 shall also be used for accounting of occupational exposure received at other facilities. Form 441.04, Personnel Exposure Questionnaire may be used as necessary to ensure radiation exposure is assigned in accordance with 10 CFR 20. (10 CFR 20.1201)

**NOTE:** *Regulatory Guide 8.40 discusses alternate methods for measuring effective dose equivalent from non-uniform external exposure.*

- A. When the external exposure is determined by measurement with an external personal monitoring device, the deep-dose equivalent must be used in place of the effective dose equivalent, unless the effective dose equivalent is determined by a dosimetry method approved by the NRC. The assigned deep-dose equivalent must be for the part of the body receiving the highest exposure. The assigned shallow-dose equivalent must be the dose averaged over the contiguous 10 square centimeters of skin receiving the highest exposure. The deep-dose equivalent, lens-dose equivalent, and shallow-dose equivalent may be assessed from surveys or other radiation measurements for the purpose of demonstrating compliance with the occupational dose limits, if the individual monitoring device was not in the region of highest potential exposure, or the results of individual monitoring are unavailable.

3.1.3.2 Summation of external and internal exposures shall be performed in accordance with MCP-191. Summation of external and internal exposures may be demonstrated by meeting one of the following conditions. (10 CFR 20.1202)

- A. If the only intake of radionuclides is by inhalation, the total effective dose equivalent (TEDE) limit is not exceeded if the sum of the deep-dose equivalent divided by the TEDE limit, and one of the following, does not exceed unity: the sum of the fractions of the

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inhalation ALI for each radionuclide, or the total number of DAC-hours for all radionuclides divided by 2,000, or the sum of the calculated committed effective dose equivalent (CEDE) to all significantly irradiated organs or tissues calculated from bioassay data using appropriate biological models and expressed as a fraction of the annual limit.

- B. If the occupationally exposed individual also receives an intake of radionuclides by oral ingestion greater than 10% of the applicable oral ALI, account for the intake and include it in demonstrating compliance with the limits.
- C. Evaluate and, to the extent practical, account for intakes of radionuclides through wounds or skin absorption.
- 3.1.3.3 Determination of external dose from airborne radioactive material shall be handled on a case-by-case basis. Each facility is designed such that there are no significant sources of radioactive material that may become airborne. (10 CFR 20.1203)
- 3.1.3.4 Determination of internal exposure shall be performed in accordance with MCP-191. If DAC are used in the determination of internal exposures, the applicable DAC values in 10 CFR 20, Appendix B, which are summarized in Appendix A of this document, shall be used. (10 CFR 20.1204)
- 3.1.3.5 The need for planned special exposure at either ISFSI/ISFF is not anticipated, but shall be controlled as follows with exceptions from 10 CFR 835 requirements noted: (10 CFR 20.1206)
- A. A planned special exposure shall only be authorized in an exceptional situation when alternatives that might avoid the dose estimated to result from the planned special exposure are unavailable or impractical.
- B. Written employer authorization is required before a planned special exposure occurs.

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- C. Written consent is not required from each individual prior to a planned special exposure, but each individual involved shall be 1) informed of the purpose of the planned operation, 2) informed of the estimated doses and associated potential risks and specific radiation levels or other conditions that might be involved in performing the task, and 3) instructed in the measures to be taken to keep the dose ALARA considering other risks that may be present.
- D. The internal and external doses from all previous planned special exposures, and all doses in excess of the limits received during the lifetime of an individual, shall be determined prior to permitting an individual to participate in a planned special exposure. (19 CFR 20.2104)
- E. A planned special exposure shall not be authorized if it would cause an individual to receive a dose from all planned special exposures and all doses in excess of the limits to exceed the numerical values of any of the dose limits in 10 CFR 20.1201(a) in any year, and five times the annual dose limits in 10 CFR 20.1201(a) during the individual's lifetime.
- 3.1.3.6 The annual occupational dose for minors shall be limited to 500 mrem. (10 CFR 20.1207)
- 3.1.3.7 Dose to an embryo/fetus shall be controlled in accordance with MCP-145, "Radiation Protection for Embryo/Fetus." Efforts shall be made to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman. If the dose limit to an embryo/fetus is already exceeded by the time a worker declares her pregnancy, an additional 50 mrem for the remainder of the gestation period may be allowed. (10 CFR 20.1208)

**3.1.4 Radiation Dose Limits for Individual Members of the Public**

- 3.1.4.1 Radiation exposure (non-occupational) to individual members of the public outside a restricted area shall not exceed 100 mrem/y. Radiation exposure to any member of the public in the general environment (outside the INL [for TMI-2 ISFSI and ISFF] or FSV ISFSI 100-meter perimeter boundary) shall be limited to an annual TEDE

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of 25 mrem, a thyroid dose of 75 mrem, and 25 mrem to any other organ. (40 CFR 190.10, 40 CFR 191.03, 10 CFR 20.1301, 10 CFR 72.126(d) and 72.104)

- 3.1.4.2 The results of the ISFSI/ISFF Radiological Environmental Monitoring Program (as well as the INL Environmental Monitoring Program and the INL National Emission Standards for Hazardous Air Pollutants (NESHAP) annual report for the TMI-2 ISFSI and ISFF) shall be used to verify compliance with the exposure limits. The dose rate in any unrestricted area shall be maintained less than 2 mrem/h and 50 mrem/y for continuous exposed individuals. (10 CFR 20.1302)

**3.1.5 Radiological Criteria for License Termination**

- 3.1.5.1 When a license termination plan or proposal for release of either ISFSI site for unrestricted use is developed, compliance with the radiological criteria for license termination shall be demonstrated. Decommissioning plans for the FSV ISFSI the TMI-2 ISFSI, and the ISFF are docketed (Docket No. 72-09 72-20, and 72-25 respectively) as Chapter 10 of the respective license applications. (10 CFR 20, Subpart E)

**NOTE:** *The 1991 INEL Diffuse Emissions NESHAPS Report documented an average subsurface residual radioactivity inside the ICPP fence as 12.0, 3.0, 0.08, 0.07, and 0.6 pCi/g for Cs-137, Eu-152, Nb-95, Ru-106, and Sb-125 respectively. (EDF No. NESHAPS-91-DIFFUSE) Prior to construction of the TMI-2 ISFSI radioanalytical results of soil bore hole samples collected within the footprint of the storage pad indicated an average Cs-137 concentration of 0.4 pCi/g to a soil depth of 4 feet. Lesser and/or no detectable concentrations were detected at soil depths up to 12 feet. (SKE-09-98)*

- 3.1.5.2 ISFSI operations shall, to the extent practical, be conducted to minimize the introduction of residual radioactivity into the site, including the subsurface, in accordance with the radiation protection requirements and radiological criteria for license termination. (10 CFR 20.1406(c))

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**3.1.6 Surveys and Monitoring**

3.1.6.1 Internal and external occupational radiation exposure monitoring thresholds specified in 10 CFR 20 (10% of applicable limits for adults; minors likely to receive 100 mrem/y DDE or CEDE, 150 mrem/y LDE, or 500 mrem/y SDE or EDE; declared pregnant workers likely to receive 100 mrem/y DDE or CEDE) are not anticipated to be exceeded during routine operation of either ISFSI/ISFF. Capability for providing such monitoring in accordance with MCP-145, MCP-148, "Personnel Decontamination," MCP-188, MCP-189, MCP-191, and MCP-357, "Job-Specific Air Sampling/Monitoring Program," shall be maintained as applicable. (10 CFR 20.1502)

**NOTE 1:** *Surveys for loose surface contamination will include gross alpha radioactivity unless technical justification for not surveying for gross alpha contamination is documented.*

**NOTE 2:** *Technical justification for not performing alpha surveys at FSV is based on the fact the FSV SAR Section 7 does not mention alpha source terms or potential doses arising from alpha emitters (see reference FJB-12-12).*

3.1.6.2 Radiation, contamination, and airborne radioactivity surveys shall be performed periodically in either ISFSI or ISFF in accordance with MCP-139, "Radiological Surveys," and MCP-357, "Job Specific Air Sampling/Monitoring Program," as applicable. Contamination surveys may be performed using either a scaler or a count rate meter. (10 CFR 20.1501)

**NOTE 1:** *10 CFR 20.1101 and 1501 require survey frequencies commensurate with the scope and extent of activities at the licensed facility. The survey frequencies will either be specified in the respective ISFSI technical specifications or performed quarterly as a minimum.*

**NOTE 2:** *Survey frequencies, radiological condition assessment, and method of documentation for the ISFF will be determined prior to facility operation.*

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**NOTE 3:** *A minimum of seven dosimetry stations will be maintained inside the FSV ISFSI structure. Stations will be located above the Charge Face and in the Alarm Station, as directed by the Facility Manager.*

**NOTE 4:** *Changes in radiological conditions that exceed three standard deviations above either the pre-operational baseline or historical mean warrant investigation.*

- A. During normal fuel storage operations, routine radiation and contamination surveys shall be performed quarterly, as a minimum, at the FSV ISFSI and TMI-2 ISFSI. At the TMI-2 ISFSI additional radiological surveys will be conducted in accordance with the TMI-2 ISFSI technical specifications.

**NOTE:** *Neutron dose equivalent rate surveys will be performed at the TMI-2 ISFSI prior to loaded cask shipments from the TMI-2 ISFSI, and during implementation of radiation monitoring surveillances required by technical specifications.*

- B. Radiological conditions during Dry Shielded Canister (DSC) transfer loading operations at the TMI-2 ISFSI and during other than normal fuel storage operations at the FSV ISFSI shall be evaluated. Appropriate radiation and contamination survey requirements shall be implemented as necessary.

**NOTE:** *The Minimum Detectable Activity (MDA) for contamination smears, when counted with a scaler and calculated in accordance with Appendix B, or the background count rate if using a count rate meter, will be recorded on the survey report. Results of each contamination survey point may be recorded. "Less than MDA" or "Background" is an acceptable entry on the report.*

- C. ISFSI surveys shall be documented on an ISFSI Radiological Survey Report as follows for the TMI-2 ISFSI and FSV ISFSI:

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1. For routine radiological surveys at the TMI-2 ISFSI use Form 431.84, "TMI-2 ISFSI Radiological Survey Report," (See Appendix C for example).
2. Use TPR-7066, "Periodic HSM Monitoring, DSC Sampling, and Filter Housing Leak Tests" during its implementation at the TMI-2 ISFSI.
3. Use either Appendix D or TPR-5613, "FSV ISFSI Radiation Survey and Vault Drain System Sample Collection and Analysis," for the FSV ISFSI.

3.1.6.3 Radiation and contamination monitoring instrumentation shall be calibrated periodically for the types of radiation measured in accordance with MCP-93, "Health Physics Instrumentation." Documentation of such calibration shall either be provided by the service provider or readily retrievable upon request. (10 CFR 20.1501)

3.1.6.4 Thermoluminescent dosimetry shall be used when occupational radiation exposure monitoring is performed. (10 CFR 20.1502)

3.1.6.5 Personnel thermoluminescent dosimetry, when used, shall be processed at the INL by a DOE Laboratory Accreditation Program (DOELAP) accredited processor. For the purpose of demonstrating compliance with 10 CFR 20.1501, DOELAP accreditation shall be considered a National Voluntary Laboratory Accreditation Program (NVLAP) accreditation equivalent for the radiation performance categories that approximate the radiation environment at the TMI-2 ISFSI FSV ISFSI and ISFF. (10 CFR 20.1501)

### 3.1.7 Control of Exposure from External Sources in Restricted Areas

**NOTE 1:** *The criteria for releasing material from posted contamination areas at either the TMI-2 ISFSI, the FSV ISFSI, or ISFF for unrestricted use will not be the release criteria specified in MCP-425, "Radiological Release Surveys and the Control and Movement of Contaminated Material," Appendix B, but "no detectable radioactivity" which is defined as follows:*

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- A. *Less than MDA when loose surface contamination smears are counted using a scaler*
- B. *Less than 100 cpm above background (ncpm) when monitoring with a count rate meter (for example, pancake GM probe, and counter).*

**NOTE 2:** *Since material released from posted contamination areas at the TMI-2 ISFSI is released to INTEC, which is subsequently regulated under 10 CFR 835, material that is contaminated above the release criteria noted above may be conditionally released to INTEC in accordance with MCP-425, Sections 4.3 or 4.4, depending on the level of contamination relative to the release criteria specified in MCP-425, Appendix B.*

**NOTE 3:** *When a cask is shipped from the TMI-2 ISFSI, release criteria will be those specified in the respective transport plans. Since the release criteria are considerably higher than those specified in MCP-425, Appendix B, the ALARA goal for contamination control purposes will be the criteria specified in MCP-425, Appendix B.*

- 3.1.7.1 All material leaving a posted contamination area shall be surveyed prior to unrestricted release to uncontrolled areas in accordance with MCP-425.

**NOTE:** *The threshold for application of special control of access to high radiation areas will be 100 mrem/h at 30 centimeters per 10 CFR 20.1601, not 1 rem/h as required by 10 CFR 835.502.*

- 3.1.7.2 During routine transfer and storage operations at either ISFSI, personnel access points to high radiation areas (HRA) and very high radiation areas (VHRA) shall be posted and controlled using the guidance from NRC Regulatory Guide 8.38 as applicable. HRAs shall remain locked when not accessed and posted in accordance with MCP-187, "Posting Radiological Control Areas." Access shall be controlled using the radiological work permit (RWP) process in accordance with MCP-7, "Radiological Work Permit." (10 CFR 20.1601 and 20.1602)

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**3.1.8 Respiratory Protection and Controls to Restrict Internal Exposure  
in Restricted Areas**

**NOTE:** *The respiratory protection program at the ICP is implemented in accordance with MCP-2726, “Respiratory Protection”. In addition to the ICP requirements, the following additional requirements apply during respirator usage at the respective NRC regulated facilities. Where there is a conflict between requirements, the 10 CFR 20 requirements will take precedence.*

- 3.1.8.1 Process or other engineering controls such as containment or ventilation are to be used, to the extent practical, to control the concentrations of radioactive material in air. (10 CFR 20.1701)
- 3.1.8.2 When it is not practical to apply process or other engineering controls to control concentrations of radioactive material in air to less than 0.1 DAC (conservatively limiting exposure to 12 DAC-hours in an 84-hour work week), radiation exposure monitoring is to be increased and intakes of radioactive material are to be limited by access control, limitation of exposure time, use of respiratory protection and/or other controls. Safety factors other than radiological factors may be considered if an ALARA analysis is performed to determine whether or not respirators should be used. The impact of respirator use on workers’ industrial health and safety should also be considered. (10 CFR 20.1702)
- 3.1.8.3 Only respiratory protection equipment that is tested and certified by the National Institute for Occupational Safety and Health (NIOSH) is to be used. Exceptions to this requirement may be allowed through a formal application process. (10 CFR 20.1703[a] and [b])
- 3.1.8.4 The respiratory protection program is to include 1) air sampling sufficient to identify the potential hazard, permit proper equipment selection, and estimate exposures, 2) surveys and bioassays as appropriate to evaluate actual intakes, 3) testing of respirators for operability immediately prior to each use, 4) written procedures regarding monitoring, including air sampling and bioassays, supervision and training of respirator users, fit testing, respirator selection, breathing air quality, inventory and control, storage, issuance, maintenance, repair, testing and

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quality assurance of respiratory protection equipment, recordkeeping, and limitations on periods of respirator use and relief from respirator use, 5) determination by a physician prior to initial fitting of a face sealing respirator, before the first field use of non-face sealing respirators, and every 12 months thereafter or periodically at a frequency determined by a physician, that the individual user is medically fit to use the respiratory protection equipment, and 6) fit testing, with a fit factor at least 10 times the assigned protection factor for negative pressure devices, and a fit factor at least 500 times the assigned protection factor for any positive pressure, continuous flow, and pressure-demand devices, before the first field use of tight fitting, face-sealing respirators and periodically thereafter at a frequency not to exceed one year. Fit testing must be performed with the facepiece operating in the negative pressure mode. (10 CFR 20.1703[c])

- 3.1.8.5 Each respirator user is to be advised that they may leave the area at any time for relief from respirator use in the event of equipment malfunction, physical or psychological distress, procedural or communication failure, significant deterioration of operating conditions, or any other conditions that might require such relief. (10CFR20.1703[d])
- 3.1.8.6 Limitations appropriate to the type and mode of use shall be considered. Provisions shall be made for vision correction, adequate communication, low temperature work environments, and the concurrent use of other safety or radiological protection equipment. Equipment shall be used in such a way as not to interfere with proper operation of the respirator. (10 CFR 20.1703[e])
- 3.1.8.7 Standby rescue persons are required whenever one-piece atmosphere-supplying suits, or any combination of supplied air respiratory protection device and personnel protective equipment are used from which an unaided individual would have difficulty extricating himself or herself. The standby persons must be equipped with respiratory protection devices or other apparatus appropriate for the potential hazards. The standby rescue persons shall observe or otherwise maintain continuous communication with the workers, and be immediately available to assist them in case of a failure of the air supply or for any other reason that requires relief from distress. A sufficient number of standby

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rescue persons must be immediately available to assist all users of this type of equipment and to provide effective emergency rescue if needed. (10 CFR 20.1703[f])

- 3.1.8.8 Atmosphere-supplying respirators must be supplied with respirable air of grade D quality or better as defined by the Compressed Gas Association (Publication G-7.1, Commodity Specification for Air, 1997) and included in the regulations of the Occupational Safety and Health Administration (OSHA). (10 CFR 20.1703[g] and 29 CFR 1910.134)
- 3.1.8.9 No objects, materials or substances, such as facial hair, or any conditions that interfere with the face-facepiece seal or valve function, and that are under the control of the respirator wearer, shall be present between the skin of the wearer's face and the sealing surface of the tight-fitting respirator facepiece. (10 CFR 20.1703[h])
- 3.1.8.10 In estimating the dose to individuals from intake of airborne radioactive materials, the concentration of radioactive material in the air is inhaled when respirators are worn is initially assumed to be ambient concentration in air without reparatory protection, divided by the assigned protection factor. If the dose is later found to be greater than the estimated dose, the corrected value must be used. If the dose is later found to be less than the estimated dose, the corrected value may be used. (10 CFR 20.1703[i])
- 3.1.8.11 Authorization shall be obtained from the NRC before using assigned protection factors in excess of those specified in 10 CFR 20, Appendix A and summarized in Appendix F of this document. (10 CFR 20.1705)

**3.1.9 Storage and Control of Licensed Material**

- 3.1.9.1 Licensed material shall be controlled at either ISFSI/ISFF through implementation of MCP-121, "Areas Containing Radioactive Materials," and MCP-137, "Radioactive Source Accountability and Control," as applicable. (10 CFR 20.1801 and 20.1802)

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**NOTE 1:** *Restricted Areas, as defined in 10 CFR 20.1003, are the same as Controlled Areas, as defined in MCP-187, Appendix B. The Controlled Area, as defined by 10 CFR 20.1003, is outside the ISFSI/ISFF perimeter fence and is not required to be posted.*

**NOTE 2:** *Any area requiring posting as a Radioactive Material Area (RMA) is defined as having stored licensed material exceeding ten times the quantities specified in 10 CFR 20, Appendix C.*

**NOTE 3:** *Airborne Radioactivity Areas will be posted when either the airborne radioactivity exceeds 1 DAC or there is a potential to receive 0.6 percent of an ALI (12 DAC-hours) in a week. Refer to Appendix A for the ALI and DAC values of the respective radionuclides.*

### 3.1.10 Precautionary Procedures

3.1.10.1 Characterized radiological areas, as defined in 10 CFR 20.1003, shall be posted and controlled through implementation of MCP-187 as applicable to demonstrate compliance. (10 CFR 20.1901, 20.1902, and 20.1903)

- A. 10 CFR 20.1901 allows use of the color purple on caution signs containing the standard radiation symbol.
- B. Exceptions to color requirements are allowed for items that are subjected to high temperature. (10 CFR 20.1901)
- C. Contamination Areas (CA) or High Contamination Area (HCA) are neither defined in 10 CFR 20 nor required to be posted. However, to ensure consistent application of contamination controls within INTEC, CAs shall be posted if loose surface contamination levels exceed 1,000 dpm beta-gamma or 20 dpm alpha per 100 cm<sup>2</sup>. HCAs shall be posted if loose surface contamination levels exceed 100,000 dpm beta-gamma or 2,000 dpm alpha per 100 cm<sup>2</sup>.

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- D. Areas or rooms in which amounts of licensed material exceed ten times the quantities in 10 CFR 20, Appendix C, shall be posted as “Caution” or “Danger Radioactive Material” area. (10 CFR 20.1902)
  - E. In addition to the contents of signs and labels prescribed in this part, and as needed, provide, on or near the required signs and labels, additional information, as appropriate, to make individuals aware of potential radiation exposures and to minimize the exposures. (10 CFR 20.1901)
- 3.1.10.2 Containers of licensed material shall be labeled and controlled through implementation of MCP-187 as applicable to demonstrate compliance. (10 CFR 20.1904 and 20.1905)
- A. Each container of licensed material shall be clearly labeled with a radiation symbol, the words “Caution” or “Danger Radioactive Material,” and sufficient information to determine appropriate precautions to avoid or minimize exposures. The label must be durable.
  - B. Prior to the removal or disposal of empty uncontaminated containers to unrestricted areas, the radioactive material label shall either be removed or defaced.
  - C. Labeling exemptions specified in 10 CFR 20.1905 may be used when applicable.
- 3.1.10.3 The receipt and opening of packages shall be performed in accordance with the following controls: (10 CFR 20.1906)
- A. When an ISFSI/ISFF expects to receive a package containing quantities of radioactive material in excess of a Type A quantity, arrangements shall be made to receive the package when the carrier offers it for delivery, or be notified of the arrival of the package at the carrier’s terminal and to take possession of the package expeditiously.

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**NOTE:** *The transfer of special form sources in government owned or operated vehicles to and from an ISFSI are exempt from the contamination monitoring requirements of the following paragraph, but is not exempt from the survey requirement for measuring radiation levels that is required to ensure that the source is still properly lodged in its shield.*

- B. The external surfaces of a package labeled with a Radioactive White I, Yellow II, or Yellow III label shall be monitored for radioactive contamination unless the package contains only radioactive material in the form of a gas or in special form. The external surfaces of the labeled package shall be monitored for radiation levels unless the package contains quantities of radioactive material that are less than or equal to the Type A quantity. All packages known to contain radioactive material shall be monitored for radioactive contamination and radiation levels if there is evidence of degradation of package integrity (such as packages that are crushed or damaged). Monitoring required by this paragraph shall be performed as soon as practical after receipt of the package, but no later than 3 hours after the package is received at the ISFSI/ISFF if it is received during normal working hours, or not later than 3 hours from the beginning of the next working day if it is received after normal working hours.
- C. If removable radioactive surface contamination levels exceed the corresponding federal limits of 10 CFR 71.87, or external radiation levels exceed federal limits of 10 CFR 71.47, then the FSO shall be notified so that immediate notification can be made to the carrier and the NRC.

**NOTE:** *The following paragraph and referenced procedures reflect the rolldown of requirements in 10 CFR 20.1906(e). Due consideration will be given to special instructions for the type of package being opened.*

- D. Once the preceding paragraphs of this section are performed as appropriate, open the package while

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implementing radiological controls as necessary for the quantity and form of radioactive material received. Upon discovery of any evidence of damage to the package or its contents, place the package in a safe and controlled location and notify Packaging and Transportation of the damaged package in accordance with MCP-2669, "Hazardous Material Shipping."

**3.1.11 Waste Disposal**

3.1.11.1 Licensed material shall be disposed either by transfer to DOE, the primary contractor, or other authorized recipients, in accordance with MCP-1390, "Waste Generator Services Waste Management." (10 CFR 20.2001)

**NOTE 1:** *Approval of disposal procedures will be obtained when the need for disposal of licensed material becomes necessary at the FSV ISFSI. Temporary on-site storage of such material, in accordance with MCP-121, will be the interim option until disposal procedure approval is obtained. (10 CFR 20.2002)*

**NOTE 2:** *The need for discharge of licensed material into sanitary sewerage is not anticipated at either ISFSI, therefore demonstration of compliance with the requirements controlling such activity is not necessary. (10 CFR 20.2003)*

**NOTE 3:** *Licensed material designated as radioactive waste is presently neither generated nor disposed at the FSV ISFSI. A maximum of fifteen 55 gallon drums of low-level waste (approximately 100 cubic feet) will be stored in the Modular Vault Dry Storage (MVDS). (FSV ISFSI SAR, Section 3.3.6)*

**NOTE 4:** *Staging of low-level waste in the transfer cask reception bay at the FSV ISFSI will not be permitted when a cask containing spent fuel is in the cask load/unload port in order to assure a potential fire does not impact a loaded cask. (FSV ISFSI SAR, Section 7.6.4.4)*

**NOTE 5:** *In order to reduce the potential for a low-level radioactive waste fire from involving the Depleted Uranium Plugs, a minimum of 20 horizontal feet separation will be required between the plugs and any drums containing low-level waste stored at the FSV ISFSI. (FSV ISFSI SAR, Section 7.6.4.4)*

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**NOTE 6:** *The need for treatment or disposal by incineration of licensed material is not anticipated at the FSV ISFSI, therefore demonstration of compliance with the requirements controlling such activity is not necessary. (10 CFR 20.2004 and 20.2005)*

**NOTE 7:** *A shipping manifest tracking system will be established when the transfer of low-level radioactive waste from the FSV ISFSI for disposal at a land disposal facility becomes necessary. Such transfers will be controlled. (10 CFR 20.2006)*

3.1.11.2 Licensed material from the TMI-2 ISFSI and ISFF shall be treated in accordance with MCP-1390. A shipping manifest tracking system shall be established when transfer of low-level radioactive waste for disposal at a land disposal facility becomes necessary. Such transfers shall be controlled. (10 CFR 20.2004, 20.2005, and 20.2006)

**3.1.12 Records**

3.1.12.1 The ISFSIs and ISFF shall use the units of Curie, rad, rem, including multiples and subdivisions thereof, on required records. SI units may be included in parentheses. Clear distinction as to the type of dose equivalent shall also be made among the quantities entered on the records when appropriate. (10 CFR 20.2101)

3.1.12.2 Survey results used in the determination of dose from external radiation sources; measurement results and calculations used to determine individual intakes of radioactive material and used in the assessment of internal dose; results of air sampling, surveys, and bioassays to substantiate the respiratory protection program; and measurement results and calculations used to evaluate the release of radioactive effluents to the environment shall be retained for the duration of the license in accordance with MCP-557, "Records Management." (10 CFR 20.2102 and 20.2103)

3.1.12.3 Records of audits and reviews of the program content and implementation, radiological surveys, and radiological monitoring equipment calibrations shall be retained for a minimum of three years in accordance with MCP-557. (10 CFR 20.2103)

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**NOTE:** *Records from surveys describing the location and amount of subsurface residual radioactivity identified at the site must be kept with records important for decommissioning, and such records must be retained accordingly.  
(10 CFR 20.1501(b))*

3.1.12.4 Records of radiological surveys which document spills, unusual occurrences involving the spread of radioactive contamination, and results of measurements and calculations used to evaluate the release of radioactive effluents to the environment, and contain information important to the decommissioning of the ISFSI/ISFF shall be retained in an identified location for the duration of the license, or until the site is released for unrestricted use, in accordance with MCP-557 and forwarded to the NRC Region IV office prior to license termination. Records considered important to decommissioning consist of the following.  
(10 CFR 20.2103, 72.30, and 72.80)

- A. Records of spills or other unusual occurrences involving the spread of contamination in and around the facility, equipment, or site. These records may be limited to instances when contamination remains after any cleanup procedures or when there is reasonable likelihood that contaminants may have spread to inaccessible areas as in the case of possible seepage into porous material such as concrete. These records must include any known information on identification of involved nuclides, quantities, forms, and concentrations. (10 CFR 72.30(d)(1))
- B. As-built drawings and modifications of structures and equipment in restricted areas where radioactive materials are used and/or stored, and of locations of possible inaccessible contamination such as buried pipes which may be subject to contamination. If drawings are not available, appropriate records of available information concerning these areas and locations shall be substituted. (10 CFR 72.30(d)(2))

**NOTE:** *A restricted area means any area, access to which is limited by the licensee for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials. For the purposes of demonstrating compliance with 10 CFR 72.30(d)(3), this note*

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*provides the list of designated and formerly designated restricted areas. The restricted areas designated and formerly designated at the TMI-2 ISFSI are the areas inside the Protected Area chain link fence barrier. The restricted areas designated and formerly designated at the FSV ISFSI are the areas inside the Protected Area barrier, and the spare parts storage room in the Entrance Facility. The restricted areas designated and formerly designated at the ISFF are the areas inside the Protected Area chain link fence barrier.*

- C. A list contained in a single document and updated no less than every two years of all areas designated and formerly designated as restricted areas as defined under 10 CFR 20.1003, and all areas outside of restricted areas that require documentation under 72.30(d)(1). (10 CFR 72.30(d)(3))
- 3.1.12.5 The occupational radiation dose received during the current year shall be determined for each individual who is likely to receive an annual occupational dose requiring monitoring. A variety of records may be accepted to determine the dose received, but exposure history of each individual shall be recorded on NRC Form 4 or other clear and legible record, including all of the information required by NRC Form 4. The form or record must show each period in which the individual received occupational exposure to radiation or radioactive material and must be signed by the individual who received the exposure. For each period for which reports are obtained, the dose shown in the report in preparing the NRC Form 4 shall be used. For any period for which a report is not obtained, a notation shall be placed on the NRC Form 4 indicating the periods of time for which data are not available. The NRC Form 4 or equivalent shall be retained for the duration of the license in accordance with MCP-557. (10 CFR 20.2104)
- 3.1.12.6 Records of individual occupational radiation monitoring results, planned special exposures, and exposure to individual members of the public shall be retained for the duration of the license in accordance with MCP-557. (10 CFR 20.2105, 20.2106, and 20.2107)

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- 3.1.12.7 Records of licensed material disposal shall be retained for the duration of the license in accordance with MCP-557. (10 CFR 20.2108)
- 3.1.12.8 The legibility of each record shall be maintained throughout the specified retention period. Each record shall be either an original, a reproduced copy, or a microform. Authorized personnel shall authenticate each copy and microform. Each microform shall be capable of producing a clear copy throughout the required retention period. Records shall also be stored in electronic media with the capability for producing legible, accurate, and complete records during the required retention period. Adequate safeguards against tampering with and loss of records shall be maintained. (10 CFR 20.2110)

**3.1.13 Reports**

- 3.1.13.1 Any theft or loss of licensed material shall be reported. (10 CFR 20.2201)
- 3.1.13.2 Any event involving byproduct, source, or special nuclear material in possession at either ISFSI/ISFF that may have caused, or threatens to cause, exposure and intake thresholds established in 10 CFR 20.2202(a) to be exceeded shall be reported immediately. Exposure data included in the report shall be provided to the occupationally exposed individual. The report must be transmitted no later than the transmittal to the NRC. (10 CFR 19.13 and 10 CFR 20.2202)
- 3.1.13.3 The discovery of any event involving loss of control of licensed material in possession at either ISFSI/ISFF that may have caused, or threatens to cause, exposure and intake thresholds established in 10 CFR 20.2202(b) to be exceeded shall be reported within 24 hours of discovery. Exposure data included in the report shall be provided to the occupationally exposed individual. The report must be transmitted no later than the transmittal to the NRC. (10 CFR 19.13 and 10 CFR 20.2202)
- 3.1.13.4 Any event resulting in exposure, radiation level, or radioactive material concentration thresholds in 10 CFR 20.2203 to be exceeded shall be reported within 30 days after learning of the event. Exposure data included in the report shall be provided to the occupationally exposed individual or an identified member of the public. The report

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must be transmitted no later than the transmittal to the NRC. (10 CFR 19.13, 10 CFR 20.2203, and 10 CFR 20.2205)

- 3.1.13.5 The occurrence of any planned special exposure shall be reported within 30 days following the exposure. The best estimate of dose resulting from a planned special exposure shall be reported. Exposure data included in the report shall be provided to the occupationally exposed individual. The report must be transmitted no later than the transmittal to the NRC. Preauthorization reports that are required by 10 CFR 835.204 are not applicable to planned special exposures received at either ISFSI. (10 CFR 20.1206, 10 CFR 20.2204, 10 CFR 20.2205, and 10 CFR 19.13)

**NOTE:** *Occupational radiation exposure reported to monitored individuals and the NRC in accordance with 10 CFR 20.2206 and 10 CFR 19.13 shall be the annual cumulative exposure received at the INL when the cumulative direct reading or electronic dosimetry responses for a monitored individual while working in an ISFSI/ISFF exceed the minimum detectable dose of a personnel thermoluminescent dosimeter (typically 10 mrem) to be consistent with information reported in accordance with 10 CFR 835.801.*

- 3.1.13.6 An annual report for the preceding year of the results of individual monitoring carried out at either ISFSI/ISFF for each individual for whom monitoring was required shall be submitted prior to April 30 of each year. An annual report shall be provided to each individual monitored of the dose received in that monitoring year if the individual's occupational dose exceeds 100 mrem TEDE or 100 mrem to any individual organ or tissue, or the individual requests his or her annual dose report. (10 CFR 19.13 and 10 CFR 20.2206)

- A. Each notification and report sent to an individual shall be in writing and include appropriate identifying data such as the name of the licensee, the name of the individual, the individual's social security number, the individual's exposure information, and contain the statement: "This report is furnished to you under the provisions of the Nuclear Regulatory Commission regulation 10 CFR 19. You should preserve this report for future reference."

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- B. The occupational radiation exposure reported to each individual shall be based on records maintained in accordance with 10 CFR 20.2106. The body burden of radionuclides may be included in records of individual monitoring results.
- C. At the request of a worker formally engaged in licensed activities at either ISFSI/ISFF, a report of the worker's exposure to radiation and/or radioactive material shall be furnished. This report shall be furnished within thirty days of the request, or within thirty days after the exposure of the individual has been determined, whichever is later.
- D. At the request of a worker who is terminating employment that involved exposure to radiation or radioactive material at either ISFSI/ISFF during the current monitoring period, a written report regarding the radiation dose received by that worker from operation at the ISFSI/ISFF during the monitoring period shall be provided at termination. If the most recent monitoring results are not available, then a written estimate of the dose shall be provided.

**NOTE:** *The FSV and TMI-2 ISFSIs (and eventually the ISFF) do not possess Category 1 or Category 2 nationally tracked sources as defined in 10 CFR 20.1003.*

3.1.13.7 A National Source Tracking Transaction Report shall be completed and submitted for each type of transaction involving a nationally tracked source including manufacture, transfer, receipt, disassembly and disposal. (10 CFR 20.2207)

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**3.1.14 Exemptions and Additional Requirements**

- 3.1.14.1 The TMI-2 and FSV ISFSIs and the ISFF shall be exempt from the requirement in 10 CFR 20.1501(c) to have the personnel dosimetry processor accredited by NVLAP provided the type of radiation monitored is closely approximated by one or more of the DOELAP proficiency test categories. This exemption for the TMI-2 ISFSI is documented as License Condition 12(b) in Material License SNM-2508. This exemption for the FSV ISFSI was effective upon transfer of Materials License SNM-2504 to DOE (Docket 72-09, TAC No. L22388, March 12, 1999). This exemption for the ISFF is pending NRC review and approval. (10 CFR 20.2301)
- 3.1.14.2 Additional requirements may be imposed by the NRC by rule, regulation, or order as deemed appropriate or necessary to protect health or minimize danger to life or property. (10 CFR 20.2302)
- 3.1.14.3 The facility manager and FSO of each ISFSI/ISFF shall maintain Radiological Worker (either I or II) qualification in accordance with DOE Standardized Core Training.
- 3.1.14.4 The FSV ISFSI facility manager and FSO shall maintain Junior Radiological Control Technician, or equivalent/higher qualification, in accordance with DOE Standardized Core Training for implementation of routine radiation protection tasks specific to the ISFSI. Such qualification shall be tracked in the INL TRAIN as INL Radiation Monitor (QLRADMON).
- 3.1.14.5 Radiological control technicians supporting either ISFSI/ISFF shall maintain qualifications in accordance with DOE Standardized Core Training for implementation of routine radiation protection tasks specific to each ISFSI/ISFF.
- 3.1.14.6 All individuals who in the course of employment are likely to receive in a year an occupational dose in excess of 100 mrem while working at either ISFSI/ISFF shall receive required instructions. (10 CFR 19.12)

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**3.2 Safety and Health Program**

3.2.1 The Worker Safety and Health Program shall be implemented at each ISFSI/ISFF in accordance with the requirements of PRD-851 (10 CFR 851 Program Requirements Matrix). Safety professionals are available to provide oversight and assistance in safely performing the work scope.

3.2.2 A positive safety culture commensurate with the safety and security significance of the activities at the ISFSIs and the nature and complexity of the ISFSI Management organization and functions shall be established in accordance with the expectations of the NRC. The following are traits of a positive safety culture. Individuals and organizations performing or overseeing regulated activities involving nuclear materials at the ISFSIs should take the necessary steps to promote a positive safety culture by fostering these traits. (Final Safety Culture Policy Statement)

3.2.2.1 *Leadership Safety Values and Actions* – Leaders demonstrate a commitment to safety in their decisions and behaviors.

3.2.2.2 *Problem Identification and Resolution* – Issues potentially impacting safety are promptly identified, fully evaluated, and promptly addressed and corrected commensurate with their significance.

3.2.2.3 *Personnel Accountability* – All individuals take personal responsibility for safety.

3.2.2.4 *Work Processes* – The process of planning and controlling work activities is implemented so that safety is maintained.

3.2.2.5 *Continuous Learning* – Opportunities to learn about ways to ensure safety are sought out and implemented.

3.2.2.6 *Environment for Raising Concerns* – A safety conscious work environment is maintained where personnel feel free to raise safety concerns without fear of retaliation, intimidation, harassment, or discrimination.

3.2.2.7 *Effective Safety Communication* – Communications maintain a focus on safety.

3.2.2.8 *Respectful Work Environment* – Trust and respect permeate the organization.

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- 3.2.2.9 *Questioning Attitude* – Individuals avoid complacency and continuously challenge existing conditions and activities in order to identify discrepancies that might result in error or inappropriate action.

### 3.3 Environmental Protection Program

**NOTE:** *Since the FSV ISFSI is a conditionally exempt small quantity generator, Sections 3.3.1 and 3.3.2 apply only to the TMI-2 ISFSI. A similar section will be written for ISFF prior to construction.*

- 3.3.1 The NRC-licensed ISFSIs adhere to the CWI Environmental Policy by conducting their operations in a safe, compliant, and cost-effective manner that protects human health and the environment. This is achieved by integrating environmental requirements and pollution prevention into work planning and execution, and taking actions to minimize the environmental impacts of operations. Each activity utilizes the Integrated Safety Management System (ISMS) to provide a consistent approach to ensure environmental, worker, and public safety.

The NRC-licensed ISFSIs are fully committed to regulatory compliance and environmental stewardship. Safety and environmental requirements are established through PDD-1004, “Integrated Safety Management System,” and PDD-1012, “Environmental Management System.” The Environmental Management System integrates environmental protection, pollution prevention, and regulatory compliance into work planning and execution throughout all work areas as a function of the five core elements of ISMS and the elements of the ISO-14001, Environmental Management System Standard. Instructions to comply with environmental requirements are contained in MCP-3480, “Environmental Instructions for Facilities, Processes, Materials, and Equipment.”

- 3.3.2 An environmental regulatory compliance evaluation which documents which Resource Conservation Recovery Act (RCRA), Clean Air Act (CAA), Clean Water Act (CWA), and National Environmental Policy Act (NEPA) statutes are applicable to the ISFSI shall be completed in accordance with MCP-3480, “Environmental Instructions for Facilities, Processes, Materials, and Equipment.” The applicable statutes shall be implemented as described.

- 3.3.2.1 Effective, safe, and compliant management, generation, and disposition of low-level radioactive waste shall be performed in accordance with MCP-1390.

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- 3.3.2.2 Characterization, management, and final disposition of conditional industrial waste shall be performed in accordance with MCP-1390.
- 3.3.2.3 Actions necessary to identify air pollution regulatory requirements and associated compliance methods that apply to proposed sources and/or activities shall be performed in accordance with MCP-3480.
- 3.3.2.4 Spent lamps, tubes, and bulbs removed from service shall be replaced and managed appropriately.
- 3.3.2.5 The disposition of low-level radioactive waste shall be managed in accordance with MCP-1390.
- 3.3.2.6 Any solid radioactive, hazardous, and industrial waste generated shall be characterized appropriately.
- 3.3.2.7 MCP-3480 shall be implemented as applicable to ensure NEPA and federal environmental permitting requirements are demonstrated.
- 3.3.2.8 The federal and state codes, standards and regulations, DOE/NE-ID orders, policy and site-specific documents that wholly, or in part, impose requirements or provide guidelines applicable to the INL and the ISFSI shall be described in PRD-5030, “Environmental Requirements for Facilities, Processes, Materials, and Equipment.”
- 3.3.2.9 Any hazardous waste generated at the ISFSI shall be managed in accordance with MCP-1390.
- 3.3.2.10 The disposition of spent C-seals for the filter housing on the DSC and the inner sample port plug, due to their lead coating, shall be managed in accordance with MCP-1390.
- 3.3.2.11 Funding sources for laboratory services needed for Environmental Management funded activities shall be identified as necessary.
- 3.3.2.12 Required RCRA training shall be provided as necessary in accordance with MCP-3480.
- 3.3.2.13 Environmental management of motor carrier operations to and from the ISFSI shall be performed in accordance with MCP-2670, “Motor Carrier Operations.”

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- 3.3.2.14 Compliance with NRC licensing requirements for the independent storage of spent nuclear fuel (NEPA Environmental Assessment and Environmental Reports) shall be demonstrated in accordance with NEPA. Specifically, the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement* and the *Nuclear Regulatory Commission Final Environmental Assessment for the License Review for Fort St. Vrain Independent Spent Fuel Storage Installation* are used to demonstrate compliance.
- 3.3.2.15 Information required by 10 CFR 51 and 10 CFR 72 for NEPA regulation implementation and siting factors shall be provided in the ISFSI Environmental Report.
- 3.3.2.16 Compliance with MCP-3002, “Managing Disturbed Soils,” shall be demonstrated during any soil disturbance.
- 3.3.3 A list of the radioactive materials released to the atmosphere shall be included in the annual INL NESHAP Report. (40 CFR 61.94)

**NOTE:** *DOE is changing most of the dosimetric terms used in 10 CFR 835. Dosimetric terms used in the ICP radiation protection program and by the DOELAP accredited dosimetry processor are different from those used in 10 CFR 20. Until such time 10 CFR 20 is revised to reflect the new dosimetric terminology, the following crosswalk is to be used.*

<i>10 CFR 20 Dosimetric Terms</i>	<i>10 CFR 835 Dosimetric Terms</i>
<i>Committed effective dose equivalent</i>	<i>Committed effective dose</i>
<i>Committed dose equivalent</i>	<i>Committed equivalent dose</i>
<i>Cumulative total effective dose equivalent</i>	<i>Cumulative total effective dose</i>
<i>Deep dose equivalent</i>	<i>Deep equivalent dose</i>
<i>Dose equivalent</i>	<i>Equivalent dose</i>
<i>Effective dose equivalent</i>	<i>Effective dose</i>

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<i>Lens of the eye dose equivalent</i>	<i>Lens of the eye equivalent dose</i>
<i>Quality factor</i>	<i>Radiation weighting factor</i>
<i>Shallow dose equivalent</i>	<i>Shallow equivalent dose</i>
<i>Weighting factor</i>	<i>Total weighting factor</i>
<i>Total effective dose equivalent</i>	<i>Total effective dose</i>

#### 4. DEFINITIONS

Definitions applicable to the radiation protection program are provided in 10 CFR 20.1003.

#### 5. REFERENCES

10 CFR 19, “Notices, Instructions, and Reports to Workers: Inspections and Investigations”

10 CFR 20, “Standards for Protection Against Radiation”

10 CFR 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions”

10 CFR 71, “Packaging and Transportation of Radioactive Material”

10 CFR 72, “Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste”

10 CFR 73, “Physical Protection of Plants and Materials”

10 CFR 835, “Occupational Radiation Protection”

10 CFR 851, “Worker Safety and Health Program”

29 CFR 1910, “Occupational Safety and Health Standards”

40 CFR 61, “National Emission Standards for Hazardous Air Pollutants”

40 CFR 190, “Environmental Radiation Protection Standards for Nuclear Power Operations”

40 CFR 191, “Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes”

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Blanket Master Agreement (BMA) No. 509028, General Infrastructure Support  
Safeguards and Security

DOE/EH-0258T-1, “General Employee Radiological Training and Radiological Worker  
Training, Program Management Manual”

DOE/EH-0262T-2, “Radiological Control Technician, Standardized Technician  
Qualification Standard”

DOE Programmatic Spent Nuclear Fuel Management and Idaho National Engineering  
Laboratory Environmental Restoration and Waste Management Programs  
Environmental Impact Statement

EDF No. NESHAP-91-DIFFUSE, “1990 and 1991 NESHAPS Annual Report CAP-88  
Dose Assessment and Verification and Validation Report for Diffuse Emissions,”  
August 3, 1992

F. J. Borst Interoffice Memorandum to file, "Technical Justification for Not Performing  
Alpha Surveys at the Fort St. Vrain Independent Fuel Storage Installation", FJB-  
12-12, August 21, 2012

Form 431.84, “TMI-2 ISFSI Radiological Survey Report”

Fort St. Vrain Independent Spent Fuel Storage Installation Technical Specifications

Fort St. Vrain Independent Spent Fuel Storage Installation Environmental Report

Idaho Spent Fuel Facility Technical Specifications

Idaho Spent Fuel Facility Environmental Report

ISO-14001, Environmental Management System Standard

MCP-7, “Radiological Work Permit”

MCP-8, “Performing Management Assessments and Management Reviews”

MCP-1390, “Waste Generator Services Waste Management”

MCP-91, “ALARA Program and Implementation”

MCP-93, “Health Physics Instrumentation”

MCP-121, “Areas Containing Radioactive Materials”

MCP-137, “Radioactive Source Accountability and Control”

MCP-139, “Radiological Surveys”

MCP-145, “Radiation Protection for Embryo/Fetus”

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MCP-148, “Personnel Decontamination”

MCP-187, “Posting Radiological Control Areas”

MCP-188, “TLD Usage and Obtaining Personnel Dose History”

MCP-189, “Multiple, Neutron and Extremity TLD Dosimeters”

MCP-191, “Radiological Internal Dosimetry”

MCP-325, FSV Security Administration

MCP-357, “Job Specific Air Sampling/Monitoring Program”

MCP-425, “Radiological Release Surveys and the Control and Movement of  
Contaminated Material”

MCP-557, “Records Management”

MCP-2669, “Hazardous Material Shipping”

MCP-2670, “Motor Carrier Operations”

MCP-2726, “Respiratory Protection”

MCP-3002, “Managing Disturbed Soils”

MCP-3480, “Environmental Instructions for Facilities, Processes, Materials, and  
Equipment”

MCP-9435, “Fort St. Vrain (FSV) Weapons and Equipment”

Nuclear Regulatory Commission Final Environmental Assessment for the License  
Review for Fort St. Vrain Independent Spent Fuel Storage Installation

NUREG 1507, “Minimum Detectable Concentrations with Typical Radiation Survey  
Instruments for Various Contaminated Field Conditions”

PDD-1004, “Integrated Safety Management System”

PDD-1012, “Environmental Management System”

PRD-183, “ICP Radiological Control Manual”

PRD-851, “10 CFR 851 Program Requirements Matrix”

PRD-5030, “Environmental Requirements for Facilities, Processes, Materials, and  
Equipment”

Safety Analysis Report for the Fort St. Vrain Independent Spent Fuel Storage Installation

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Safety Analysis Report for the Idaho Spent Fuel facility Independent Spent Fuel Storage Installation

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S. K. Evans letter to R. P. Smith, “Revision to the November 8, 1998 Letter Summarizing the TMI-2 ISFSI Radiological Soil Sample Results,” SKE-09-98, December 14, 1998

Three Mile Island—2 Independent Spent Fuel Storage Installation Technical Specifications

Three Mile Island—2 Independent Spent Fuel Storage Installation Environmental Report TPR-5613, “FSV ISFSI Radiation Survey and Vault Drain System Sample Collection and Analysis”

TPR-7066, “Periodic HSM Monitoring, DSC Sampling, and Filter Housing Leak Tests”

USNRC Final Safety Culture Policy Statement, June 14, 2011 (NRC ADAMS Accession Number ML103200087)

USNRC Regulatory Guide 8.8, Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Plants Will Be As Low As Reasonably Achievable

USNRC Regulatory Guide 8.10, Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Reasonably Achievable (ALARA)

USNRC Regulatory Guide 8.38, Control of Access to High and Very High Radiation Areas in Nuclear Power Plants

USNRC Regulatory Guide 8.40, Methods for Measuring Effective Dose Equivalent from External Exposure

## **6. APPENDIXES**

Appendix A, Annual Limits of Intake (ALI) and Derived Airborne Concentrations (DAC) for the Predominant Radionuclides at the TMI-2 ISFSI FSV ISFSI, and ISFF

Appendix B, Minimum Detectable Activity (MDA)

Appendix C, TMI-2 ISFSI Radiological Survey Report

Appendix D, FSV ISFSI Radiological Survey Report

Appendix E – Not Used

Appendix F, Respiratory Protection Factors Applicable to the TMI-2 ISFSI FSV ISFSI and ISFF

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**Appendix A**
**Annual Limits of Intake (ALI) and Derived Airborne Concentrations (DAC) for the  
Predominant Radionuclides at the TMI-2 ISFSI FSV ISFSI, and ISFF**

Radionuclide	Inhalation ALI (uCi)*	Inhalation DAC (uCi/ml)*
Cs-137	2E-2	6E-8
Y-90	6E2	3E-7
Sr-90	4E0	2E-9
Pu-241	3E-1	1E-10
Kr-85	N/A	1E-4
Pm-147	1E2	5E-8
Am-241	6E-3	3E-12
Co-60	3E1	1E-8
Pu-239	6E-3	3E-12
Sm-151	1E2	4E-8
Pu-240	6E-3	3E-12
Ni-63	2E3	7E-7
Eu-154	2E1	8E-9
H-3	8E4	2E-5
Eu-155	9E1	4E-8
Pu-238	7E-3	3E-12
Sb-125	5E-2	2E-7
Cs-134	1E2	4E-8
I-129	9E0	4E-9

\* Based on most limiting exposure class in 10 CFR 20, Appendix B.

**Appendix B****Minimum Detectable Activity (MDA)**

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$$\text{MDA (dpm)} = (3 + 3.29 (R_b \times T_{sb} (1 + T_{sb} / T_b))^{1/2}) / K \times T_{sb}$$

---

$R_b$  = background counting rate (cpm)

$T_{sb}$  = sample counting time (minutes)

$T_b$  = background counting time (minutes)

$K$  = conversion factors (that is, efficiency)

\* Refer to NUREG 1507, pages 3 through 5 for derivation of equation.

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**Appendix C  
TMI-2 ISFSI Radiological Survey Report**

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**TMI-2 ISFSI RADIOLOGICAL SURVEY REPORT**

RWP No.: \_\_\_\_\_ Log Date/Time: \_\_\_\_\_ / \_\_\_\_\_

Work Activity: \_\_\_\_\_

Instrument Type: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Efficiency: \_\_\_\_\_

Calibration Due Date \_\_\_\_\_

Scaler Background (cpm)                      alpha \_\_\_\_\_                      beta-gamma \_\_\_\_\_

Scaler MDA (dpm)                              alpha \_\_\_\_\_                      beta-gamma \_\_\_\_\_

Count Rate Meter Background (dpm)      alpha \_\_\_\_\_                      beta-gamma \_\_\_\_\_

Performed By: \_\_\_\_\_ Reviewed By: \_\_\_\_\_

HSM	Rear Panel Door Radiation Levels (beta-gamma / neutron, mrem/h)		Front Door Radiation Levels (beta-gamma / neutron, mrem/h)		Surface Contamination Levels (alpha / beta-gamma, dpm/100 cm <sup>2</sup> )	
	Contact	30 cm	Contact	30 cm	Rear Door Vent	Drain Line
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

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**TMI-2 ISFSI RADIOLOGICAL SURVEY REPORT**

HSM	Rear Panel Door Radiation Levels (beta-gamma / neutron, mrem/h)		Front Door Radiation Levels (beta-gamma / neutron, mrem/h)		Surface Contamination Levels (alpha / beta-gamma, dpm/100 cm <sup>2</sup> )	
	Contact	30 cm	Contact	30 cm	Rear Door Vent	Drain Line
13						
14						
15	NA	NA	NA	NA	NA	NA
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

  

End Shield Wall	SE	SW	NE	NW
Contact Radiation Level (mrem/h)				

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**TMI-2 ISFSI RADIOLOGICAL SURVEY REPORT**

Survey Map

Example

Refer to MCP-139, "Radiological Surveys," for survey map legend.

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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**Appendix D**

**FSV ISFSI Radiological Survey Report**

RWP No.: \_\_\_\_\_ Log Date/Time: \_\_\_\_\_ / \_\_\_\_\_

Work Activity: \_\_\_\_\_

Instrument Type: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Efficiency: \_\_\_\_\_

Cal. Due Date: \_\_\_\_\_

Scaler Background (cpm)                      alpha \_\_\_\_\_                      beta-gamma \_\_\_\_\_

Scaler MDA (dpm)                              alpha \_\_\_\_\_                              beta-gamma \_\_\_\_\_

Count Rate Meter Background (dpm)      alpha \_\_\_\_\_                      beta-gamma \_\_\_\_\_

Performed By: \_\_\_\_\_ Reviewed By: \_\_\_\_\_

Survey Map

Refer to MCP-139, "Radiological Surveys," for survey map legend.

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Survey Map

Refer to MCP-139, “Radiological Surveys,” for survey map legend.



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**Appendix E**

**Not Used**

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### Appendix F

#### Respiratory Protection Factors Applicable to the TMI-2 ISFSI FSV ISFSI, and ISFF

Respiratory Equipment Type	Protection Factor
Full facepiece, negative pressure, air purifying respirator	100
Full facepiece, airline, continuous flow or pressure demand atmosphere supplying respirator	1,000
Airline, continuous flow hood	1,000
Self-contained breathing apparatus (SCBA), pressure demand	10,000