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U.S. DEPARTMENT OF ENERGY

WASTE ISOLATION PILOT PLANT

GENERAL PLANT DESIGN DESCRIPTION (GPDD)

SYSTEM DESIGN DESCRIPTION (SDD)

SDD GPDD

Prepared by

Washington TRU Solutions LLC
Carlsbad, New Mexico

For

U.S. Department of Energy

Cognizant Individual	Pete Allen	10/04/10
	Printed Name	Date
Cognizant Manager	John Garcia	11/05/10
	Printed Name	Date

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CHANGE HISTORY

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3	10/98	Appendix E	ECP 1-VU97-107 ECO No. 9051
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SUMMARY

The Defense Authorization Act of 1979, Public Law 96-164, authorized the Department of Energy (DOE) to provide a research and development facility for demonstrating the safe disposal of radioactive waste produced by national defense activities. The DOE's decision to proceed with the Waste Isolation Pilot Plant (WIPP) followed a thorough National Environmental Policy Act (NEPA) review and was announced in a 1981 Record of Decision (ROD). The WIPP Land Withdrawal Act of 1992 (LWA), Public Law 102-579, modified by the WIPP Land Withdrawal Amendment Act of 1996 (LWAA), Public Law 104-201, transferred public land to DOE and established the regulatory framework and specific requirements prior to beginning waste management disposal operations. The WIPP Disposal Phase Final Supplemental Environment Impact Statement (SEIS) defines the alternatives reviewed for transuranic (TRU) waste management and disposal. The ROD, approved in January 1998, selects the WIPP as the desired alternative.

The WIPP is designed to dispose permanently of TRU waste generated by defense-related activities. Located within 10,240 acres of land in Eddy County in southeastern New Mexico, 26 miles east of Carlsbad, project facilities include disposal rooms excavated to 2,150 ft underground (about a half mile) in an ancient stable salt formation. TRU waste consists primarily of tools, gloves, clothing, and other such items contaminated with trace amounts of radioactive elements, mostly plutonium. In May 1998, the Environmental Protection Agency (EPA) certified that the facility meets the criteria established in 40 *Code of Federal Regulations* (CFR) 194. The WIPP is exempt from the Nuclear Regulatory Commission (NRC) regulations for storage and disposal of waste.

The WIPP is a nonreactor nuclear facility to be used for long term disposal of transuranic waste. As such, a limited number of engineered design features are provided to protect the public and site workers from the possibility of an uncontrolled release of radioactive materials. Since it has been established by analysis (DOE/WIPP-07-3372, *Waste Isolation Pilot Plant Documented Safety Analysis*) that a criticality accident is incredible at the WIPP, a Criticality Accident Alarm System is not provided.

The WIPP has capacity limits to emplace TRU waste in the underground for disposal over an operating life of 35 years. The total capacity of WIPP by volume is 6.2 million cubic ft of TRU waste; including approximately 250,000 ft^3 of Remote-Handled (RH) TRU waste. (Reference Public Law 102-579, WIPP LWA).

The WIPP shall have the capacity to process 500,000 cubic feet of CH TRU waste per year. The WIPP shall have the capacity to process 10,000 cubic ft of RH TRU waste per year.

The RH TRU waste canisters must be emplaced in each room prior to emplacing the CH TRU waste containers since the RH TRU waste canisters are disposed in

horizontally drilled holes in the walls of the underground rooms that become inaccessible after emplacing the CH TRU waste containers.

The 55-gallon drum containers of CH TRU waste can each contain approximately 7.5 ft^3 of waste. Standard Waste Boxes (SWBs), which can be used for disposal of CH TRU waste, can each contain approximately 64 ft^3 of waste. The RH TRU canister is expected to contain approximately 25 ft^3 of waste.

S.1 Surface Structures

The WIPP surface structures accommodate personnel and equipment and provide space for the receipt, handling, and transfer of waste from the surface to the underground disposal horizon. The surface structures are located within a fenced perimeter area of approximately 35 acres. The Waste Handling, Support, and Exhaust Filter buildings are the key areas needed for the conduct of waste handling operations. The other buildings and facilities provide space and services required to support the WIPP site and include the guard and security building, engineering building, sewage treatment facility, water pump house building, safety and emergency facility, warehouses, compressor building, training building, and other auxiliary buildings.

The primary surface waste handling operations are conducted in the Waste Handling Building (WHB) Bldg. 411 which has two basic operating areas: the CH bay for handling CH TRU waste; and the RH bay for handling RH TRU waste. An area is provided outside the WHB for off-loading CH TRU waste packages from transportation trailers and reloading empty containers for return to the generating sites. An area for off-loading RH TRU waste is also provided for the RH transport trailers, which are moved directly into the RH Bay for off-loading and subsequent reloading the transport trailer with an empty RH waste cask. The WHB includes ventilation systems with high efficiency particulate air (HEPA) filters in the air exhaust ducts.

The WIPP has four vertical shafts extending from the surface to the underground horizon 2,150 ft. below the surface: the Waste Hoist Shaft, the Salt Handling (SH) Hoist Shaft, the Air Intake Shaft (AIS), and the Exhaust Shaft.

The shafts are lined from the shaft collar to the top of the salt formation (approximately 850 ft below the surface), but are unlined through the salt formation. The shaft lining is designed to withstand water pressure associated with the full piezometric head in any water bearing layer encountered.

The Waste Hoist shaft is 19 ft in diameter and is located between the CH and RH Bays in the WHB. It is served by the waste hoist cage to transport CH or RH TRU waste for emplacement in the underground horizon. The hoist is also used to transport personnel, equipment, or materials to or from the surface and the underground. Some air is downcasted through the waste shaft, from the Auxiliary Air Intake Shaft and the WHB, to preclude the possibility of contaminated air, in the unlikely event of a release, escaping into the waste hoist tower and to the atmosphere.

The SH Hoist Shaft is 10 ft in diameter and is located beneath the SH head frame on the north side of the paved road within the site fenced perimeter area. The hoist has a combined personnel cage and bottom dump salt handling skip. This shaft provides the only means of removing mined materials from the underground and serves as a secondary supply of air to the underground areas.

The Exhaust Shaft is 16 ft in diameter and is located adjacent to the Exhaust Filter Building (EFB), Bldg. 413. It serves as the exhaust air duct for the underground areas.

The AIS is 16 ft in diameter and is located north of the entrance to the site. It serves as the primary supply of fresh air for the underground areas.

S.2 Underground Structures

The underground structures are located on the disposal horizon 2,150 ft. below the surface and consist of: the waste disposal area; the underground support area; and the North Area, formerly the experimental area.

The underground area has four main entries, three for fresh air and one for return air, and a number of disposal rooms. The layout of the shafts and entries allows disposal and mining operations to proceed concurrently. While waste is being emplaced in the rooms of one panel, another panel can be mined simultaneously.

The underground station located at the lower end of the Waste Hoist shaft provides access for personnel and equipment to handle and transport the waste containers to the emplacement location.

The underground support area provides space for workshops, a warehouse, offices, electrical substation, diesel fuel, parking areas, lunch room, and sanitary facilities. The underground support area is located in the shaft pillar area at the 2,150 ft. horizon.

The North Area consists of several rooms and pillars that were used for evaluating the interaction of simulated waste and thermal sources on bedded salt under controlled conditions. Portions of the North Area are now used for conducting scientific experiments.

1.0 SYSTEM DESCRIPTION

The General Plant Design Description (GPDD) defines the overall and principal design requirements for the WIPP based on the functional classification assigned to structures, systems, and components (SSCs) in the DSA. The GPDD establishes the overall plant design requirements and the SDDs define the individual system design requirements for structures and components.

In addition, the SDDs provide a physical description of the SSCs and the interface relationship between the systems. Appendix B provides a list of the WIPP systems and subsystems covered by the SDDs. The SDDs also contain operating parameters for the applicable system. Some of these operating parameters are contained in specific WIPP site procedures to allow the performance of work activities in compliance with DOE requirements.

The GPDD also defines:

The hierarchy of technical documents to be used to design, test, operate, and maintain the equipment and facilities.

The SSC functional classifications, definitions, and applicability to WIPP as defined in the DOE/WIPP-07-3372, *Waste Isolation Pilot Plant Documented Safety Analysis*. The DSA specifically examine those hazards inherent in processes and related operations that can result in uncontrolled release of hazardous material (i.e., chemical or radiological) or process-unique energy sources (e.g., high-pressure autoclave). Standard industrial hazards do not require DSA coverage.

1.1 Documentation Hierarchy

The overall requirements for the design of the WIPP shall be derived from federal and state laws, federal executive orders, DOE Orders, and federal agency regulations. Reference Figure 1-1 for a logic diagram of the hierarchy of the technical and other requirement documents applicable to WIPP.

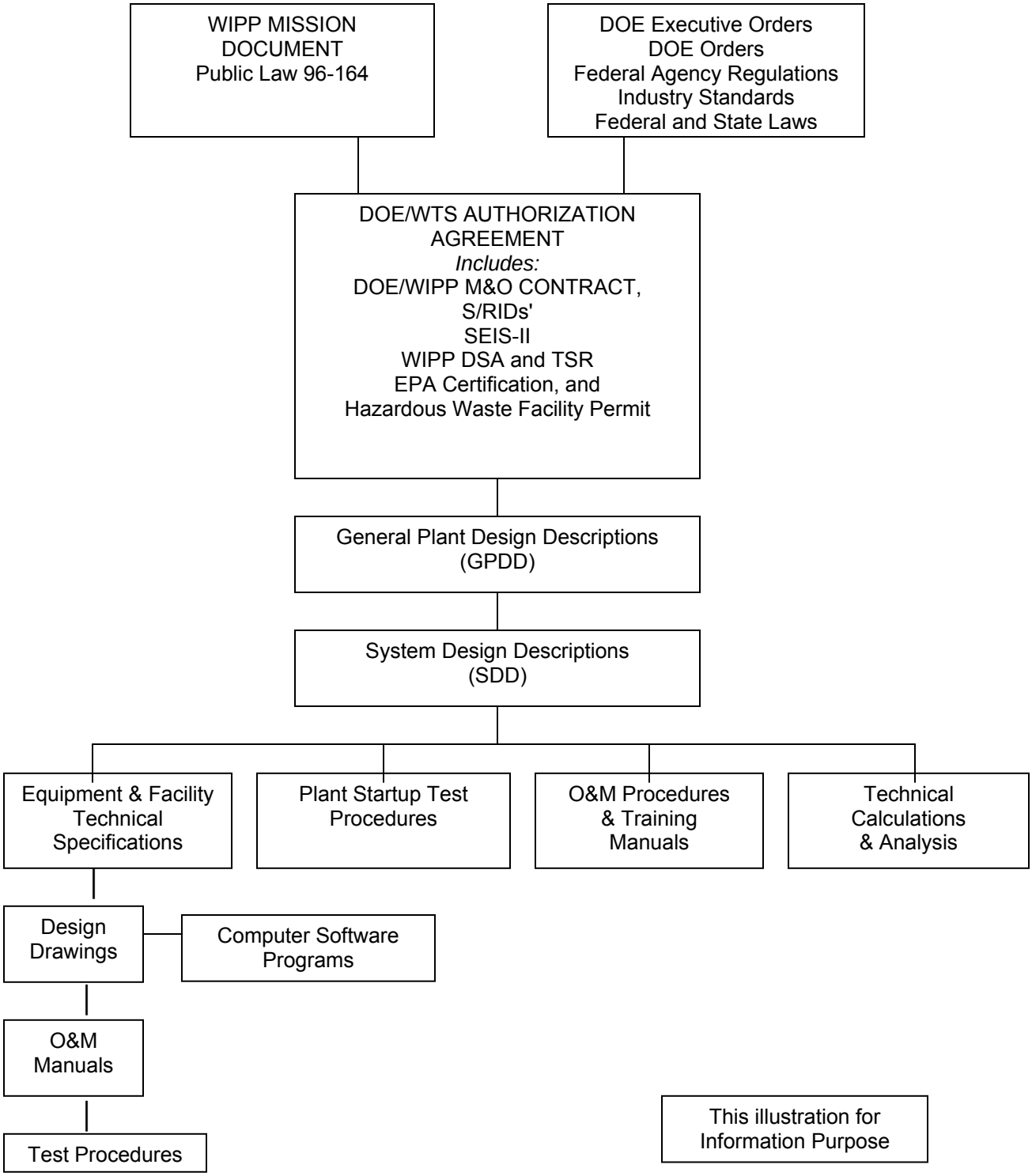

Figure 1-1 – Document Logic Hierarchy

2.0 DESIGN REQUIREMENTS

The WIPP shall be designed and operated to satisfy applicable executive orders, federal and state laws, DOE Orders and regulations promulgated by federal and state agencies.

The WIPP was designed under DOE Order 6430-81 and was certified in compliance with DOE Order 6430.1A, General Design Criteria, which is superseded by DOE Orders 420.1B, Facility Safety, and 430.1B, Real Property Asset Management. For specific facilities, such as WIPP, that are under the purview of the Defense Nuclear Facilities Safety Board (DNFSB), DOE O 433.1, Maintenance Management Program for DOE Nuclear Facilities, remains in effect until 10 CFR 830.340, "Maintenance Management" (not finalized) is issued as final.

The general design criteria of DOE Order 6430-81 is the "Code of Record" for the design of the WIPP SSCs. Revisions to DOE Orders apply to new designs.

DOE O 420.1B and DOE-STD-3009 require a functional classification of SSCs important to accidents analyzed in the DSAs. Functional classification replaces design classification. The criteria for functional classification is described in Section 2.7.2.

2.1 Facility Hazard Category

The hazard categorization for the CH TRU Waste Handling Process was developed based on the methodology and requirements in DOE-STD-1027-92, Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports. The Standard requires that a nonreactor nuclear facility be placed in a hazard category based on the unmitigated release of material from the facility. The material then is compared against Threshold Quantities (TQs) identified in Attachment 1 of the Standard.

The maximum drum radionuclide inventory developed in Chapter 3 of the WIPP DSA, susceptible to an unmitigated accidental release is 80 plutonium equivalent-curies (PE-Ci). Since this quantity exceeds the Hazard Category 3 threshold of 56 Ci for Pu-239 (Attachment 1 of Standard). WIPP is designated as a Hazard Category 2 Nuclear Facility. The following waste handling and disposal SSCs, those SSCs where TRU waste can reside outside of the Type B shipping container, are as follows:

- Waste Handling Building
- Waste Hoist Shaft
- Underground S-400 from the Waste Shaft Station to and including the Exhaust Shaft and Underground Exhaust System
- Underground E-140 from S-400 south

- Underground E-300 from S-400 south
- Waste Disposal Panels and Access Drifts

2.2 Design Limitations

The following limitations shall apply to RH TRU waste at WIPP as stipulated in (1) the agreement for consultation and cooperation between the DOE and the State of New Mexico on the WIPP and (2) Public Law 102-579 of October 30, 1992 (WIPP LWA):

No RH TRU waste received at WIPP may have a surface dose rate in excess of 1,000 rems per hour.

No more than 5 percent by volume of the RH TRU waste received at WIPP may have a surface dose rate in excess of 100 rems per hour.

RH TRU waste received at WIPP shall not exceed 23 curies per liter maximum activity level (average over the volume of the canister).

The total curies of RH TRU waste received at WIPP shall not exceed 5,100,000 curies.

The WIPP is designed to have an underground disposal capacity of approximately 6.2 X 106 ft3 TRU waste. Approximately 250,000 ft3 RH TRU waste can be disposed in the underground at WIPP.

2.3 Applicable Codes and Standards

Applicable industry and government standards, in addition to those required by DOE Orders and regulations, shall be utilized and specified as part of the system and equipment design requirements. Any additional equipment design requirements which are required for WIPP to perform its primary functions satisfactorily shall be specified in the design and construction documents and procurement documents. Also, codes, standards, and other requirements specific to WIPP systems are specified in the individual SDDs

The WIPP facility design was based on federal and state codes and standards in effect at that time (see Appendix G). However modifications to the facility shall be made using the current edition of the applicable Code and/or Standard, as determined by the approved engineering change. Modifications to the facility that affect Safety Class (SC) SSCs shall or Safety Significant (SS) SSCs shall apply the Appendix C design standards. In all cases, the modification and the bases for modification to the original design shall be documented by using the engineering design change control documentation process.

The codes, standards, regulatory requirements, and DOE Orders that shall be applied to the management, design, construction, testing, operation, maintenance, modification, and decommissioning of WIPP are specified in Appendix C for SC and SS SSCs, and in the SDDs listed in Appendix B.

2.4 Environmental Conditions for Design

The WIPP SSCs shall be designed for continuous operation in the environmental conditions described in Table 2-1, unless defined otherwise in the individual SDDs. This requirement may be satisfied by providing protective enclosures or placing components in locations with a controlled environment where this is feasible.

Table 2-1 – Surface and Underground Environmental Conditions for Design

SURFACE ENVIRONMENTAL CONDITIONS AND RANGES	
CONDITION	RANGE
Altitude	3,000 ft to 4,000 ft
Temperature Extremes	-17° F to 120° F
Relative Humidity	1% to 99%
Airborne Dust (salt)	up to 0.02 g/m3
Wind Velocity	up to 110 mph
Wind Direction (prevailing)	from southeast quadrant
Precipitation average Annual	13 in.
Precipitation 24 Hour Maximum	6 in.
Average Annual Snowfall	5 in.
Hottest Month	July
Coldest Month	December
Mean Barometric Pressure	26.4 in Hg*
*At WIPP Site Elevation (29.6 in Hg. Corrected to sea level)	
UNDERGROUND ENVIRONMENTAL CONDITIONS AND RANGES	
CONDITION	RANGE
Altitude	1,000 ft to 2,000 ft
Temperature Extremes	35° F to 110° F
Relative Humidity	0% to 20%
Airborne Dust (salt)	up to 0.02 g/m3
Wind Velocity	up to 20 mph
Note: See References 7 and 8 of Appendix A	

2.5 Quality Assurance

Quality Assurance requirements for WIPP SSCs were originally based on the design classification of the item. DOE O 420.1B and DOE-STD-3009 require that SSCs important to accidents analyzed in the Safety Analysis are functionally classified. DOE G 420.1-1, Nonreactor Nuclear Safety Design Criteria and Explosive Safety Criteria Guide for Use with DOE O 420.1B, Facility Safety, discusses the development

of QA requirements for the design fabrication, construction, and modification of SSCs in conjunction with the safety analysis.

To assure that the required quality is achieved for WIPP SSCs, the design, procurement, manufacture, construction, installation, testing, operation and maintenance of the system components shall be conducted in conformance with WP 13-1, Washington TRU Solutions LLC Quality Assurance Program Description.

Design specifications, equipment specifications, and drawings for the system and related services shall contain quality assurance (QA) program requirements appropriate to the item or work being specified. These specifications shall also define inspections, examinations, and tests appropriate to the specified item or work.

A graded approach to the application of QA controls shall be conducted in accordance with WP 09-CN3005. Application of the appropriate quality assurance requirements shall be determined in a manner consistent with the associated consequences of component failure and relative functional importance of the item involved.

2.6 Technical Safety Requirements (TSRs)

Limiting Conditions for Operations (LCOs) are selected to detail the operability requirements for the given equipment and to ensure that the practical definitive parameter limits are included in the LCO statement as identified in the DSA Chapter 5.

The WIPP TSR (DOE/WIPP-07-3373, *Waste Isolation Pilot Plant Technical Safety Requirements*) per 10 CFR 830.205 shall be used to establish the safety boundaries, limiting control settings, and administrative controls (based on the Functional Classification of systems, equipment, and facilities and/or safety analyses) necessary to ensure the safe operation of the WIPP, to reduce the potential risk to the public and onsite personnel from uncontrolled releases of radioactive or other hazardous materials, and to minimize exposure to personnel from direct radiation during normal operations. The TSRs consist of the following:

- Safety Limits (SL) (No SLs for WIPP)
- Limiting Control Settings (LCS) (No LCSs for WIPP)
- Limiting Conditions for Operation (LCO) (See DSA/TSR)
- Surveillance Requirements (SR) (See DSA/TSR)
- Design Features (DF) (See DSA/TSR)
- Administrative Controls (AC) (See DSA/TSR)

A safety review and classification of potential and postulated accidents for WIPP, a nonreactor nuclear facility, was performed in the WIPP DSA.

2.7 Defense-in-Depth Concept and Functional Classification of SSCs

2.7.1 Defense-in-Depth Concept

Defense-in-depth as an approach to facility safety has extensive precedent in nuclear safety philosophy. It builds in layers of defense against release of hazardous materials so that no one layer by itself, no matter how good, is completely relied upon. To compensate for potential human and mechanical failures, defense-in-depth is based on several layers of protection with successive barriers to prevent the release of hazardous material to the environment. This approach includes protection of the barriers to avert damage to the plant and to the barriers themselves. It also includes measures to protect the public, workers, and the environment from harm in case these barriers are not fully effective.

The defense-in-depth philosophy is a fundamental approach to hazard control for nonreactor nuclear facilities even though they do not possess the catastrophic accident potential associated with nuclear power plants. In keeping with the graded-approach concept, no requirement to demonstrate a generic, minimum number of layers of defense-in-depth is imposed.

The first layer of defense-in-depth relies upon a high level of design quality so that important SSCs will perform their required functions with high reliability and tolerance against degradation. The first layer also relies on competent operating personnel who are well trained in operations and maintenance procedures.

The second layer of defense-in-depth consists of: (1) automatic systems; or (2) means to alert the operator to take action or manually activate systems that correct the abnormal situation and halt the progression of events toward a serious accident.

The third layer of defense-in-depth supplements the first two layers by providing confinement and post event response in the event that the first two layers have been breached.

2.7.2 Functional Classification of SSCs

The SSC functional classifications, definitions, and applicability to WIPP as defined in the WIPP DSA, DOE/WIPP-07-3372, are as follows (Appendix D is a crosswalk between functional classification, and quality level):

Safety Class SSCs - Safety Class SSCs are systems, structures, or components whose preventive or mitigative function is necessary to keep hazardous material exposure to the public below the offsite Evaluation Guideline (EG). The EG is 25 rem total effective dose equivalent (TEDE). The dose estimates to be compared to it are those received by a hypothetical maximally-exposed off-site individual (MOI) at the site boundary.

Safety Significant SSCs - SSCs not designated as Safety Class, but whose preventive or mitigative function is a major contributor to defense-in-depth (e.g. prevention of uncontrolled material releases) and/or worker safety as determined from the safety analysis. Safety significant SSC designations based on worker safety are limited to those SSCs whose failure is estimated to result in a prompt worker fatality or serious injuries or significant radiological or chemical consequences to workers.

2.8 Balance-of-Plant (BOP) SSCs

BOP is not designated as a functional class. This category includes facility SSCs not identified in Section 2.7. SSCs or functions required by OSHA and mine safety regulation are included in this category.

2.9 Natural Phenomena Design Basis Accidents (DBAs)

Natural phenomena accident initiators at WIPP are earthquakes, tornadoes, high winds, and snow. The DBAs postulated for WIPP, are the Design Basis Earthquake (DBE), Design Basis Tornado (DBT), Design Basis Winds, and Design Basis Snow Loading.

These design basis events could result in a release of radioactive or hazardous materials that cause an off-site exposure for CH TRU and RH TRU waste activities. The WIPP DSA credits the Waste Handling Building as a TSR control to withstand these DBAs.

Operational and external DBAs are defined in the WIPP DSA.

2.9.1 Earthquake and Tornado

The following structures and equipment at WIPP shall be designed to withstand the effects of both the DBE and the DBT events in accordance with the tornado and earthquake requirements of DOE Order 420.1B.

- Waste Handling Building including Tornado Doors (Bldg. 411) (SDD CF00-GC00) **[TSR DF 6.1]**
- Station A (SDD CF00-GC00)
- TRUPACT Maintenance Facility (TMF) (Bldg, 412) lateral-force-resisting structural members to prevent it collapsing on the adjacent WHB (SDD CF00-GC00) **[TSR DF 6.1]**
- Support Building (Bldg. 451) lateral-force-resisting structural members to prevent it from collapsing on the adjacent WHB (SDD CF00-GC00) **[TSR DF 6.1]**
- Tornado Dampers (SDD HV00)

- Exhaust Duct Elbow (SDD VU00) (Top of Exhaust Shaft)

- Effluent Sampling Stations A3, B2, and C (SDD RM00)

- Auxiliary Air Intake (Bldg. 465) (SDD CF00-GC00)

The following equipment at WIPP shall be designed to withstand the effects of only the DBE event in accordance with the earthquake requirements of DOE Order 420.1B.

- TRUDOCK 6-ton bridge cranes
- 140/25-ton bridge crane
- 15-ton Hot Cell crane
- Canister Shuttle Car
- 25-ton Cask Unloading Room bridge crane
- 6.25-ton Facility Cask Loading Room grapple hoist

The specific tornado and earthquake requirements for the above items, as well as other structures and equipment that must be designed to meet Uniform Building Code (UBC) seismic requirements shall be detailed and provided in the SDD CF00-GC00.

2.9.1.1 Earthquake Requirements

The DBE for WIPP is defined as having a free-field horizontal and vertical ground acceleration of 0.1 g, based on a 1,000 year recurrence period (see SDD CF00-GC00).

The UBC (latest revision at the time of design) earthquake requirements (UBC seismic zone no. 1) shall be used as the basis to design all surface structures except those confinement structures and facilities specified to be designed to a DBE as stated in Step 2.9.1.

2.9.1.2 Tornado Requirements

The DBT shall be used as the basis for designing the surface confinement and associated structures. The DBT load shall be based on the site specific study of wind and tornado probabilities at the WIPP site (Reference 7). The maximum wind speed for the DBT is 183 mph with a return period of 1,000,000 years.

The design wind loads shall be based on the requirements of ANSI A58.1-1972 with exposure C terrain classification. The following design winds shall be used:

Handling Building	DBT or 1,000 year mean recurrence level wind of 110 mph at 30 feet, whichever governs the design
Support Bldg. (451) Exhaust Filter Bldg. (413)	100 year mean recurrence level wind of 99 mph
Other facilities	50 year mean recurrence level wind of 91 mph

2.9.1.3 Wind Requirements

The design wind velocity for the WHB is 110 mph at 30 ft above ground. The wind velocity selected with a 1,000-year mean recurrence interval, is adopted from the results of a site specific wind and tornado study (*A Site-Specific Study of wind and Tornado Probabilities at the WIPP Site in Southeast New Mexico [Fujita, 1978]).* The design wind velocity exceeds the basic wind velocity specified in ANSI Standard A58.1 for the geographical location of the WIPP facility.

The design wind velocity for other WIPP structures is 91 mph, with a 50-year mean recurrence interval, except for the support building and exhaust filter building, which is 99 mph with a 100-year mean recurrence interval.

2.9.1.4 Snow Load Requirements

The WHB, including the TMF and waste hoist tower, is designed for a now load of 27 lb/ft^2.

The design snow load is derived by using the 100-year recurrence snow load of 10 lb/ft^2 specified in ANSI Standard A58.1.

3.0 OPERATIONAL INFORMATION

The operation of the WIPP waste repository when handling TRU waste for emplacement consists of:

- Receiving packages of TRU waste.
- Inspecting and preparing the packages of TRU waste containers/canisters for emplacement in the underground.
- Transferring the TRU waste to the underground for disposal.

In addition, waste operations include provisions for installing backfill over the CH TRU waste containers once emplaced.

3.1 Facility Operational Modes

The Waste Handling, Waste Storage, Standby, and Disposal Modes are the four modes of operation defined in the WIPP TSR.

3.1.1 Waste Handling Mode

A Mode when Waste is being handled or moved outside of a Closed Shipping Container or MgO is being placed in a Disposal Room.

The Waste Handling Mode of operations at WIPP consists of waste handling operations. SSCs required to operate in the Waste Handling Mode shall be operable or operating in compliance with the TSRs. Mode Compliance Equipment is designated by an "M" in the Engineering Equipment Register or as Mode Compliance Equipment by a "C" in the Engineering Instrument Register.

Maintenance, repair activities and inspections are allowed, provided that the SSCs required for Waste Handling Mode remain operable.

Mode Compliance Equipment (M) and (C) is needed to support the Waste Handling Mode of operations at WIPP.

3.1.2 Waste Storage Mode

A Mode that is used when Waste is outside of a Closed Shipping Container when Waste is not being handled or moved, and site-derived Waste is in a Waste container with the lid secured.

The WHB is configured for waste storage. Waste handling operations are not being conducted in the WHB. The SSCs and instruments that are required to be operable to support the Waste Storage Mode shall be identified as Mode Compliance Equipment (M) on the Engineering Equipment Register or (C) on the Engineering Instrument Register.

Maintenance, repair activities, and inspections are allowed, provided the SSCs required for Waste Storage Mode.

3.1.3 Standby Mode

Standby Mode is a mode used for the WHB. While in this mode, no waste outside of a closed Shipping Container (TRUPACT-II, HalfPACT, 72-B, or 10-160B) can be present in the WHB. Site-derived waste is in a waste container with the lid secured.

The Standby mode is the safest mode for the WHB due to the fact that while in this mode no waste will be present outside of a closed TRUPACT-II or HalfPACT in the

CH Bay, or a closed 72-B or 10-160B, therefore, the postulated events involving waste can not occur.

Maintenance, repair activities, and inspections are allowed, provided the SSCs required for Standby Mode remain operable.

3.1.4 Disposal Mode

Waste handling operations are not being conducted in the Underground. Ground control and barrier emplacement activities may occur at the waste face in the active disposal room.

Maintenance, repair activities, and inspections are allowed, provided the SSCs required for Disposal Mode remain operable.

3.2 Calibration Services Requirements

A program for control and calibration of measuring and test equipment (M&TE) shall be established to ensure the availability of tools and equipment necessary for maintenance, repair, and calibration of installed equipment and instruments in accordance with DOE Order 433.1.

- M&TE shall be calibrated by approved laboratory services. All calibration shall be traceable, through audit able documentation to NIST (National Institute of Standards and Technology) standards, international standards, or intrinsic standards when available. If no nationally recognized standards exist, the bases for calibration shall be documented.

- Installed instruments, instrument loops or groups of associated equipment that requires calibration shall be calibrated by M&TE with an accuracy ratio of 4 to 1 as defined in the approved standard. If a M&TE accuracy ratio is different than 4 to 1, it will be identified in each system SDD.

- Facilities shall be provided to store and maintain inventory control of the M&TE to support the testing, alignment, calibration, and servicing of the WIPP systems and equipment.

3.3 Contingency Plan

The emergency equipment listed in the WIPP HWFP Contingency Plan shall be identified as HWFP equipment in the Engineering Equipment Register. Items considered "consumable" from the HWFP Tables should not be identified on the Engineering Equipment Register

3.4 HWFP Equipment Inspections

The HWFP lists equipment required to be periodically inspected. The equipment is inspected for malfunctions, deterioration, potential for operator errors, and discharges which could lead to a release of hazardous waste constituents to the environment or pose a threat to human health. The equipment listed in the HWFP shall be identified as HWFP equipment in the Engineering Equipment Register.

APPENDIX A - REFERENCES

1. Defense Authorization Act of 1979, PL 96-164

2. WIPP Land Withdrawal Act of 1992, PL 102-579

3. WIPP Land Withdrawal Amendment Act of 1996, PL 104-201

4. WIPP Disposal Phase Final Supplemental Environmental Impact Statement

5. Agreement for Consultation and Cooperation between the Department of Energy and the State of New Mexico on the Waste Isolation Pilot Plant, dated April 13, 1988 (as amended)

6. Site Specific Study of Wind and Tornado Probabilities at the WIPP Site in Southeast New Mexico, T. Fujita, SMRP Research Paper No. 155, February 1978, revised August 2, 1978

7. An environmental baseline study of the Los Medanos Waste Isolation Pilot Plant (WIPP) Project Area of New Mexico: "A Progress Report": Sand 77-7017, Sept. 1977.

8. WIPP-DOE-71, Design Criteria Waste Isolation Pilot Plant (WIPP) Revised Mission Concept-IIA (RMC-IIA), Revision 4, February 1984.

9. WIPP Hazardous Waste Facility Permit

10. DOE Order 6430-81, *General Design Criteria Manual* (superseded by DOE Order 6430.1)

11. DOE Order 6430.1A, *General Design Criteria* (superseded by DOE Orders 420.1B and 430.1B)

12. DOE Order 420.1B, *Facility Safety*

13. DOE Order 430.1B, *Real Property Asset Management*

14. DOE Order 433.1, *Maintenance Management Program for DOE Nuclear Facilities*

15. DOE-STD-1020-2002, *Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities*

16. DOE-STD-1021-93, *Natural Phenomena Hazards Performance Categorization Guidelines for Structures, Systems, and Components*

17. DOE-STD-1022-94, *Natural Phenomena Hazards Characterization Criteria*

18. DOE-STD-1023-95, *Natural Phenomena Hazards Assessment Criteria*

19. DOE G 420.1-1, *Nonreactor Nuclear Safety Design Criteria and Explosives Safety Criteria Guide for use with DOE O 420.1B, Facility Safety*

20. DOE G 151.1-1, *Hazards Surveys and Hazards Assessment*

21. DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*

22. DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analysis (Change 2, April 2002)*

23. DOE/WIPP-07-3372, *Waste Isolation Pilot Plant Documented Safety Analysis*

24. DOE/WIPP-07-3373, *Waste Isolation Pilot Plant Technical Safety Requirements*

APPENDIX B - LIST OF SDD SYSTEMS AND SUBSYSTEMS

APPENDIX B	
LIST OF SDD SYSTEMS AND SUBSYSTEMS	
SDD	**SYSTEM**
AU00 = SC	U/G FACILITY AND EQUIPMENT
	Subsystems
AU01	U/G Experimental Facilities
AU02	U/G Disposal Facilities **[TSR DF 6.11]**
AU03	U/G Shaft Pillar Facilities
AU04	U/G Mobile Equipment
AU05	U/G Diesel Fuel System
AU06	U/G Ground Control System **[TSR SAC 5.1.1.3]**
AU07	U/G Geomechanical Monitoring System **[TSR SAC 5.1.1.3]**
AU08	Underground and Surface Surveying
CA00 = BoP	COMPRESSED AIR SYSTEM
	Subsystems
CA01	Plant Air Distribution & Compression (Surface)
CA02	Instrument Air Subsystem
CA03	U/G Air Distribution
CA04	Breathing Air Bottle Recharging Subsystem
CA05	Compressed Gases
CW01	Cooling Water Subsystems
CF00-GC00 = SC	PLANT BUILDINGS, FACILITIES & MISCELLANEOUS EQUIPMENT
	Subsystems
CF01	Special Facilities, formerly GC05
CF02	Confinement Facilities **[TSR DR 6.1, DF 6.2, DR 6.14]**
GC01	Roads and Grounds System
GC02	General Surface Facilities System
GC03	Sanitary Sewage System
GC04	Fuel System
GC05	Reference GC01
GC06	External Surface Facilities System
GC07	Surface Miscellaneous Mobile and Lifting Equipment

APPENDIX B	
LIST OF SDD SYSTEMS AND SUBSYSTEMS	
SDD	**SYSTEM**
CM00-PC00 = BoP	PLANT MONITORING & COMMUNICATIONS
	Subsystems
CM01	Central Monitoring System (CMS)
CM02	Central Monitoring Room (CMR)
CM03	WIPP Waste Information System (WWIS)
CM05	Waste Handling Barcode System (WHBS)
PC00	Plant Communications
PC01	Dial Phones
PC02	Mine Pager Phones
PC03	Plant Public Address (PA) & Alarm Systems
PC04	Radio and Other
PC05	Shared Computing Resources, WIPPnet
PC06	Emergency Operations Center (EOC)
ED00 = BoP	ELECTRICAL DISTRIBUTION SYSTEM
	Subsystems
ED01	69 kV SYS./Southwest Public Service Company
ED02	13.8 kV Switchgear & Equipment
ED03	4,160 V & 2,400 V Switchgear
ED04	480 V Switchgear
ED05	480 V Motor Control Centers
ED06	Low Voltage Power & Distribution (<600 V)
ED07	General Lighting & Receptacles Loads
ED08	Uninterruptible Power Supply (UPS)
ED09	Diesel Generators (Surface)
ED10	13.8 kV Switchgear Equipment
ED11	480 V Switchgear
ED12	480 V Motor Control Centers
ED13	Low Voltage Power & Distribution (<600 V)
ED14	General Lighting & Receptacles Loads
ED15	Grounding & Lighting Protection
ED16	Emergency Lighting
ED17	Security and Perimeter Lighting
All Subsystems	Raceways & Cable (All locations)
EM00 = BoP	ENVIRONMENTAL MONITORING SYSTEM
	Subsystems
EM02	Air Quality Monitoring
EM03	Meteorological Monitoring
EM04	Seismic Monitoring System
EM05	VOC Monitoring

APPENDIX B	
LIST OF SDD SYSTEMS AND SUBSYSTEMS	
SDD	**SYSTEM**
FP00 = SS	FIRE PROTECTION SYSTEM
	Subsystems
FP01	Fire Water Supply and Distribution System **[TSR LCO 3.1.1]**
FP02	Fire Suppression System **[TSR LCO 3.1.1]**
FP03	Fire Detection and Alarm System
FP04	Radio Fire Alarm Reporter (RFAR) System
HV00= SS	HEATING, VENTILATION AND AIR CONDITIONING SYSTEM
	Subsystems
CW02	Chilled Water Cooling System
HV01	Waste Handling Building CH Area HVAC **[TSR LCO 3.2.1]**
HV02	Waste Handling Building RH Area HVAC **[TSR LCO 3.2.2]**
HV03	Support Building (Bldg. 451) HVAC
HV04	Exhaust Filter Building (Bldg. 413) HVAC
HV05	HVAC in Bldgs. 452, 453, & 456
HV06	Miscellaneous Bldgs. HVAC
PP00 = BoP	PLANT PROTECTION SYSTEM
	Subsystems
PP01	Perimeter Fencing and Gates
PP02	Security Protection and Response System
PT00 = BoP	PACKAGING AND TRANSPORTATION SYSTEM
	Subsystems
PT01	CH TRU Container
PT02	RH TRU Cask
PT03	Transportation
PT04	Packaging Ancillary Equipment and Tools
RM00 = BoP	RADIATION MONITORING SYSTEM
	Subsystems
EM01	Radioactive Effluent Monitoring System
PV00	Plant Vacuum System
RM01	Continuous Air Monitoring System
RM02	Fixed Air Sampler System
RM03	Area Radiation Monitoring System
RM04	Portable Radiation Monitoring (PRM)
RM05	RH Continuous Air Monitors

APPENDIX B	
LIST OF SDD SYSTEMS AND SUBSYSTEMS	
SDD	**SYSTEM**
UH00 = SC	UNDERGROUND HOISTING SYSTEM
	Subsystems
UH02	Air Intake Shaft Hoist
UH03	Air Intake Shaft
UH04	Salt Handling Hoist
UH05	Salt Handling Shaft
UH06	Waste Hoist **[TSR SAC 5.1.1.1, DF 6.14]**
UH07	Waste Shaft
UH08	Exhaust Shaft
VU00 = SS	UNDERGROUND VENTILATION SYSTEM
	Subsystems
VU01	Exhaust Fans and Filters
VU02	Booster Fans & Installed Auxiliary Fans & Ducts
VU03	Ventilation Control, Bulkheads **[TSR DF 6.9, DF 6.12, DF 6.13]**
VU04	Local Temporary Ventilation
VU05	Air Intake and Exhaust
VU06	Remote Monitoring and Control
WD00 = SS	WATER DISTRIBUTION SYSTEM
	Subsystems
WD01	Domestic/Utility Water
WD02	Raw Water, Storage Tanks, and Chlorination **[TSR LCO 3.1.1]**
WH00 = SC	WASTE HANDLING EQUIPMENT
	Subsystems
WH01	TRUPACT-II Handling Equipment
WH02	CH Waste Handling Equipment Requirements **[TSR LCO 3.1.2, DF 6.4, DF 6.5, DF 6.6, DF 6.7]**
WH03	RH Waste Handling Equipment Requirements **[TSR LCO 3.1.2, DF 6.3, DF 6.6, DF 6.8]**
WH04	Site-Derived Waste Handling Equipment Requirements
WH05	Hot Cell Equipment Requirements

Safety Class = SC
Safety Significant = SS
Balance of Plant = BoP

APPENDIX C - SAFETY CLASS AND SAFETY SIGNIFICANT SSC DESIGN STANDARDS

DOE G 420.1-1	Concrete	Steel	Pressure Vessels	Piping/Valves	Pumps	Tanks (Atmos.)	Heat Exchangers	Gloveboxes	Ducts/fans	Filtration
SAFETY SIGNIFICANT	ACI-318	AISC-M011	ASME Section VIII	ANSI/ASME B31.3, ANSI/ASME B16.5	ANSI/API; ANSI/ASME B73.1M, B73.2M; ASME Section VIII; AWWA; Hydraulic Institute Standards	ANSI/API-650; AWWA-D100; ANSI/ASME-B96.1	ASHRAE Handbook; ASME Section VIII; TEMA B, C, or R	ANSI/ASTM C852; ANS 11.16	SMACNA Manual/ ASHRAE Handbook	ASHRAE-52.1; Mil-F-51068F; ANSI/ASME-N509 and N510; DOE NE STD-F3-45
SAFETY CLASS	ANSI/ ACI-349	ANSI/AISC-N690	ASME Section VIII	ANSI/ASME B31.3; ANSI-N278.1/ ANSI/ASME B16.5, B31.3	ANSI/API; ANSI/ASME B73.1M, B73.2M; ASME Section VIII; AWWA; Hydraulic Institute Standards	ANSI/API-650; AWWA-D100; ANSI/ASME-B96.1	ASHRAE Handbook; ASME Section VIII; TEMA B, C, or R	ANSI/ASTM C852; ANS 11.16	SMACNA Manual/ ASHRAE Handbook; ANSI/ANI-59.2	ASHRAE-52.1; Mil-F-51068F; ANSI/ASME-N509 and N510; DOE NE STD-F3-45

DOE G 420.1-1	Cranes	Other Equip.	Elect. Hardware	As Applicable to Specific Elect. Hardware	I & C Hardware
SAFETY SIGNIFICANT	CMAA; ANSI/ASME NOG-1; ANSI/ASME B30.2; DOE-STD-1090-2007	ANSI N 14.6; AISC M011	NFPA 70, 110, and 780; IES Lighting Handbook; ANSI C2; ANSI/IEEE C37, -80, -141, -142, -242, -399, -493, and -577	ANSI/IEEE-323, -334, -336, -344, -381, -382, -383, -420, -450, -484, -535, -628, -649, -650, -833, -934, -944, and -946	NFPA-70 and -110; ANSI C2; ANSI/ANS-8.3, -N42.18, and - N13; ANSI/ASA-Series; ANSI/IEEE-141, -142, -242, -493, and -1050
SAFETY CLASS	CMAA Nuclear Sections; ANSI/ASME NOG-1; ANSI/ASME B30.2; DOE-STD-1090-2007	ANSI N 14.6; AISC M011	NFPA 70, 110, and 780; IES Lighting Handbook; ANSI C2; ANSI/IEEE C37, -80, -141, -142, -242, -308, -338, -379, -384, -399, -493, -577, and -603		NFPA-70 and -110; ANSI C2; ANSI/ANS-8.3, -N42.18, and - N13; ANSI-N320 and -N323; ANSI/ASA-Series; ANSI/IEEE-141, -142, -242, -323, -336, -338, -344, -379, -384, -493, and -1050

APPENDIX D - DSA FUNCTIONAL CLASSIFICATION QUALITY ASSURANCE QUALITY LEVELS

Crosswalk - DSA Functional Classification/Quality Assurance Quality Levels	
NEW - 10 CFR 830 Subpart B, DOE-STD-3009-94 Change 2, DOE O 420.1B Functional Classification	
Safety Class. Safety class SSCs are systems, structures, or components whose preventive or mitigative function is necessary to keep hazardous material exposure to the public below the offsite Evaluation Guidelines (EG). The EG is 25 rem total effective dose equivalent (TEDE). The dose estimates to be compared to it are those received by a hypothetical maximally-exposed offsite individual (MOI) at the site boundary.	Current QA Graded Approach Criteria for Quality Level 1 from WP 09-CN 3005
Safety Significant. SSCs not designated as Safety Class, but whose preventive or mitigative function is a major contributor to defense-in-depth (e.g., prevention of uncontrolled material releases) and/or worker safety as determined from safety analysis. Safety significant SSC designations based on worker safety are limited to those systems, structures, or components whose failure is estimated to result in a prompt worker fatality or serious injuries or significant radiological or chemical consequences to workers.* An item should be considered for designation as Safety Significant if failure of the item could cause radiological exposure in excess of 100 rem to the worker.**	Current QA Graded Approach Criteria for Quality Level 1 from WP 09-CN 3005
Balance of Plant. This category includes facility SSCs not identified above. SSCs or functions required by OSHA and mine safety regulation are included in this category.	**Quality assurance requirements at the discretion of the Cognizant Engineer.**

* DSA specifically examines those hazards inherent in processes and related operations that can result in uncontrolled release of hazardous material (i.e., chemical or radiological) or process-unique energy sources (e.g., high pressure autoclave). Standard industrial hazards do not require DSA coverage. Standard industrial hazards such as burns from hot objects, electrocution, falling objects, etc., are of concern only to the degree that they can be a contributor to a significant uncontrolled release of hazardous material (e.g., 115-volt wiring as initiator of a fire) or major energy sources such as explosive energy.

** From DOE G 151.1-1, Volume II, *Hazards Surveys and Hazards Assessments*: "The use of 100 rem TEDE as an approximation of the lethality threshold is quite conservative. Radiation effects studies have estimated a 5 percent risk of early fatality following an acute dose of 140 rem, with a smaller but indeterminate risk expected for doses below that level. Little if any risk of early fatality would be associated with 100 rem TEDE if the dose were received over a period of time from radioactive material taken into the body."