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DERIVATION OF TECHNICAL SAFETY REQUIREMENTS

This section provides the basis for deriving the WIPP Technical Safety Requirements (TSRs) in accordance with the requirements of DOE Order 5480.22, *Technical Safety Requirements*.[1] This section provides the link between the Hazards and Accident Analysis in Chapter 5 and the WIPP TSR document, DOE/WIPP-95-2125 (current revision), *Waste Isolation Pilot Plant Technical Safety Requirements* (Attachment 1 to this SAR). DOE Order 5480.22[1] provides detailed criteria for the selection of TSR Safety Limits (SLs), Limiting Control Settings (LCSs), Limiting Conditions for Operations (LCOs), Surveillance Requirements (SRs), and Administrative Controls (ACs).

The Chapter 5 Hazards and Accident Analyses indicate that SLs, LCSs, LCOs, and SRs are not required for the WIPP facility as derived below. As discussed in Chapter 5, Design Class I Systems, Structures or Components (SSCs) are not required for the WIPP to mitigate any accidental radiological and non-radiological off-site Maximally Exposed Individual (MEI) or noninvolved worker consequences to acceptable levels. WIPP TSRs in the form of ACs are derived in this chapter. These ACs provide TSRs covering the WIPP defense-in-depth approach developed in Chapter 5.

6.1 Requirements

Requirements for the derivation of TSRs are specified in DOE 5480.22.[1]

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6.2 TSR Coverage

ACs impose administrative requirements necessary to control operation of the facility such that all TSR requirements are met. Since no SLs, LCSs, LCOs, or SRs are defined for the WIPP, WIPP specific ACs impose administrative requirements necessary to ensure operation of the facility consistent with the design that was shown to be safe in chapter 5. These administrative requirements are defined in Section 6.4.5.

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6.3 Derivation of Facility Modes

Operations at the WIPP consist mainly of waste handling, storage, and disposal operations. The following is a definition of the modes of operations. The mode of operation is defined such that the Waste Handling Building and the Underground may be in different modes. Prior to receiving waste, the facility is required to be in one of the modes of operation.

6.3.1 Waste Handling Mode

The Waste Handling Building (WHB) and/or the Underground is configured for waste handling, and all required defense-in-depth SSCs are operated as required. Maintenance, repair activities, and inspections are allowed as long as they do not prevent the functions of the SSCs required for the Waste Handling Mode. The required SSCs described in Table 6-2 ensure that the defense-in-depth features identified in Chapter 5 as consequence mitigators or additional preventative features are available during those activities (waste handling) that introduce the potential for significant accidents.

6.3.2 Waste Storage/Disposal Mode

Waste handling operations are not being conducted in the WHB and/or in the Underground. WHB and/or the Underground is configured for waste storage or disposal. After receipt of waste, the facility retains its inventory of radioactive and hazardous material. No waste handling operations are allowed during Waste Storage/Disposal Mode except as required to safely complete a waste handling evolution interrupted by SSC malfunction or unavailability, and in accordance with the applicable procedure. Maintenance, repair activities, and inspections are allowed, provided the SSCs required in Table 6-2 for Waste Storage/Disposal Mode are restored to operation in a timely manner, and SSCs are not intentionally removed from service during waste handling completion.

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6.4 Derivation of WIPP TSRs

6.4.1 Safety Limits (SLs)

As defined in DOE Order 5480.22,[1] Technical Safety Requirements, SLs are limits on process variables associated with those physical barriers, generally passive, that are necessary for the intended facility function and that are found to be required to guard against the uncontrolled release of radioactivity and other hazardous material. "Process Variables" refers to observable, measurable parameters such as temperature and pressure. "Passive physical barriers" refers to those barriers that constitute the primary process material boundary.

Based on the analysis presented in Chapter 5, no SLs are identified for the WIPP facility.

6.4.2 Limiting Control Settings (LCSs)

As defined in DOE Order 5480.22,[1] LCSs are settings on safety systems that control process variables to prevent exceeding SLs. More precisely, an LCS is the set point for an instrument or device monitoring a process variable that, if exceeded, initiates actions to prevent exceeding an SL.

The WIPP facility has no SLs identified, therefore, no LCSs are required.

6.4.3 Limiting Conditions for Operations (LCOs)

DOE Order 5480.22,[1] Attachment 1, Section II.2.3.h, provides that "LCOs should be written only for systems and equipment which meet one (or more) of the following descriptions," and prescribes five selection criteria, h.(1) through h.(5). The order also emphasizes that "Maintaining the LCOs at the minimum number necessary will emphasize the importance of the LCOs and better ensure the compliance with them." All five criteria clearly tie the LCOs to the facility accident or transient analyses.

The LCO selection criteria interpretations define TSR content based on key nuclear safety analysis requirements. Specifically, three of the five TSR LCO selection criteria are understood to restrict TSR LCOs to only those requirements that are under the direct control of the facility's operators, and are of primary importance for: **prevention** (Criterion h.(1)), **mitigation** (Criterion h.(2)), and **initial conditions** (Criterion h.(3)) of credible, unmitigated accident scenarios. Additionally, Criterion h.(4) involves the application of criteria h.(1), h.(2), and h.(3) to experiments and experimental facilities, and Criterion h.(5) to systems and equipment that are used for handling fissile material. The specifics of each criterion as applied to the WIPP facility are as follows:

- Criterion h.(1) - Prevention:

  A basic concept in the protection of the public is the prevention of accidents that have the potential for an uncontrolled release of radioactive material. Criterion h.(1) is intended to ensure that TSRs be selected to identify instrumentation that is used to detect, and to indicate in the control room or other control location, a significant degradation of the physical barriers which prevent the uncontrolled release of radioactive or other hazardous materials. For example, instrumentation installed to detect significant degradation of a reactor coolant pressure boundary enables the operator to correct the degraded condition prior to accident initiation or to place the facility in a condition that reduces the likelihood of the accident.

Instrumentation at the WIPP, such as the Continuous Air Monitors (CAMs), Effluent Monitors, Area Radiation Monitors (ARMs), and installed instrumentation to control differential pressure, is not required to prevent accidents as analyzed in the SAR from occurring, or to facilitate the Central Monitoring Room (CMR) operator placing the facility in a condition reducing the likelihood of an accident from occurring. Therefore, Criterion h.(1) has no application to the WIPP.

- Criterion h.(2) - Mitigation:

Criterion h.(2) provides that "Structures, systems, and components that are relied upon in the Safety Analyses to function or actuate to prevent or mitigate accidents, or transients that either involve the assumed failure of, or present a challenge to, the integrity of a physical barrier that prevents the uncontrolled release of radioactive materials … intended to include only those structures, systems, and components that are part of the primary success path of a safety sequence analysis and those support and actuation systems necessary for them to function successfully."

The "primary success path of a safety sequence analysis" is defined as "the sequence of events assumed by the Safety Analyses, which leads to the conclusion of a transient or accident with consequences that are acceptable. Hence, any structure, system, or component in that assumed sequence should be included in the LCO."

Consistent with the primary intent of DOE Order 5480.22[1] establishing requirements for the protection of the public, the existing practice is: 1) to evaluate the unmitigated radiological and non-radiological consequences to members of the MEI and noninvolved worker as the result of an accident; 2) to compare the radiological and non-radiological consequences to established accident risk evaluation guidelines; and 3) if the consequences of the accident exceed the established accident consequence risk evaluation guidelines, to define SSCs and associated TSR LCOs mitigating or reducing those consequences to acceptable levels below the established criteria.

The unmitigated MEI and noninvolved worker radiological and non-radiological consequences and risk evaluation guidelines, as documented in Chapter 5, Tables 5.2-3, and 5.2-4. are used as the basis for applying this criterion.

Application of DOE Order 5480.22[1] TSR LCO Selection Criterion h.(2) to the WIPP:

The WIPP SSCs that are assumed to function in the SAR accident analysis mitigating an accident's radiological and non-radiological consequences to acceptable levels (to within the accident risk evaluation guidelines) satisfy Criterion h.(2).

The unmitigated radiological and non-radiological accident consequences were estimated and compared to the risk evaluation guidelines in Chapter 5. The unmitigated radiological and non-radiological accident consequences are below the consequence risk evaluation guidelines therefore; 1) mitigating SSCs are not required, and 2) TSR LCOs are not required. Tables 5.2-3 and 5.2-4 of Chapter 5 of the SAR list the analyzed accidents, and the mitigated and unmitigated MEI and noninvolved worker radiological consequences. All of the radiological and non-radiological accident consequences are well below the applicable risk evaluation guidelines.

- Criterion h.(3) - Initial Condition:

  Process variables as initial conditions of accidents or transients that are monitored and controlled during operations so the parameter remains within the analysis bounds satisfy this selection criterion. The WIPP is not a process facility, therefore process variables are not considered in the SAR accident analysis as initial conditions for accidents. Thus, Criterion h.(3) is not applicable to the WIPP.

- Criterion h.(4):

  Criterion h.(4) involves applying criteria h.(1), h.(2), and h.(3) to experimental activities involving radioactive or other hazardous materials. There are currently no planned experimental or test activities at the WIPP. Therefore, Criterion h.(4) is not applicable to the WIPP.

- Criterion h.(5):

  Criterion h.(5) applies to fissile material handling facilities and is only related to inadvertent criticality protection. Inadvertent criticality is not a credible hazard at the WIPP. Inadvertent criticality is controlled through the ACs Criticality Program in conjunction with the Waste Characteristics program which conforms to the WIPP Waste Acceptance Criteria (WAC).[2] Therefore, Criterion h.(5) is not applicable to the WIPP.

6.4.4 Surveillance Requirements (SRs)

As defined in DOE Order 5480.22,[1] SRs relate to testing, channel calibration, channel operational testing, or inspection to maintain the operability, quality, and safety of SSCs and their support systems. SRs are defined as the requirements necessary to maintain facility operation within the SLs, LCSs, and LCOs. Selection criteria for SRs are defined in DOE Order 5480.22.[1]

Without SLs, LCSs, and LCOs for the WIPP facility, SRs are not required.

6.4.5 Administrative Controls

As discussed in Section 2.4 of Attachment 1 of DOE Order 5480.22,[1] ACs impose necessary requirements controlling operation of the facility to meet all TSR requirements. Without SLs, LCSs, LCOs, and SRs, WIPP specific ACs impose administrative and operational requirements supporting the WIPP defense-in-depth concept. Basic elements and requirements defined for TSR AC programs are enforced by the associated implementing WIPP procedures.

Supporting the first layer of defense-in-depth (the prevention of accidents) as defined in Section 5.1.6, WIPP TSR ACs are established as follows:

- To maintain the design, quality, testability, inspectability, operational capability, maintainability, and accessibility of the facility, TSR ACs are required relating to: (1) configuration and document control, (2) maintenance, (3) quality assurance, and (4) geotechnical monitoring. These ACs are important to ensure the frequency of events and the availability of the operating and design conditions remain as analyzed in Section 5.2.3.

- To ensure that the facility operations are conducted by trained and certified/qualified personnel in a controlled and planned manner, TSR ACs are required relating to: (1) facility operations chain of command and responsibilities, (2) facility staffing requirements, (3) procedures, (4) staff qualifications, (5) conduct of operations, and (6) training. These ACs are important to ensure the low frequency of the accidents analyzed in Section 5.2.3, in particular to those waste handling accidents where human error is the major contributor to the likelihood of the accident initiating event (CH3, CH4, and CH9).

- To ensure that hazards are limited within the bounds assumed in Section 5.2, or that the occurrence of a deviation from the assumed hazard bounds are at an acceptably low frequency, TSR ACs are required relating to: (1) waste characteristics (Waste Acceptance Criteria), (2) waste container integrity, and (3) criticality safety. The TSR AC for waste characteristics limits the radionuclide content of each waste container, restricts the fissile content of the containers, and restricts the presence of waste characteristics unacceptable for management at the WIPP facility. Container integrity ensures the robustness reflected in the waste release analyses, while criticality safety is a designed in-storage and handling configuration that ensures (in conjunction with waste characteristics) that active criticality control is not required.

Supporting the second and third layers of defense-in-depth, WIPP TSR ACs are identified which establish programs for radiation protection of workers and the environment (including radiation monitoring equipment and airborne radioactivity monitoring), and mitigation of off-normal events though emergency management.

6.4.5.1 SSCs Required to Support Defense-In-Depth

Specific SSCs identified for each accident in Section 5.2.3 that fulfill a defense-in-depth safety function, or considered essential for waste handling, storage and/or disposal operations are as follows: (1) Waste Handling Building (WHB) Heating, Ventilation and Air Conditioning (HVAC) (excluding RH area ventilation unless the RH area is used for CH storage or handling), and Underground Ventilation and Filtration System (UVFS) (including underground shift to filtration); (2) Waste Hoist Equipment (including Brake System); (3) Waste Handling Equipment (including the TRUDOCK Bridge Crane, forklifts, transporters, etc., as required), (4) WHB structure including tornado doors, (5) Central Monitoring System (to support underground shift to filtration only); and (6) Radiation Monitoring System, active waste disposal room exit alpha CAM (for underground shift to filtration). The applicability of the important defense-in-depth SSCs to each accident analyzed in Section 5.2.3, is listed in Table 6-1. The above SSCs are classified as “Defense-In-Depth SSCs,” and are applicable to each mode as shown in Table 6-2.

As shown in Section 6.4.3, based on the criteria for assigning Technical Safety Requirement (TSR) Limiting Conditions for Operation (LCOs), defense-in-depth SSCs are not assigned TSR LCOs. The facility has no complex system requirements to maintain an acceptable level of risk. The WIPP Waste Acceptance Criteria for transuranic wastes and the design of the waste handling process and its supporting facilities provide assurance that the immediate consequences of an accident will be limited and allow the WIPP facility to isolate and contain releases while maintaining a high assurance that no additional releases will occur. The facility is designed to minimize the presence and impact of other energy sources that could provide the heat or driving force to disperse hazardous materials. The magnitude of hazardous materials that can be involved in an accident leading to a release is very limited. The radioactive material is delivered to the site in sealed containers, and the waste handling operations are designed to maintain that integrity throughout the entire process required to safely emplace those containers in the site's underground waste disposal rooms. Inventory limits on individual containers ensure that heat generated by radioactive decay can be easily dissipated by

passive mechanisms. Finally, only a limited number of waste containers have the possibility of being breached as a result of any one accident initiating event. As a result, the consequences of unmitigated releases from all accidents hypothesized in Chapter 5, including those initiated by human error, do not produce significant offsite health consequences.

When something unusual happens during normal operations (such as defense-in-depth SSCs becoming unavailable), **waste handling can be simply stopped** until an acceptable operating condition is reestablished. The facility is designed to minimize the presence and impact of other energy sources that could provide the heat or driving force to disperse hazardous materials. Should an accident involving the breach of a container occur, **the plant design permits the immediate cessation of activity and isolation of the area where the breach occurs**. Once isolation is achieved, there is no driving force within the waste or waste handling area that could result in a further release of the waste material. The absence of energy sources that can disperse the radioactive waste allows the immediate termination of all activities, evacuation of personnel, and isolation of the area without the threat of additional consequences. This will enable WIPP personnel to then proceed with detailed planning to meet the unique circumstances of any accidental release prior to initiating decontamination and the execution of recovery actions, while assuring that the health and safety of both workers and the public is protected. The controls necessary to maintain safety during the recovery and cleanup can be documented in the recovery plans, its associated Radiological Work Permit, and the USQ process. In order to ensure protection during recovery from an event that breaches a waste container, the Defense-In-Depth SSCs for the waste handling mode will be required during the period of time that waste may be exposed.

Based on SAR Section 5.2.4.1, Evaluation of the Design Basis, specific functional requirements are not assigned here for the Defense-In-Depth SSCs, rather, the SSCs shall be operated as required in Table 6-2. Detailed design descriptions for the Defense-In-Depth SSCs may be found in Chapter 4, and the applicable Systems Design Descriptions.

6.4.5.2 Defense-In-Depth SSC Operation

Defense-in-depth SSCs are listed in Table 6-1. The applicable System Design Descriptions define defense-in-depth SSCs, describe their intended safety functions, and specify the requirements for design, operation, maintenance, testing, and calibration. WP 04-AD3001, Facility Mode Compliance, shall be implemented, and maintained to ensure that defense-in-depth SSCs are operated as required during each facility mode as described in Table 6-2.

If any of the Defense-In-Depth SSCS fails to operate (when required), or becomes unavailable during waste handling operations, or must be taken out of service for maintenance or repair, Waste Handling operations shall be stopped, and the area shall be placed in the Waste Storage/Disposal Mode. Waste Handling operations shall not resume until all of the required Defense-In-Depth SSCs required for waste handling mode are capable of being operated, as required.

The Defense-In-Depth SSCs operational requirements ensure that important defense-in-depth SSCs are operated as required during Waste Handling Mode in the Surface or Underground, to provide protection for the "most likely" waste handling accidents identified in Section 5.2.3: (1) CH2, Crane Failure in the Waste Handling Building (WHB); (2) CH3, Puncture of Waste Containers in the (WHB); (3) CH4, Drum Drop in WHB; and (4) CH9, Drum Drop in the Underground; for natural phenomenon events: (1) CH6, Design Basis Earthquake; and CH10, Design Basis Tornado; and for less likely operational accidents evaluated to be beyond extremely unlikely identified in Section 5.2.3: (1) CH1, Spontaneous Ignition in a Drum in the WHB; (2) CH5, Waste Hoist Failure; (3) CH7, Spontaneous Ignition in a Drum in the Underground; and (4) CH11, Roof Fall.

As discussed above, if any of the Defense-In-Depth SSCs fail to operate (when required), or become unavailable during Waste Handling operations, Waste Handling operations shall be stopped, and the facility shall be placed in the Waste Storage/Disposal Mode. Waste Handling operations shall not resume until the required SSCs are capable of being operated as required.

During Waste Storage/Disposal Mode in the WHB, the Defense-In-Depth SSCs operational requirements ensure that important defense-in-depth SSCs are operated as required during temporary storage operations (for waste temporarily stored in the WHB prior to transfer to the underground) to provide protection for less likely operational accidents identified in Section 5.2.3: (1)CH1, Spontaneous Ignition in a Drum in the WHB; and for natural phenomenon events: (1) CH6, Design Basis Earthquake, and CH10, Design Basis Tornado.

During Waste Storage/Disposal Mode in the Underground, the Defense-In-Depth SSCs operational requirements ensure that important defense-in-depth SSCs are operated as required (for waste disposed in the underground), to provide protection for less likely operational accidents identified in Section 5.2.3: (1) CH7, Spontaneous Ignition in a Drum in the Underground; and (2) CH11, Roof Fall.

It should be noted that the likelihood of CH1, CH7, and CH11 were evaluated in Section 5.2.3 to be beyond extremely unlikely. As such for the Waste Storage/Disposal Mode, if any of the required Defense-In-Depth SSCs fail to operate (when required), or become unavailable, no specific actions are identified, other than to perform corrective maintenance on the affected equipment in a timely manner.

A summary of the applicability of defense-in-depth SSCs in relation to the mode definitions is presented in Table 6-2.

6.5 Design Features

The Design Features of the WIPP Facility are described in Chapter 4 of the SAR.

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6.6 Interface TSRs

The WIPP Facility does not have interfacing TSRs from other facilities.

References for Chapter 6

1. DOE Order 5480.22, Technical Safety Requirements, September 15, 1992.

2. WIPP-DOE-069, Waste Acceptance Criteria for the Waste Isolation Pilot Plant, Rev. 5, February 1996.

Table 6-1, Summary of Defense-In-Depth Functions and Defense-in-Depth Features Important to Accident Scenarios

Accident	Defense-In-Depth Function	Defense-in-Depth Feature	TSR Control (AC)	Type of Feature (SSC or Administrative Control (AC))
CH1 Spontaneous Ignition in WHB	• Primary Confinement	• Vented DOT Type A, or equivalent, Waste Container	5.9.12	SSC (Passive)
	• Secondary Confinement	• Waste Handling Building Structure (WHB) • WHB CH HVAC System • WHB HEPA Filters	5.1 5.1 5.1	SSC (Passive) SSC (Active) SSC (Passive)
	• Limitations on waste container radionuclide and fissile inventory and waste characteristics	• WIPP Waste Acceptance Criteria	5.9.12	AC
	• Provide facility emergency response to the event (notification, evacuation, direct response)	• WIPP Emergency Management Program	5.9.8	AC

Table 6-1, Summary of Defense-In-Depth Functions and Defense-in-Depth Features Important to Accident Scenarios

Accident	Defense-In-Depth Function	Defense-in-Depth Feature	TSR Control (AC)	Type of Feature (SSC or Administrative Control (AC))
CH2 Crane Failure in WHB	• Primary Confinement	• Vented DOT Type A, or equivalent, Waste Container	5.9.12	SSC (Passive)
	• Secondary Confinement	• Waste Handling Building Structure (WHB) • WHB CH HVAC System • WHB HEPA Filters	5.1 5.1 5.1	SSC (Passive) SSC (Active) SSC (Passive)
	• TRUDOCK Crane designed to prevent failure resulting in a dropped load • Adjustable Center of Gravity Lift Fixture (ACGLF) designed to prevent load from swinging	• TRUDOCK Crane Design, ACGLF Design • Configuration Control • Quality Assurance	5.1 5.9.1/5.9.13 5.9.4	SSC (Active) AC AC
	• TRUDOCK Crane maintained to prevent failure resulting in a dropped load • Adjustable Center of Gravity Lift Fixture maintained to prevent load from swinging	• Preventative Maintenance	5.9.3	AC
	• TRUDOCK Crane operated to prevent failure resulting in a dropped load • Adjustable Center of Gravity Lift Fixture operated to prevent load from swinging	• Pre-op Checks/Inspections (Conduct of Ops) • Operator Training and Qualifications • Waste Handling Procedures • Hoisting and Rigging Practices • Operations performed with spotter present • Document Control	5.9.7 5.9.6 5.9.5 5.9.6 5.9.6 5.9.2	AC AC AC AC AC AC
	• Limitations on waste container radionuclide and fissile inventory and waste characteristics	• WIPP Waste Acceptance Criteria	5.9.12	AC
	• Provide facility emergency response to the event (notification, evacuation, direct response)	• WIPP Emergency Management Program	5.9.8	AC

Table 6-1, Summary of Defense-In-Depth Functions and Defense-in-Depth Features Important to Accident Scenarios

Accident	Defense-In-Depth Function	Defense-in-Depth Feature	TSR Control (AC)	Type of Feature (SSC or Administrative Control (AC))
CH3 Puncture in WHB	• Primary Confinement	• Vented DOT Type A, or equivalent, Waste Container	5.9.12	SSC (Passive)
	• Secondary Confinement	• Waste Handling Building Structure (WHB) • WHB CH HVAC System • WHB HEPA Filters	5.1 5.1 5.1	SSC (Passive) SSC (Active) SSC (Passive)
	• Waste Handling Equipment (Forklift and Attachment Design, and Facility Pallet) designed to prevent failure resulting in a punctured waste container	• Forklift and Attachments Design, Facility Pallet Design • Configuration Control • Quality Assurance	5.1 5.9.1/5.9.13 5.9.4	SSC (Active) AC AC
	• Waste Handling Equipment maintained to prevent failure resulting in a punctured waste container	• Preventative Maintenance	5.9.3	AC
	• Waste Handling Equipment operated to prevent failure resulting in a punctured waste container	• Pre-op Checks/Inspections (Conduct of Ops) • Operator Training and Qualifications • Waste Handling Procedures • Hoisting and Rigging Practices • Operations performed with spotter present • Document Control	5.9.7 5.9.6/5.9.4 5.9.5 5.9.6 5.9.6 5.9.2	AC AC AC AC AC AC
	• Limitations on waste container radionuclide and fissile inventory and waste characteristics	• WIPP Waste Acceptance Criteria	5.9.12	AC
	• Provide facility emergency response to the event (notification, evacuation, direct response)	• WIPP Emergency Management Program	5.9.8	AC

Table 6-1, Summary of Defense-In-Depth Functions and Defense-in-Depth Features Important to Accident Scenarios

Accident	Defense-In-Depth Function	Defense-in-Depth Feature	TSR Control (AC)	Type of Feature (SSC or Administrative Control (AC))
CH4 Drop in WHB	• Primary Confinement	• Vented DOT Type A, or equivalent, Waste Container	5.9.12	SSC (Passive)
	• Secondary Confinement	• Waste Handling Building Structure (WHB) • WHB CH HVAC System • WHB HEPA Filters	5.1 5.1 5.1	SSC (Passive) SSC (Active) SSC (Passive)
	• Waste Handling Equipment (Forklift and Attachments, Facility Pallet) designed to prevent failure resulting in a dropped waste container	• Forklift and Attachments Design, Facility Pallet Design • Configuration Control • Quality Assurance	5.1 5.9.1/5.9.13 5.9.4	SSC (Active) AC AC
	• Waste Handling Equipment maintained to prevent failure resulting in a dropped waste container	• Preventative Maintenance	5.9.3	AC
	• Waste Handling Equipment operated to prevent failure resulting in a dropped waste container	• Pre-op Checks/Inspections (Conduct of Ops) • Operator Training and Qualifications • Waste Handling Procedures • Hoisting and Rigging Practices • Operations performed with spotter present • Document Control	5.9.7 5.9.5 5.9.5 5.9.6 5.9.6 5.9.2	AC AC AC AC AC AC
	• Limitations on waste container radionuclide and fissile inventory and waste characteristics	• WIPP Waste Acceptance Criteria	5.9.12	AC
	• Provide facility emergency response to the event (notification, evacuation, direct response)	• WIPP Emergency Management Program	5.9.8	AC

Table 6-1, Summary of Defense-In-Depth Functions and Defense-in-Depth Features Important to Accident Scenarios

Accident	Defense-In-Depth Function	Defense-in-Depth Feature	TSR Control (AC)	Type of Feature (SSC or Administrative Control (AC))
CH5 Waste Hoist Failure	• Primary Confinement	• Vented DOT Type A, or equivalent, Waste Container	5.9.12	SSC (Passive)
	• Secondary Confinement	• Underground Ventilation Exhaust System	5.1	SSC (Active)
		• Underground Ventilation Exhaust HEPA Filters	5.1	SSC (Passive)
		• Central Monitoring System (for actuation of underground shift to filtration only)	5.1	SSC (Active)
	• Waste Hoist System designed to prevent failure resulting in an uncontrolled movement of the hoist	• Waste Hoist and Brake System Design	5.1	SSC (Active)
		• Configuration Control	5.9.1/5.9.13	AC
		• Quality Assurance	5.9.4	AC
	• Waste Hoist System maintained to prevent failure resulting in an uncontrolled movement of the hoist	• Preventative Maintenance	5.9.3	AC
	• Waste Hoist System operated to prevent failure resulting in an uncontrolled movement of the hoist	• Pre-op Checks/Inspections (Conduct of Ops)	5.9.7	AC
		• Operator Training and Qualifications	5.9.6/5.9.4	AC
		• Waste Handling Procedures	5.9.5	AC
		• Hoisting and Rigging Practices	5.9.6	AC
		• Operations performed with spotter present	5.9.6	AC
		• Document Control	5.9.2	AC
	• Limitations on waste container radionuclide and fissile inventory and waste characteristics	• WIPP Waste Acceptance Criteria	5.9.12	AC
	• Provide facility emergency response to the event (notification, evacuation, direct response)	• WIPP Emergency Management Program	5.9.8	AC

Table 6-1, Summary of Defense-In-Depth Functions and Defense-in-Depth Features Important to Accident Scenarios

Accident	Defense-In-Depth Function	Defense-in-Depth Feature	TSR Control (AC)	Type of Feature (SSC or Administrative Control (AC))
CH6 DBE	• Primary Confinement	• Vented DOT Type A, or equivalent, Waste Container	5.9.12	SSC (Passive)
	• WHB structure (includes structure and structural components) designed and maintained to prevent failure during a DBE resulting in waste container breach	• Waste Handling Building DBE design • Configuration Control • Quality Assurance • Preventative Maintenance	 5.9.1/5.9.13 5.9.4 5.9.3	SSC (Passive) AC AC AC
	• WHB 6-ton bridge crane and waste hoist designed and maintained to prevent failure during a DBE resulting in waste container breach	• Waste Handling Building 6-ton bridge crane and waste hoist DBE design • Configuration Control • Quality Assurance • Preventative Maintenance	5.1 5.9.1/5.9.13 5.9.4 5.9.3	SSC (Passive) AC AC AC
	• Limitations on waste container radionuclide and fissile inventory and waste characteristics	• WIPP Waste Acceptance Criteria	5.9.12	AC
	• Provide facility emergency response to the event (notification, evacuation, direct response)	• WIPP Emergency Management Program	5.9.8	AC
CH 7 Spontaneous Ignition in U/G	• Primary Confinement	• Vented DOT Type A, or equivalent, Waste Container	5.9.12	SSC (Passive)
	• Secondary Confinement	• Underground Ventilation Exhaust System • Underground Ventilation Exhaust HEPA Filters • Radiation Monitoring System (active waste disposal room exit alpha CAM for underground shift to filtration) • Central Monitoring System (for actuation of underground shift to filtration only)	5.1 5.1 5.1 5.1	SSC (Active) SSC (Passive) SSC (Active) SSC (Active)
	• Limitations on waste container radionuclide and fissile inventory and waste characteristics	• WIPP Waste Acceptance Criteria	5.9.12	AC
	• Provide facility emergency response to the event (notification, evacuation, direct response)	• WIPP Emergency Management Program	5.9.8	AC

Table 6-1, Summary of Defense-In-Depth Functions and Defense-in-Depth Features Important to Accident Scenarios

Accident	Defense-In-Depth Function	Defense-in-Depth Feature	TSR Control (AC)	Type of Feature (SSC or Administrative Control (AC))
CH9 Drop in U/G	• Primary Confinement	• Vented DOT Type A, or equivalent, Waste Container	5.9.12	SSC (Passive)
	• Secondary Confinement	• Underground Ventilation Exhaust System	5.1	SSC (Active)
		• Underground Ventilation Exhaust HEPA Filters	5.1	SSC (Passive)
		• Radiation Monitoring System (active waste disposal room exit alpha CAM for underground shift to filtration)	5.1	SSC (Active)
		• Central Monitoring System (for actuation of underground shift to filtration only)	5.1	SSC (Active)
	• Waste Handling Equipment (Forklift and Attachments, Facility Pallet) designed to prevent failure resulting in a dropped waste container	• Forklift and Attachments Design, Facility Pallet Design	5.1	SSC (Active)
		• Configuration Control	5.9.1/5.9.13	AC
		• Quality Assurance	5.9.4	AC
	• Waste Handling Equipment maintained to prevent failure resulting in a dropped waste container	• Preventative Maintenance	5.9.3	AC
	• Waste Handling Equipment operated to prevent failure resulting in a dropped waste container	• Pre-op Checks/Inspections (Conduct of Ops)	5.9.7	AC
		• Operator Training and Qualifications	5.9.6/5.9.4	AC
		• Waste Handling Procedures	5.9.5	AC
		• Hoisting and Rigging Practices	5.9.6	AC
		• Operations performed with spotter present	5.9.6	AC
		• Document Control	5.9.2	AC
	• Limitations on waste container radionuclide and fissile inventory and waste characteristics	• WIPP Waste Acceptance Criteria	5.9.12	AC
	• Provide facility emergency response to the event (notification, evacuation, direct response)	• WIPP Emergency Management Program	5.9.8	AC

Table 6-1, Summary of Defense-In-Depth Functions and Defense-in-Depth Features Important to Accident Scenarios

Accident	Defense-In-Depth Function	Defense-in-Depth Feature	TSR Control (AC)	Type of Feature (SSC or Administrative Control (AC))
CH10 DBT	• WHB structure (includes structure and structural components) designed and maintained to prevent failure during a DBT resulting in waste container breach	• Waste Handling Building DBT design • Configuration Control • Quality Assurance • Preventative Maintenance	5.1 5.9.1/5.9.13 5.9.4 5.9.3	SSC (Passive) AC AC AC
	• Limitations on waste container radionuclide and fissile inventory and waste characteristics	• WIPP Waste Acceptance Criteria	5.9.12	AC
	• Provide facility emergency response to the event (notification, evacuation, direct response)	• WIPP Emergency Management Program	5.9.8	AC
CH11 Roof Fall	• Primary Confinement	• Vented DOT Type A, or equivalent, Waste Container	5.9.12	SSC (Passive)
	• Secondary Confinement	• Underground Ventilation Exhaust System • Underground Ventilation Exhaust HEPA Filters • Radiation Monitoring System (active waste disposal room exit alpha CAM for underground shift to filtration) • Central Monitoring System (for actuation of underground shift to filtration only)	5.1 5.1 5.1 5.1	SSC (Active) SSC (Passive) SSC (Active) SSC (Active)
	• Underground disposal areas designed to prevent failure resulting in a breached waste container	• Underground disposal area design • Configuration Control • Quality Assurance	5.9.1/5.9.13 5.9.4	SSC (Passive) SSC (Passive) AC
	• Underground disposal areas maintained to prevent failure resulting in a breached waste container	• Ground Control/Inspections and Assessments • Geomechanical Monitoring	5.9.14 5.9.14	AC AC
	• Limitations on waste container radionuclide and fissile inventory and waste characteristics	• WIPP Waste Acceptance Criteria	5.9.12	AC
	• Provide facility emergency response to the event (notification, evacuation, direct response)	• WIPP Emergency Management	5.9.8	AC

Table 6-2 Summary of Applicability of Defense-In-Depth SSCs to WIPP Modes

Defense-In-Depth SSCs	Waste Handling Mode		Waste Storage/Disposal Mode	
	WHB	Underground	WHB	Underground
WHB HVAC System	X		X*	
Waste Hoist (when required to transport waste)	X	X		
Waste Handling equipment (including the TRUDOCK Bridge Crane, forklifts, facility pallets, underground transporters, etc.) as required during waste handling operations only.	X	X		
WHB structure including tornado doors	X		X*	
Underground Ventilation and Filtration System		X		X
Radiation Monitoring System (active waste disposal room exit alpha CAM for underground shift to filtration)		X		X
Central Monitoring System to support underground shift to filtration		X		X

*Note that no defense-in-depth operational requirements apply to the WHB when no WASTE is present.

Following failure of a required SSC, the facility will be placed in the WASTE Storage/Disposal Mode. During the time required to effect the required repairs, the facility is not in violation of the TSR.

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