Ms. Judith M. Espinosa, Secretary  
New Mexico Environment Department  
P.O. Box 26110  
Santa Fe, NM 87502

Dear Secretary Espinosa:

This letter transmits the 1992 Scheduled Update to the WIPP Final Safety Analysis Report (FSAR). This set of WIPP FSAR page changes involve updates reflecting WIPP organizational changes and minor design changes (Enclosure 1), and editorial changes (Enclosure 2). These page changes involve no impacts related to public health and safety from those reported in the existing WIPP FSAR and FSAR Addendum.

Though these changes do not involve any new impacts on the public health and safety, the FSAR page changes are being provided for your information prior to their formal publication.

If you have any questions relating to these FSAR page changes, please contact Dr. James A. Mewhinney at (505) 887-8143.

Sincerely,

[Signature]

Arlen Hunt, Manager  
WIPP Project Site Office

Enclosures

cc w/enclosures:
C&C_File
J. Garcia, WID
J. Mewhinney, WPSO
J. Harvill, WTAC
Enclosure 1

WIPP FSAR Changes with Revisions Due to Facility Design Changes, Procedure Changes and Organizational Changes
# LIST OF FSAR CHANGE PAGES

(With reasons for each change)

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* A USQ review was undertaken and the finding was negative. The USQ review and the review results have been documented in a WID memo.

** A Safety Evaluation and an independent review of the Safety Evaluation have been undertaken and documented in accordance with the WID procedure, WP 02-1102.
BASES FOR CONCLUSION
THAT FSAR CHAPTER 11 CHANGE PAGES PROVIDED
IN THIS ATTACHMENT DO NOT INVOLVE
A REDUCTION TO THE QA PROGRAM COMMITMENTS

All the FSAR Chapter 11 (Quality Assurance) change pages provided in this Attachment as listed on Page 1 of this list involve update revisions to bring the FSAR consistent with the current organizations of the project participants and the most up-to-date QA program information in the DOE's quality assurance programs for the WIPP Project. As such, they do not involve any change to the QA Program that reduces the commitments in the program description.

This statement of Bases for Conclusion is provided in accordance with the requirement of the DOE/EM's "Evaluation Process Guidance for WIPP Changes" (Paragraph 4.6).
The purpose of the SEIS is to examine potential environmental consequences of (1) changes in the "proposed action" since publication of the FEIS, and (2) changes in information, assumptions, or methods of analysis previously employed. The critical inquiry is to determine the significance of these changes by comparing their consequences with the environmental impacts evaluated by the FEIS. Modifications to the proposed action examined in the FEIS are as follows:

- Changes in the TRU radionuclide inventory including high-curie content waste, high-neutron waste, and elimination of high-level waste experiments
- Emplacement of hazardous chemical constituents of TRU mixed waste
- Changes in waste transportation including packaging, routes, and transportation modes
- Changes to the WIPP experimental program

The SEIS provides a companion document to this FSAR to the extent it provides additional detail regarding certain environmental impacts. Information identified during the SEIS process that indicated a need for additional safety analysis resulted in an appropriate modification to the FSAR being prepared.

Chapter 1 of this document includes a summary of the location and major design features of the WIPP facility. Chapter 1A contains a summary safety analysis, and Chapters 2 through 5 have descriptions of the site characteristics, design criteria, and design bases used in plant design and the plant operations. Chapter 6 contains discussions of radiation protection, environmental protection, industrial safety, industrial hygiene, and security. Chapter 7 includes an accident analysis of the plant. Chapter 8 includes an explanation of the methodology being used to complete an assessment of the long-term waste isolation performance of the WIPP. The final assessment will not be completed until 1992 and will be included in a future amendment to this FSAR. The conduct of operations and operational safety requirements are discussed in Chapters 9 and 10. The quality assurance program is described in Chapter 11. Chapter 12 contains a description of future decontamination and decommissioning of the facility, and Chapter 13 is the glossary of technical terms and acronyms.

Amendments to this FSAR will be made when significant modifications are proposed for the WIPP facility. Among the factors that will be considered in determining whether a proposed physical or administrative change constitutes a significant modification are:

- Increases in the risk from a hazard beyond that previously analyzed and reviewed. This may stem from changes in operating characteristics such as speed, temperature, or pressure; increases in the quantity of hazardous materials; and/or changes in design features or administrative controls.
- Reductions in the reliability of any item for which credit has been taken for the reduction or control of a hazard.
- Introduction of a new hazard.
- Application of new regulations.
- Receipt of new information indicating an increased hazard associated with an existing operation.

The review and authorization levels for significant modifications to DOE operations will be selected based on the hazards associated with the modification and not on the original authorization for the operation. The DOE will determine the review and authorization level.
1.4 IDENTIFICATION OF AGENTS AND CONTRACTORS

The overall responsibility for the design, construction, operation, and decommissioning of the Waste Isolation Pilot Plant (WIPP) facility rests solely with the U.S. Department of Energy (DOE). Within the DOE, the Assistant Secretary for Environmental Restoration and Waste Management (EM) is responsible for implementing the radioactive waste disposal policy. The WIPP Project Integration Office (WPIO) and WIPP Project Site Office (WPSO) have been established to manage and administer all project activities.

The DOE-AL has contracted with the following organizations to participate in the WIPP Project:

- Sandia National Laboratories (SNL), Department of Waste Management Technology, Albuquerque, New Mexico, to serve as the Scientific Advisor
- Bechtel National Incorporated, Advanced Technology Division, San Francisco, California, to serve as the Architect/Engineer
- Westinghouse Electric Corporation, Waste Isolation Division, Carlsbad, New Mexico, to serve first as the Technical Support Contractor (1978-1985) and later as the Management and Operating Contractor (1985-present)

NOTE: The U.S. Army Corps of Engineers was the construction manager under provisions of an Interagency Agreement prior to transfer of this responsibility to the Management and Operating Contractor (MOC).

SNL, as the Scientific Advisor, has been responsible for developing the conceptual design of the WIPP facility, preparing the Draft and Final Environmental Impact Statements, and performing the site selection and characterization studies. SNL is also responsible both for developing and implementing the in situ experimental testing programs and for completing the performance assessment of the WIPP facility in compliance with 40 CFR 191 Subpart B.

Bechtel, the Architect/Engineer, is responsible for developing the detailed design of the facility, including construction bid package development and design related geotechnical explorations. Bechtel has engaged the services of Rockwell International as consultant for the design of special waste handling equipment.

As the Technical Support Contractor (TSC) (from 1978-1985), Westinghouse was responsible for providing general management and procurement support to the WPO. In this role, Westinghouse performed technical reviews of the design, prepared the Safety Analysis Report, supported preparation of the Final Environmental Impact Statement, and provided support in operational planning and quality assurance. In 1985, the DOE/AL contracted with Westinghouse to provide management and operating services as the MOC. In this capacity, Westinghouse is solely responsible for general management and operating services, including operational safety, engineering management, quality assurance and control, project control, construction management, and environmental services. As part of its responsibility as MOC, Westinghouse ensures that all inputs to facility operations are properly reviewed for health, safety, and environmental implications.

The DOE has entered into a formal agreement with the State of New Mexico for the purpose of consultation and cooperation (referred to as the C and C Agreement). This agreement, its associated working agreement and subsequent modifications provide a basis for the Governor of New Mexico to exercise the state’s right, granted under Public Law 96-164, to comment on and make recommendations regarding the public health and safety aspects of the WIPP Project. The C and C Agreement designates key events, sets time frames for review, comment and resolution of comments, and establishes procedures for review of the WIPP Project activities and for resolving conflicts.
The purpose of the Environmental Evaluation Group (EEG) is to conduct an independent technical evaluation of the WIPP Project related to the protection of the public health and safety. The EEG was established in 1978 with funds provided by the DOE to the State of New Mexico. Public Law 100-456, the National Defense Authorization Act, FY89, Section 1433, assigned the EEG to the New Mexico Institute of Mining and Technology and provided for continued funding from the DOE through Contract DE-AC04-79AL10752.

The EEG performs independent technical analyses and monitoring for background radioactivity in air, water, and soil, both on the site and in surrounding communities.

Figure 1.4-1 lists responsibilities of the WIPP Project participants. The organizational functions, responsibilities and authorities of the project participants for operating the WIPP facility are discussed in Chapter 9.
This illustration for Information Purposes Only. As WIPP Gains Operational Experience, the Location of RMS Equipment May Change.
4.4.8.1.6 Alarms

The following paragraphs describe the various alarm systems available for the WIPP facility.

Evacuation Alarm System - The evacuation alarm system is used for, and limited to, situations requiring immediate, rapid, and complete or selective area evacuation. The evacuation alarm signal is produced by a tone generator. The signal characteristics conform with the requirements of ANSI N2.3. The evacuation alarm signal is transmitted plant-wide over the paging channel of the PA speakers, overriding its normal use. The evacuation alarm signal is initiated automatically by underground fire alarm signals for underground areas. Evacuation alarm signals using the Public Address system, local and plant wide, can also be initiated manually from the CMR.

Security Alarm System - A security alarm system is provided in the event that there is a breach in plant security. An unauthorized opening of a monitored gate, door, or window activates visible and audible alarm signals. These signals alert personnel in the CMR.

Radiological, Fire and Equipment Alarms - Radiological, fire, process, and equipment condition alarm systems are discussed in Sections 4.4.6, 5.4, 5.5.1, and 5.7.

4.4.8.1.7 Power Sources

The safety communications and alarms systems are normally operated from utility power through the emergency power bus. In the event of a utility power failure, these systems are supplied by site-generated back-up power. Selected alarms and information functions will be guarded by the uninterruptible power supply (UPS).

4.4.8.2 Inspection and Testing

The communications and alarms systems described herein are conventional and have a history of operating successfully. All components of the communications and alarms equipment use solid-state circuitry for high reliability and long life. They are in use on a daily basis and are maintained in a scheduled manner to assure constant surveillance and continuous flow of information on the operational status of the systems.

Systems used less frequently, such as evacuation alarms, are periodically inspected and tested to check the adequacy of the signal level, availability of normal and standby power sources, and the proper function of all circuits. Personnel and visitors are taught the actual sound of the alarms. All personnel are notified before alarms are tested except in the case of unannounced emergency response drills required by DOE Order 5500.2.

Communication equipment used for the security systems is tested periodically. Records of all scheduled tests are maintained. Inspections and testing are covered in the WIPP Safety Manual WP 12-1, Facility Operations Manual, WP 04-1 and the Mining Operations Manual WP 04-2.

4.4.8.3 Reliability Features

Safety communication and alarm system designs include diversity and operational reliability. The systems are provided with reliable and redundant power supplies for continuous communications between intraplant and off-site locations. Upon loss of the normal off-site power source, the uninterruptible power from the UPS...
This Illustration for Information Purposes Only.

FIGURE 4.4-11
Electrical Distribution System
An effluent and environmental monitoring program is in place to monitor releases to the environment so that facility releases may be maintained ALARA.

6.1.5.2 Administrative Organization

The administrative organization for Radiation Safety is depicted in Figure 6.1-14. Radiation Safety is a functional part of the Environment, Safety and Health (ES&H) Department. The functions included in the ES&H Department are emergency planning, radiation protection, industrial safety, and regulatory compliance. The management organization described in the following paragraphs implement the radiological control program.

Environment, Safety and Health - The Manager for Environment, Safety and Health (ES&H)) has responsibility for all activities concerning industrial safety and radiation protection of employees and the general public. With regard to Radiation Safety, the ES&H Manager is responsible for the training of radiation workers and health physics technicians, emergency planning, and the ALARA program. The ES&H Manager is also responsible for coordinating these activities with cognizant governmental agencies. Within the organization of the Management and Operating Contractor, the Radiation Safety Manager reports to the Manager for ES&H.

Radiation Safety - The Radiation Safety Manager is responsible for maintaining radiological safety of the plant by regularly evaluating and assessing surface contamination, radiation levels, and airborne radioactivity concentrations in radiological work areas with respect to approved limits. With regard to Radiation Safety, day-to-day operations are the responsibility of the Operational Health Physics Manager.

The Operational Health Physics (OHP) Manager is responsible for directing the daily activities of Health Physics Technicians performing surveillance of routine and special WIPP facility operations. The OHP Manager is also responsible for establishing training programs to qualify employees who may receive occupational radiation exposure. This program includes biennial requalification.

In the area of Radiological Engineering, the Radiological Engineering Manager's special responsibilities include operating radiological instrumentation and maintaining these instruments in a state of operational readiness to be used in normal or emergency operations. The Radiological Engineering Manager is also responsible for supporting the development and maintenance (in conjunction with the Training Section) a training program consistent with Orders DOE 5480.11 and 5480.5 for Health Physics Supervisors and Technicians, including biennial requalification.

In the area of dosimetry, the Manager of Dosimetry and Analytical Technology is responsible for operating and maintaining a personnel dosimetry program to determine radiation exposure to employees and visitors who are authorized to receive occupational radiation exposure. In addition, the Manager of Dosimetry and Analytical Technology is responsible for implementing and operating the internal dosimetry program. He has the authority to remove from the list of employees authorized to receive occupational radiation exposure those who have either exceeded the established administrative radiation exposure limits or who have not demonstrated their continuing understanding of or compliance with the WIPP radiological control program.

The ES&H Manager and designees have the authority to stop operations when an actual or impending loss of radiological safety control is identified. In addition, because of the emphasis placed on radiation safety, the ES&H Manager has a direct line of communication to the General Manager in matters of radiation safety. Minimum qualifications for Radiation Protection Program personnel are in accordance with applicable DOE Orders and Guidance and meet the requirement of Section 9.1.3 of this FSAR.
FIGURE 6.1-1
Waste Handling Building Radiation and Contamination Zones

LEGEND
Radiation zone designation during transient condition
Radiation zone designation
Contamination zone designation

See Tables 6.1-6 and 6.1-7

This Illustration for Information Purposes Only.
As WIPP Gains Operational Experience, the Location of RMS Equipment May Change.
FIGURE 6.1-14
Radiation Safety Organizational Relationship
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MAY 1990
CHAPTER 9

CONDUCT OF OPERATIONS

9.1 ORGANIZATION STRUCTURE

9.1.1 OWNER ORGANIZATION

As discussed in Section 1.4, the U.S. Department of Energy (DOE) is the owner of the Waste Isolation Pilot Plant (WIPP) facility. A contract for the management and operation of the WIPP facility was established with Westinghouse Electric Corporation in October 1985. The organizational functions, responsibilities, and authorities of the DOE, the Management and Operating Contractor (MOC), the Scientific Advisor (Sandia National Laboratories), and the Architect-Engineer (Bechtel) are discussed in Section 1.4. Responsibility for operating the WIPP facility has been assigned to the MOC organization as depicted in Figure 9.1-1. This figure depicts the single chain of command through which the Assistant Secretary for Environmental Restoration and Waste Management has assigned responsibility for operational safety at the WIPP to a single MOC.

9.1.2 MANAGEMENT AND OPERATING CONTRACTOR ORGANIZATION

9.1.2.1 Organization

Although the DOE is responsible for all aspects of the WIPP facility, it delegates these functions to various contractors. The MOC is primarily responsible for management of current and future construction contracts and for all WIPP facility operations. Only the MOC will have an ongoing effect on day-to-day operation of the facility. Therefore, its internal functions and organization will be discussed in the following paragraphs. The MOC's organizational structure is depicted in Figure 9.1-2. This figure depicts department management positions that have direct environment, safety, health or quality assurance responsibilities associated with day-to-day operations of the WIPP facility.

9.1.2.2 Department Functions, Responsibilities, and Authorities

9.1.2.2.1 General Manager

The General Manager (GM) has overall responsibility for the operation, maintenance, and modification of the WIPP facility, including primary responsibility for the health and safety of employees and protection of the environment. The GM plans, directs, and controls these activities either personally or through a proper delegation of authority. Management functions are performed in accordance with management policies and requirements as defined in the operating contract.
9.1.2.2 Manager for Environment, Safety, and Health

The manager for Environment, Safety, and Health (ES&H) directly supports the GM in the area of implementing the WIPP facility ES&H program. The ES&H Manager has been delegated staff responsibility for radiation safety, industrial safety, environmental protection, and regulatory compliance. In this manner, a clear line of authority is established for evaluating matters of ES&H concern to the GM.

9.1.2.2.3 Operations Department

The Operations Department is responsible for control, care, and operation of all surface structures including the Waste Handling Building and associated equipment; for all on-site handling and storage of radioactive waste; for all on-site handling and storage of hazardous waste; for the off-site transportation of hazardous materials; for monitoring and operating all site utilities including HVAC, power distribution, water and sewer, and operation of the Central Monitoring System. It is also responsible for all WIPP facility underground mining operations including mining, underground salt transport, hoisting, surface salt transport, and key WIPP facility experimental programs.

9.1.2.2.4 Engineering Department

The Engineering Department is responsible for the design of equipment, systems, and facilities for special operations and to administer the review of the design of other major Project Participants. After plant completion, Engineering responsibility will include providing for the design of new facilities, resolving technical and operational problems, and making required improvements.

9.1.2.2.5 Quality and Regulatory Assurance Department

The Quality and Regulatory Assurance (Q&RA) Department is responsible for identifying, developing and defining applicable requirements. Q&RA also assists line management in interpreting and implementing quality assurance program elements, and provides performance-based and improvement-oriented independent assessment of quality-affecting activities.

9.1.2.2.6 Program Management Department

The Program Management (PM) Department is responsible for Division-wide planning and scheduling support, integration of technical programs, program development and program reporting. PM provides coordination in the areas of strategic planning and out-year budget development. PM also has the responsibility for analyzing programmatic performance, recommending workscope priorities, and conducting various contingency analyses related to program workscope and budget.

9.1.2.2.7 Controller

The Controller is responsible for complete financial and accounting systems and computer services at the facility.

9.1.2.2.8 Human Resources Department

The Human Resources Department is responsible for all personnel-related functions in support of facility operations. In addition, the Human Resources Department is responsible for planning and implementing general required employee technical training programs and the certifying/qualifying of the operating staff.
9.1.2.2.9 External and Governmental Affairs

The External and Governmental Affairs Department is responsible for public information programs, governmental affairs, and technical outreach and communications. It is responsible for maintaining public displays, preparing handouts and brochures, interacting with the electronic and print media, conducting the visitor's program at the WIPP site, coordinating the activities of the Speaker's Bureau, identifying and resolving issues between the WIPP Project and outside institutions, maintaining a continuing program of contacts with individual representatives from outside institutions, and conducting a continuous public relations effort. It is also responsible for the States Relations and Training Program (SRTP) aimed at preparing emergency response personnel along WIPP transportation routes.

9.1.2.3 Corporate Management

The MOC for the WIPP facility is the Waste Isolation Division (WID) of Westinghouse Electric Corporation. Organizationally, the WID is part of the Government Operations Business Unit (GOBU). This Business Unit includes other Government owned facilities that are operated by Westinghouse. The WID draws upon several resources that result from this arrangement. First, the Business Unit has formed several committees aimed at integrating information regarding ES&H, and Radiation Protection activities at the various facilities. This facilitates the exchange of solutions to common ES&H problems and issues.

Second, the Business Unit management supports WID activities by participating in Corporate reviews and audits of WIPP activities and providing management and attention, as needed.

Beyond the Business Unit, the WID has access to expertise in a vast number of technical disciplines from throughout the corporation. This includes areas of particular interest to the WIPP such as waste management, risk assessment, safety analysis, environmental services, analytical services, regulatory compliance, transportation, legal, quality assurance, and others. These are supported by Headquarters staff functions in all areas of ES&H.

The corporation conducts periodic audits of all of its operating facilities, including the WIPP, to determine compliance with applicable laws and regulations and with Westinghouse corporate directives. These audits are conducted in areas which include engineering and design, construction, quality assurance, testing, operation and other activities. Westinghouse corporate policy is to conduct all of its operations in a manner that is protective of the health and safety of personnel, the public, and the environment. This commitment extends down to all levels of management and is reflected in the goals and objectives established for operating entities.

The corporation as a whole has no specific authority with regard to engineering and design, construction, QA, testing, operation and other activities beyond those carried out by the Waste Isolation Division, as specified in the contract with the DOE. However, corporate resources are available and will be committed, as needed, to ensure that all of these activities are carried out in a quality and timely manner. Corporate management is responsible for the selection of the WID GM and, thereby, exerts a vital role in providing the proper direction for WID activities.
This illustration for Information Purposes Only.

FIGURE 9.1-1
WIPP Facility Operations Responsibility
• Demonstrating that the WIPP operating procedures are comprehensive and sufficiently detailed to perform normal waste handling operations, and to recover from off-normal occurrences encountered during waste handling operations.

• Establishing the aggregate time estimate for WIPP waste handling operations

• Providing the basis for estimating the dose to be received by WIPP waste handling personnel

9.2.5 ONGOING EVALUATION AND TESTING

Once systems have completed the start-up process, they are available for day-to-day operations. During operations, it is important to ensure that systems remain within their nominal performance parameters. If systems fail to operate, it is equally important that they are repaired in a timely manner and correct operability must be re-established.

Responsibility for ongoing evaluation falls with a number of organizations, depending on the nature of the evaluation. For example, some equipment is subjected to periodic operability checks to ensure that operating parameters are within the range allowed for reliable operations. Examples are environmental continuous aerosol samplers (covered in the WIPP Environmental Procedures Manual) and safety-related systems covered by the OSR’s in Chapter 10 (covered by the Operational Safety Requirements Administration Manual, WP 04-7).

Other systems require periodic preventive maintenance. This is performed in accordance with the WIPP Maintenance Manual, WP 10-001.

Analytical and measurement equipment are entered into a calibration recall system to ensure timely calibration and re-calibration of this equipment. The calibration program is covered by Chapter 10 of the WIPP Procedure Manual. Quality Assurance performs a surveillance function to ensure that equipment requiring calibration is operated with valid calibration certifications.
Miner training and retraining programs meet 30 CFR Parts 48, 49, and 57*, and include at least the following subject areas: self-rescue and respiratory devices, mine transportation, communications, introduction to the work environment, mine maps, escapeways, emergency evacuation, barricading, roof control, ventilation, health, hazard recognition, electrical hazards, first aid, mine gases, and such other courses as the operating contractor may require based on circumstances and conditions in the mining area.

All mine personnel will demonstrate, to the satisfaction of the operating contractor, an adequate knowledge of the subject areas included in the training/retraining programs.

The instructors at the WIPP facility who present material that is under the guidance of 30 CFR are certified by the Mine Safety and Health Administration (MSHA), e.g., the Inexperienced Miner Safety Training, Mine Safety annual Refresher Training and Mine Rescue Team Training. Instructors of material not under the guidance of 30 CFR are not MSHA certified. Mine supervisors and other mine personnel will meet the qualifications for mine employees as set forth in WIPP miner training and retraining procedures.

9.3.4 QUALIFICATION TRAINING PROGRAMS

A formal and uniform program for equipment and/or task training, qualification, and certification is chartered by the Operations Program Plan* and is implemented in the WIPP Facility Training Program. The program is continuously evaluated and upgraded through:

- Observation of individual employee response to written, operational, and oral examinations and evaluations.

- Management observation and appraisal of the on-the-job performance of each employee, functioning both independently and as a team member of an operating crew.

The WIPP Facility Training Program's basic objectives are to:

- Assure that WIPP facility employees are properly trained to perform their assignments in a safe and efficient manner.

- Maintain levels of operational proficiency through continuing training, retraining, and requalification/recertification.

Any individuals who have not completed a training program for a qualified position or who have had their qualification expire must be under the direct, constant supervision of an individual who is qualified.

Continuing training is addressed in Section 3 of the WIPP Training Program Manual, WP 14-1 and is provided to maintain the knowledge level acquired in the initial training program; upgrade identified weak areas; and keep personnel informed of facility modifications, program changes, regulatory changes, and administrative changes.
References for Section 9.3

1. DOE Order 5480.5, Safety of Nuclear Facilities, (September 23, 1986).

9.4 NORMAL OPERATIONS

9.4.1 PLANT PROCEDURES

Formal written operating procedures are prepared for all operations involving radioactive material. In addition, procedures are written for complex or critical operations not involving radioactive material, such as system testing and inspection, nonradioactive hazardous waste management, and others. These procedures are prepared before the operation is conducted and are kept current. Operational configuration control of the facility and those systems critical to receipt of waste is governed by procedures. Prior to processing waste, a procedure is used to verify that the facility is ready. Operational procedures include system lineups that are periodically verified. In addition, surveillance procedures are used to insure compliance with the operational safety requirements. Work on equipment essential to the operation of the facility is also controlled procedurally by Operations. After a piece of equipment is worked on, the equipment is retested to verify operability.

Formal written procedures are prepared and maintained for mining operations. These procedures are in compliance with all applicable federal mining regulations, including 30 CFR Part 57. Procedures are established to ensure the satisfactory preparation and thorough review of the original operating procedures and any modifications to the procedures that may be necessary.

A master file of operating procedures is kept current by the operating contractor and controlled copies of the procedures are available at the operating stations. The quality assurance requirements for procedures are discussed in Section 11.5 of this FSAR.

9.4.2 PERSONNEL TRANSPORT

Underground personnel transport, as planned, is via battery-powered, rubber tired vehicles of two types. One is similar to a golf cart and holds up to two persons; the other is a larger vehicle holding up to eight persons. Enough vehicles are provided to avoid overcrowding or overloading. The vehicles conform to all applicable standards of 30 CFR Part 57, including, but not limited to, equipping them with such safety devices as protective canopies, headlights and backup lights, horns, brakes, and fire extinguishers.

When these vehicles are not in use, they are parked in a designated location in the access shaft pillar area within a walking distance from the hoist-shaft personnel unloading point. From that point, they are driven to the operating face areas. This procedure is the same for the mining and waste storage operations of the plant.

Training for safe operation of the personnel transporters is included in the required safety training programs of all underground workers. Those rules and regulations are in full compliance with the requirements of 30 CFR Part 48.

9.4.3 MINE SAFETY AND HEALTH ADMINISTRATION (MSHA)

The requirements of the Mine Safety and Health Administration (MSHA) for Metal and Non-Metal Underground Mines are and will continue to be applied to the WIPP facility. These health and safety standards are found in 30 CFR Part 57.
References for Section 9.4

1. (Deleted) [5/92


5. DOE Order 5484.1, Environmental Protection, Safety, and Health Protection Information Reporting Requirements (February 24, 1981).


9.5 WIPP FACILITY SECURITY PLAN

9.5.1 INTRODUCTION

This section presents the basis for the WIPP facility Operation Security Plan and describes how this program protects the WIPP facility and related structures.

9.5.2 RESPONSIBILITIES

It is the responsibility of the Management and Operating Contractor (MOC) to establish and maintain security procedures and systems which fulfill the security policies of the Department of Energy (DOE). This activity is supervised by the Security Manager who reports to the Manager of Human Resources. All WIPP managers, supervisors, and employees are expected to maintain and enforce the standards of security awareness and practices in regard to their actions in the WIPP facility operation.

9.5.3 ADMINISTRATIVE SYSTEMS

In accordance with Reference 1, the MOC Security Department establishes and maintains administrative security systems. These systems include: personnel security clearances, visit and assignment authorization for foreign nationals, visitor documentation, information protection, and key and lock controls.

9.5.4 PHYSICAL PROTECTION SYSTEMS

The physical protection standards are defined in References 2 and 3, which include protection of property and assets against deliberate acts of theft and vandalism. This responsibility rests with the armed security guard force, which provides 24-hour protection and designated receptionists, which provide working hour protection of outlying structures. Additional physical protection is provided by fences and other barriers, intrusion and duress alarms, protective lighting, and closed-circuit television systems. Some of these systems are interfaced with the Central Monitoring System (CMS), described in section 5.7, which enhances their capabilities.

9.5.4.1 Training and Qualification of Security Personnel

The physical qualifications for Security personnel are given in References 4 and 5. Security personnel training includes: security at the WIPP facility, legal authority of the position, first aid and fire protection, radiological and mine safety training, riot and crowd control, weapons qualification and safety, and report writing. Security personnel are also assigned emergency response duties as backup fire/rescue personnel and the appropriate training given.

9.5.4.2 Physical Design Considerations

The WIPP facility is designed to limit personnel or vehicle access. The primary barrier is the security fence. The normal access to the site will be through the Security gatehouse. Vehicular traffic may be routed through other gates, as necessary.
References for Section 9.5

CHAPTER 11

QUALITY ASSURANCE

The Quality Assurance (QA) Programs established and implemented by the Major Project Participants (MPPs), the U. S. Department of Energy WIPP Project Site Office (DOE-WPSO); the Architect Engineer (AE); the Construction Manager (CM); the Scientific Advisor (SA); and the Management and Operating Contractor (MOC) during the site evaluation, design and major construction phases of the Waste Isolation Pilot Plant (WIPP) Project, were structured to comply with ANSI/ASME NQA-1-1979 and selected supplements as applicable to those activities. Bechtel National Inc. (BNI), as A-E, was assigned the prime responsibility for quality in design of the WIPP facility and therefore assured that appropriate controls were applied to the actual design process and that technical and quality requirements were included in design documents such as drawings and technical specifications. The U.S. Army Corps of Engineers (USACE), as the Construction Manager, was assigned prime responsibility for the preparation, award, and administration of the construction contracts. Sandia National Laboratories (SNL), the Scientific Advisor, is assigned prime responsibility for efforts involving site validation and experiments. Westinghouse, as the Management and Operating Contractor, is assigned the responsibility for the operation of the WIPP facility equipment and structures after turnover from the Construction Manager.

The Quality Assurance Programs, which will be established and implemented by the current MPPs (The DOE-WPSO, SA and MOC) will address the Quality Assurance requirements for operations and thereby continue to ensure the safe and reliable operation of the WIPP facility. These include, but are not limited to programs involving environmental, experimental, performance assessment, geotechnical and geosciences activities as well as those involving operational activities such as facility operation and maintenance, mining, minor construction, waste handling, and storage. Table 11-1 provides a listing of QA standards that are considered applicable during the design, construction, and operation of the WIPP facility.

11.1 ORGANIZATION

11.1.1 GENERAL REQUIREMENTS

This section defines the organizational structure and responsibilities of the organizations performing quality related activities. The DOE-WPSO QA Plan provides clear and definitive lines of authority, responsibility and communications for organizations involved in the QA Program. The DOE-WPSO Project Manager is responsible for defining the QA Program objectives. In accordance with Chapter IV, Part 8C of Order AL 1120, the DOE-WPSO Project Manager has been assigned the contractual authority for the DOE contracts with the MPPs. As stated in Refs 1 and 2 this includes the authority to stop work that is being performed by the Management and Operating Contractor and the Scientific Advisor. The DOE-WPSO Organizational Structure and Functional responsibility assignments are such that attainment of quality related program objectives is accomplished by the Line Management who have been assigned responsibility for performing the work in accordance with the DOE Test Phase Management Plan and Management Directives for the WIPP, DOE/WIPP-103. Therefore, the DOE-WPSO Senior Line Management reports directly to the DOE-WPSO Project Manager and are responsible for the global implementation of QA policies as applicable to their areas of responsibility.
The Quality and Regulatory Assurance (QARA) Manager reports directly to the DOE-WPSO Project Manager and shall have a sufficient qualified staff to implement the requirements and responsibilities identified herein. The QARA Manager has the authority and organizational freedom to:

- Identify and recommend solutions to quality problems
- Verify implementation of solutions.

The QARA Manager or designee has been delegated the authority to stop work that may result in bodily harm to site personnel, damage to equipment, radioactive contamination or release of radioactivity to the public or environment. The QARA Organization does not have direct responsibility for the performance of work which they overview, audit or inspect to verify compliance with applicable QA requirements.

The other MPPs (SA and MOC) providing quality-related material, equipment, spare parts and/or services are required by contract documents to develop and implement a QA Program based on their scope of work. The SA and MOC shall report directly, but independently to the DOE-WPSO. In any case, each MPPs (DOE, SA, MOC) shall assure their quality-related activities are implemented in accordance with the applicable elements of ASME NQA-1 as defined on Figure 11.1-1. DOE-WPSO shall be the focal point of interface between the SA and MOC for all matters related to quality. It shall be the responsibility of the SA and MOC QA Management to immediately notify the DOE-WPSO-QRA to resolve programmatic differences or conflicts that may have a significant impact on the other’s QA Program.

Interfaces related to Programmatic Quality Assurance activities between the MPPs QA Managers shall be integrated through DOE-WPSO-QRA.

Direct interface between the SA and MOC QA organizations, based on their assigned scope of work, will normally be related to experiments for performance assessment and/or QA Programmatic activities. These interface activities are controlled and coordinated by procedural methods such as Test Plans, QA Plans and/or Implementing Procedures and shall be documented and become project records. The internal organizational, structure, functional responsibilities, levels of authority and lines of communication shall be documented in detail in each of the MPPs Quality Assurance Programs.

The SA and MOC QA Programs shall also include provisions for assuring that their Line Management is responsible for quality and that the QA Organization has sufficient authority, independence, organizational freedom and access to work areas to (1) identify, and recommend solutions to quality problems (2) verify implementation of solutions (3) stop work that may result in bodily harm to site personnel, damage to equipment, radioactive contamination or release of radioactivity to the public or environment (4) perform audits, surveillances, overviews or inspections to verify compliance with applicable QA requirements.

11.1.2 GENERAL RESPONSIBILITIES

11.1.2.1 DOE-WPSO

The DOE-WPSO, as the Owner, shall be responsible for establishing the overall site QA Program objectives and assuring their implementation by each MPPs. DOE-WPSO shall ensure that QA interface control measures between the SA and MOC are documented in their respective QA Programs.
### TABLE 11-1
APPLICABLE QUALITY ASSURANCE STANDARDS

**PART A - DESIGN AND CONSTRUCTION**

1. ANSI/ASME NQA-1-1979, Quality Assurance Program Requirements for Nuclear Power Plants
2. DOE Order 5700.6, Quality Assurance
3. DOE-AL Order AL 5700.6, Quality Assurance
4. Sandia National Laboratories, Department 6330, Quality Assurance Program Plan
7. WIPP/DOE 207, Construction Quality Assurance Program Plan
8. U.S. Army Corps of Engineers Quality Assurance Program for Construction of WIPP
9. SNT-TC-1A (1980), American Society of Nondestructive Testing Recommended Practice
10. DOE Order 1324.2, Records Disposition

**Part B - OPERATIONS**

2. DOE Order 5700.6, Quality Assurance
3. DOE WIPP Project Integration Office (WPIO) Plan for the WIPP Quality Assurance Program
4. DOE/WIPP 105, DOE WIPP Project Site Office (WPSO) Quality Assurance Plan
5. Sandia National Laboratories, Department 6330 Quality Assurance Program Plan
6. WP 13-1, Westinghouse Waste Isolation Division Quality Assurance Program Description
7. SNT-TC-1A, American Society of Nondestructive Testing Recommended Practice
8. DOE Order 1324.2, Records Disposition
<table>
<thead>
<tr>
<th>ASME NQA-1 REQUIREMENTS</th>
<th>WPSO</th>
<th>SA</th>
<th>MOC</th>
</tr>
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<tbody>
<tr>
<td>1. ORGANIZATION</td>
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</tr>
<tr>
<td>SUPPLEMENT 1S-1</td>
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<td></td>
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<tr>
<td>2. QUALITY ASSURANCE PROGRAM</td>
<td>X</td>
<td>X</td>
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<tr>
<td>SUPPLEMENT 2S-1</td>
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<td>X</td>
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<tr>
<td>SUPPLEMENT 2S-3</td>
<td>D</td>
<td>X</td>
<td>X</td>
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<tr>
<td>SUPPLEMENT 2S-4</td>
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<tr>
<td>3. DESIGN CONTROL *</td>
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<td>SUPPLEMENT 3S-1</td>
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<tr>
<td>4. PROCUREMENT DOCUMENT CONTROL</td>
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</tr>
<tr>
<td>SUPPLEMENT 4S-1</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5. INSTRUCTIONS, PROCEDURES, AND DRAWINGS *</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>6. DOCUMENT CONTROL</td>
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<td>SUPPLEMENT 6S-1</td>
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<tr>
<td>7. CONTROL OF PURCHASED ITEMS AND SERVICES</td>
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<tr>
<td>SUPPLEMENT 7S-1</td>
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<td>8. IDENTIFICATION AND CONTROL OF ITEMS</td>
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<tr>
<td>SUPPLEMENT 8S-1</td>
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<tr>
<td>9. CONTROL OF PROCESSES</td>
<td>D</td>
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<td>SUPPLEMENT 9S-1</td>
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<td>10. INSPECTION</td>
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<td>SUPPLEMENT 10S-1</td>
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<tr>
<td>11. TEST CONTROL</td>
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<tr>
<td>SUPPLEMENT 11S-1</td>
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<tr>
<td>SUPPLEMENT 11S-2</td>
<td>D</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>12. CONTROL OF MEASURING AND TEST EQUIPMENT</td>
<td>D</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>SUPPLEMENT 12S-1</td>
<td>D</td>
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<td>X</td>
</tr>
<tr>
<td>13. HANDLING, STORAGE, AND SHIPPING</td>
<td>D</td>
<td>X</td>
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<tr>
<td>SUPPLEMENT 13S-1</td>
<td>D</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>14. INSPECTION, TEST, AND OPERATING STATUS</td>
<td>D</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>15. CONTROL OF NONCONFORMING ITEMS</td>
<td>X</td>
<td>X</td>
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<tr>
<td>SUPPLEMENT 15S-1</td>
<td>X</td>
<td>X</td>
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<td>16. CORRECTIVE ACTION</td>
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<td>17. QUALITY ASSURANCE RECORDS</td>
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<td>SUPPLEMENT 17S-1</td>
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<td>X</td>
</tr>
<tr>
<td>18. AUDITS</td>
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<tr>
<td>SUPPLEMENT 18S-1</td>
<td>X</td>
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</table>

**LEGENDS:**
- **WPSO** - DOE/WIPP Site Project Office
- **MOC** - Management and Operating Contractor
- **SA** - Scientific Advisor
- **X** - Requirement Applies
- **D** - Delegated
- *WPSON has assigned responsibilities to the MOC & SA therefore, drawing control requirements are considered not applicable.*

**FIGURE 11.1-1**
Requirements of NQA-1 Applicable to Project Participants QA Programs for WIPP

11.1-6

MAY 1990
FIGURE 11.1-2
WIPP Facility Quality Assurance Organization and Interfaces

LEGEND:

- QA Direction and Reporting
- Programmatic Implementation Interfaces
- Audit/Surveillance

This Illustration for Information Purposes Only.
11.2 QUALITY ASSURANCE PROGRAM

11.2.1 GENERAL REQUIREMENTS

11.2.1.1 QA Program

The Quality Assurance (QA) Programs developed by the Major Project Participants (DOE-WPSO, Scientific Advisor, Management and Operating Contractor) for the WIPP facility are identified in Table 11-1. These programs shall be planned, implemented and maintained based on the criteria established in the Basic and Supplementary requirements of ASME NQA-1. ASME NQA-1 is mandated through applicable DOE documents identified on the hierarchy of QA documents shown on Figure 11.2-1. The QA Programs identified herein shall apply to the activities affecting quality in the operations of the WIPP Facility. Management of those organizations implementing the quality assurance program, or portions thereof, shall annually assess the adequacy of that part of the program for which they are responsible and shall assure its effective implementation. The verification of quality achievement shall be performed by each project participant Quality Assurance organization through such activities as Audits, Management Assessments, Overviews, etc. DOE-WPSO shall have the responsibility to verify overall project Quality Achievement.

11.2.1.2 Indoctrination and Training

(Quality Assurance & Non-Quality Assurance Personnel)

Personnel performing or managing activities affecting quality shall be indoctrinated and trained for their related job task. The extent of indoctrination and training will be commensurate with the following:

- The scope, complexity, and nature of the activity
- The education, experience, and proficiency of the person.

Activities affecting quality include designing, purchasing, fabricating, handling, shipping, storing, cleaning, erecting, installing, inspecting, testing, operating, maintaining, monitoring, repairing and modifying.

Personnel shall be indoctrinated in the following subjects as they relate to a particular function:

- General criteria, including applicable codes, standards, and company procedures
- Applicable quality assurance program elements
- Job responsibilities and authority
- Radiation Safety

Training shall be provided, if needed to:

- Achieve initial proficiency
- Maintain proficiency
- Adapt to changes in technology methods of job responsibilities

Documentation of the indoctrination and training shall be provided and maintained in accordance with established requirements.
11.2.2 GENERAL RESPONSIBILITIES

Department of Energy (DOE-WPSO)

The basic and supplementary requirements of ASME NQA-1 identified on Figure 11.1-1 shall apply for those activities performed by DOE-WPSO at the WIPP Facility. The DOE-WPSO shall also be responsible for the review and approval of the SA and MOC QA Programs specified herein and monitors (e.g. audits, reviews, etc.) the work practices of the SA and MOC to assure proper implementation.

Scientific Advisor (SA)

The goal of the SA's QA program is to ensure that research, development, demonstration and assessment activities are performed in a controlled and documented manner using good laboratory, engineering and management practices with independent QA assessment.

The QA Program has been established to meet the Basic and Supplementary requirements of ASME NQA-1 as identified in Figure 11.1-1. The Scientific Advisor's Quality Assurance Program Plan and Quality Assurance Procedures detail specific guidance for the application and implementation of the QA Program requirements, relative to the goal.

All work performed by the SA that has a direct effect on the end product (experimental data) will be conducted in accordance with these QA Program requirements. All experimental activities used to collect data are conducted under controlled conditions in accordance with documented and approved plans and procedures.

Management and Operating Contractor (MOC)

A graded approach is used to determine the application of the QA Program to quality related items and activities dependent upon their relative functional importance of nuclear safety, industrial safety and reliability, i.e., application of ASME NQA-1 Basic and Supplementary requirements are based on design classes as defined in Chapter 3, Section 3.1.7 of this document.

The graded approach that will be applied to the Operations of the WIPP facility is as stated below.

If desired on a case-by-case basis, more stringent quality assurance requirements may be imposed over and above the minimum requirements specified by the design class level in order to obtain an additional degree of operational reliability and safety.

Design Class I and II

The Basic and Supplementary requirements of ASME NQA-1 identified on Figure 11.1-1 shall apply. Additional requirements of ASME NQA-1 may be applied depending upon the uniqueness, complexity and importance of the item.

Design Class IIIA

The Basic requirements of ASME NQA-1 identified on Figure 11.1-1 shall apply. Supplementary requirements may be applied depending upon the uniqueness, complexity or importance of the item.
Design Class IIIB

Good commercial practices shall apply such as:

- New or revised designs that would be based on industrial codes and/or standards.
- Procurement of materials and services will include the applicable quality requirements in the Procurement Documents.
- Activities will be prescribed by instructions, procedures, drawings, or sketches of a type appropriate to the circumstances.
- Special processes (e.g., welding, heat treating, NDE) affecting the quality of items and services will be controlled.
- Inspections required to verify conformance of an item or activity will be planned and executed.
- Handling, packaging and storage will be controlled to control damage or loss.
- Items that do not conform to specified requirements will be controlled to prevent inadvertent installation or use.
- Records that furnish documentary evidence of quality will be specified and controlled.

Procurement of commercial grade items (off-the-shelf) may be procured for use in any Design Class System or Operation in accordance with requirements of Design Class IIIB Requirements. However, the QA requirements for the design, installation, use and maintenance of the procured commercial grade item shall be those established for the Design Class of the associated system or operation.

No Design Class

This is the classification for facility items that are not considered quality related such as office equipment, furniture, janitorial supplies, etc.
FIGURE 11.2-1
Hierarchy of WIPP Project Quality Assurance Requirements Documents

4/93

This illustration for information purposes only.
11.3.1.8 As-Built Conditions

Approved changes to the design, installation, or construction of any item, component or system shall be incorporated into the design drawing/document to reflect the as-built condition of the item, component, or system.

Approved documents for reports incorporating as-built conditions include nonconformances, and Engineering change control documents.

11.3.2 GENERAL RESPONSIBILITIES

11.3.2.1 DOE-WPSO

The DOE-WPSO has assigned the responsibility for the design of the WIPP facility and the design of the experimental/test programs to the SA and MOC. The DOE-WPSO will verify contractual compliance for all phases of the design, including design changes.

11.3.2.2 SA and MOC

The SA and MOC shall be responsible for the development of the designs associated with their assigned scope of work. This design responsibility shall also include the subsequent design changes and as-built records.
When the procurement document requires the supplier to maintain specific QA records, the retention times and disposition requirements shall be prescribed.

Nonconformances - The procurement documents shall include the requirements for reporting and approving disposition of nonconformances.

Spare Parts and Replacement Parts - The procurement documents shall require the supplier to identify appropriate spare and replacement parts for assemblies and the appropriate delineation of the technical and QA-related data required for ordering these parts or assemblies.

11.4.1.2 Procurement Document Review

A review of the procurement documents and changes thereto shall be made to ensure that documents transmitted to the prospective supplier(s) include appropriate provisions to ensure that items or services will meet the specified requirements.

These reviews shall be performed and documented to provide objective evidence of their satisfactory accomplishment prior to contract award.

Changes made as a result of the bid evaluations or precontract negotiations shall be incorporated into the procurement documents. The review of such changes and related effects shall be completed prior to contract award. This review shall include the following considerations:

- Incorporation of appropriate requirements previously specified above
- Determination of any additional or modified design criteria
- Analysis of exceptions or changes requested or specified by the supplier and determination of the effects such changes may have on the intent of the procurement documents or quality of the item or services to be furnished

Reviews shall be performed and documented by personnel who have access to pertinent information and who have an adequate understanding of the requirements and intent of the procurement documents.

11.4.1.3 Procurement Document Changes

Procurement document changes shall be subject to the same degree of control as utilized in the preparation of the original documents.

11.4.2 GENERAL RESPONSIBILITIES

11.4.2.1 DOE-WPSO

The DOE-WPSO has assigned prime responsibility for procurement of certain long-lead equipment, as well as other operational procurements to the MOC. In the case of certain experimental activities, procurements involving those activities have been assigned primarily to the SA.
11.5 INSTRUCTIONS, PROCEDURES AND DRAWINGS

11.5.1 GENERAL REQUIREMENTS

Activities affecting quality, including work performed and the verification of that work, shall be prescribed and performed in accordance with plans, when required, and/or written instructions, procedures, or drawings of a type appropriate to the circumstances. These documents shall include or reference appropriate quantitative or qualitative acceptance criteria for determining that prescribed activities have been satisfactorily accomplished.

11.5.2 GENERAL RESPONSIBILITIES

In addition to the following, each major Project Participant shall be responsible for developing and maintaining a controlled list of procedures that identifies the procedures utilized in implementing their Quality Assurance Program, for compliance to the requirements of ASME NQA-1.

11.5.2.1 DOE-WPSO

DOE-WPSO shall be responsible for ensuring that their quality related activities are performed in accordance with approved procedures, instructions, plans, etc. DOE-WPSO selectively reviews instructions, drawings and procedures prepared by the SA and MOC to assure compliance to the requirements identified herein.

11.5.2.2 SA and MOC

The SA and MOC shall be responsible for ensuring that their quality-related activities are performed in accordance with approved procedures, plans, instructions or drawings.
11.6 DOCUMENT CONTROL

11.6.1 GENERAL REQUIREMENTS

11.6.1.1 Controlling Documents

Measures shall be established to ensure that the preparation, issue, and change of documents that specify quality requirements or prescribe activities affecting quality are controlled to ensure that correct documents are being employed. Such documents, including changes thereto, shall be reviewed for adequacy and approved for release by authorized personnel as defined below.

Document Preparation, Review, Approval and Issuance

Procedures shall be established to define requirements and assign responsibilities for the preparation, review, approval, release, issuance, and revision of controlled documents.

The required reviews shall be completed and documented prior to approval and issuance of controlled documents. When controlled documents are released prior to completion of required verification/review, they shall be identified and controlled. Those portions that have not been verified/reviewed shall be specifically identified in the document. Authority for the release of such documents shall be specified in procedures.

The types of documents to be controlled shall be identified and the distribution specified.

A master list or equivalent document control system shall be established to identify the current revision of controlled documents. The list or system required shall be updated on a regular basis and distributed to affected personnel.

Document Changes

Major Changes - Changes to documents other than those defined as minor changes shall be reviewed and approved by the same organizations that performed the original review and approval unless other organizations are specifically designated. The reviewing organization shall have access to pertinent background data or information upon which to base approval.

Minor Changes - Minor changes to documents, such as inconsequential editorial corrections, shall not require that the revised documents receive the same review and approval as the original documents. To avoid a possible omission of a required review, the type of minor changes that do not require such a review and approval and the persons who can authorize such a decision shall be clearly delineated in procedures.

11.6.2 GENERAL RESPONSIBILITIES

The DOE-WPSO, SA, and MOC shall establish and implement internal procedures that include responsibilities associated with controlling the preparation, review, approval, and issuance of quality related documents which prescribe activities affecting quality.

In addition, changes to these documents are reviewed by the cognizant major Project Participants, and are subject to review and approval by the DOE-WPSO. Documents (e.g., safety-related) produced by the contractors may also be controlled by having them submitted for review and approval and ultimate entry into the Document Control System administered by the MOC. These submittals may include backup calculations, design drawings analysis, operations and maintenance manuals, etc.
Provisions shall be established for disposition of the supplier's recommendation as well as verification of the implementation and the maintenance of records involving these nonconformances.

Commercial Grade Items

Commercial Grade Item (Catalogue Items) could be procured for use in any design class system. Therefore, a QA requirement for performing receiving inspection on all commercial grade items to assure the item received was the item ordered shall apply as minimum. The receipt inspection shall assure:

- Damage was not sustained during shipment
- The item received was the item ordered
- Inspection and/or testing is accomplished, as required by the purchaser, to ensure conformance with the manufacturer's published requirements
- Documentation, as applicable to the item, was received and is acceptable

11.7.2 GENERAL RESPONSIBILITIES

11.7.2.1 DOE-WPSO

The DOE-WPSO shall assure compliance by the SA and MOC to the General Requirements identified hereto through overview activities such as audits and reviews.

11.7.2.2 SA and MOC

The SA and MOC shall ensure, through the use of procedures, etc. that all items and services involving the established QA requirements are purchased and controlled in accordance with the provisions of their contract with the DOE-WPSO.
11.8.1.5 Identification of Radioactive Waste Material

The specific identification requirements for radioactive waste material is addressed in Chapter 5 of the FSAR.

11.8.2 GENERAL RESPONSIBILITIES

11.8.2.1 DOE-WPSO

The DOE-WPSO shall assure compliance to the requirements of this section by SA and MOC through overview activities such as audits and reviews.

11.8.2.2 SA

The SA shall assure the program will provide for identification and control of data, materials, parts, samples, specimens and components.

11.8.2.3 MOC

The MOC shall ensure the program will provide for the identification and control of items. This program(s) will also include the identification and control of samples and data associated with the MOC experimental programs.
11.9 CONTROL OF PROCESSES

11.9.1 GENERAL REQUIREMENTS

11.9.1.1 Process Control

Processes shall be controlled by instructions, procedures, drawing, checklists, travelers, qualification records or other appropriate means. Maintenance of this documentation shall be required by each major Project Participant.

These means shall ensure that process parameters are controlled and that specified environmental conditions are maintained.

The data collection processes used in the experimental and test programs for which standard techniques have been developed within the scientific community and whose reliability has been demonstrated are not considered a special process, therefore they do not require qualification.

11.9.1.2 Special Processes

A listing of those processes that are to be considered special processes (e.g. welding, NDE, heat treating) shall be prepared and updated as required.

Each special process shall be performed in accordance with an approved, qualified procedure that shall include or reference procedure, personnel, and equipment qualification requirements.

For special processes not covered by existing codes and standard, or when quality requirements specified for an item exceed those of existing codes or standards, the necessary requirements for qualifications of personnel, procedures, or equipment shall be specified or referenced in the procedures or instructions.

The Qualification Records (e.g. Operator & Procedure Qualification Records) associated with special processes shall be maintained and controlled in accordance with Section 11.17, QA Records.

11.9.2 GENERAL RESPONSIBILITIES

11.9.2.1 DOE-WPSO

The DOE-WPSO has assigned the implementing responsibilities for the control of processes to the SA and MOC. The DOE-WPSO shall assure compliance by the SA and MOC to the General Requirements identified hereeto through overview activities such as audits and reviews.

11.9.2.2 SA and MOC

The SA and MOC shall assure processes and special processes affecting the quality of items and services shall be defined and controlled.
The qualifications of test personnel shall be performed by procedures approved by the QA organization.

11.10.1.8 Qualification and Certification of Nondestructive Testing (NDE) Personnel

The American Society of Nondestructive Testing Recommended Practice No. SNT-TC-1A, shall apply as requirements to NDE personnel.

The qualification of NDE personnel shall be certified in writing by the QA organization.

11.10.2 GENERAL RESPONSIBILITIES

11.10.2.1 DOE-WPSO

The DOE-WPSO has assigned inspection responsibilities to the SA and MOC. The DOE-WPSO-QA shall assure compliance by the SA and MOC to the General Requirements identified herein through overview activities such as audits and reviews.

11.10.2.2 SA

The SA shall ensure that, when inspection is required to verify conformance of QA designated items or activities to specified requirements, the inspection will be planned and executed by qualified inspection personnel.

11.10.2.3 MOC

The MOC shall establish inspection and surveillance programs that will provide and ensure conformance of items or activities to specified requirements by qualified personnel.
11.11 TEST CONTROL

11.11.1 GENERAL REQUIREMENTS

11.11.1.1 Test Requirements

A test program shall be established to ensure that all testing required to demonstrate that structures, systems, components will perform satisfactorily in service is identified and performed.

The test program shall include, as appropriate, prototype qualification test, production test, proof tests prior to installation, construction tests, testing of samples preoperational tests and operational tests.

11.11.1.2 Test Procedures

Test procedures shall be complete to the extent that another qualified individual may at a later date reproduce the test results, if deemed necessary.

Test requirements and acceptance criteria shall be provided in the procedures by the organization responsible for the design of the item to be tested unless otherwise designated.

In lieu of specially prepared written test procedures, appropriate sections of related documents, such as ASTM methods, supplier manuals, equipment maintenance instructions or approved drawings or travelers with acceptance criteria can be used if so identified in the test plans.

11.11.1.3 Personnel Qualification

Personnel who perform test to verify conformance to specified requirements for the purpose of acceptability shall be qualified to the requirements established in Section 11.10 of this chapter.

11.11.2 GENERAL RESPONSIBILITIES

11.11.2.1 DOE-WPSO

The DOE-WPSO has assigned test control responsibilities to the SA and MOC. The DOE-WPSO shall assure compliance by the SA and MOC to the General Requirements identified herein through oversight activities such as audits and reviews.

11.11.2.2 SA and MOC

The SA and MOC shall be responsible for ensuring their tests and/or experiments are performed by qualified personnel in accordance with approved plans or procedures.
11.12 CONTROL OF MEASURING AND TEST EQUIPMENT (M&TE)

11.12.1 GENERAL REQUIREMENTS

11.12.1.1 Selection

Selection of M&TE including environmental monitoring equipment shall be controlled to ensure that such items are of proper type, range, accuracy, and tolerance to accomplish the function of determining conformance to specified requirements.

11.12.1.2 Calibration

M&TE shall be calibrated, adjusted, and maintained at specified intervals, or prior to use, based on required accuracy, precision, purpose, degree of usage, stability, characteristics, and other conditions that could affect measurement.

Calibration standards shall be traceable to nationally recognized standards. When national standards do not exist, provisions shall be established to document acceptability of the calibration standard used.

11.12.1.3 Control

The method and interval (recall system) of calibration for each item shall be defined based on the type or equipment stability characteristics, required accuracy intended use and other conditions affecting measurement control.

Out-of-calibration devices shall be tagged or segregated and not used until they have been recalibrated.

M&TE found to be out of calibration shall have evaluations performed and documented to determine the validity and acceptability of measurements performed since the last calibration.

11.12.1.4 Commercial Devices

Calibration and control measures may not be required for rulers, tape measures, levels, and other such devices, if normal commercial equipment provides adequate accuracy.

11.12.1.5 Handling and Storage

Provisions shall be established to provide proper handling and storage of standards and M&TE to maintain accuracy.

11.12.2 GENERAL RESPONSIBILITIES

11.12.2.1 DOE-WPSO

The DOE-WPSO shall assure compliance by the SA and MOC to the General Requirements identified herein through overview activities such as audits and reviews.
11.13 HANDLING, STORAGE AND SHIPPING

11.13.1 GENERAL REQUIREMENTS

11.13.1.1 Control

Handling, storage, packaging, shipping, cleaning and preservation of items and samples shall be conducted in accordance with approved procedures, drawing, specifications, shipment instructions, or other pertinent documents or procedures specified for use in conducting the activity to prevent damage or deterioration.

Procedures for marking and labeling for packaging, shipment handling, and storage of items and samples shall be established to adequately identify, maintain, and preserve the item, including indication of the presence of special environments or the need for special controls.

The specific requirements for handling and storage of radioactive waste material is addressed in Chapter 5 of the FSAR.

11.13.1.2 Tools and Equipment

Special handling tools and equipment shall be utilized and controlled, as necessary, to ensure safe and adequate handling.

Special handling tools and equipment shall be inspected and tested in accordance with approved procedures and at specified time intervals to verify that the tools and equipment are adequately maintained.

11.13.1.3 Operators

Operators of special handling and lifting equipment shall be experienced or trained in use of the equipment.

11.13.1.4 Marking

Instructions for marking and labeling for packaging, shipment, handling and storage of items shall be established as necessary to adequately identify, maintain and preserve the item.

11.13.2 GENERAL RESPONSIBILITIES

11.13.2.1 DOE-WPSO

The DOE-WPSO shall assure compliance by the SA and MOC to the General Requirements identified herein through overview activities such as audits and reviews.

11.13.2.2 SA and MOC

The SA and MOC shall develop a program for the handling, storage and shipping of items and samples in accordance with the requirements established herein.
11.14 INSPECTION, TEST AND OPERATING STATUS

11.14.1 GENERAL REQUIREMENTS

11.14.1.1 Inspection and Test Status

Measures shall be established to indicate by the use of markings (e.g., stamps, tags, labels, routing cards) or other suitable means, the status of inspections and tests performed on individual items to aid in ensuring that required inspections and tests have been performed and to aid in ensuring that items that have not passed the required inspections and tests are not inadvertently installed, used, or operated.

If it is not practical or feasible to mark individual items, markings shall be attached in a conspicuous place (e.g., as on the container of the items).

11.14.1.2 Operating Status

Measures shall also be established for indicating the operating status of structures, systems, and components to ensure that personnel working on, or in the vicinity are aware of the operating status of the equipment.

11.14.1.3 Experimental Status

Measures shall be established for indicating the status of experimental tests.

11.14.1.4 Application and Removal of Tags

The authority of application and removal of the status tags shall be specified.

11.14.2 GENERAL RESPONSIBILITIES

11.14.2.1 DOE-WPSO

The DOE-WPSO shall assure compliance by the SA and MOC to the General Requirements identified herein through overview activities such as audits and reviews.

11.14.2.2 SA and MOC

The SA and MOC shall develop and implement a program for the inspection and test and/or status of items and/or activities in accordance with the General Requirements established herein.
Notification

Notification of final disposition of nonconformances shall be sent to affected parties after documentation and after verified completion of corrective action.

A documented method shall be established to provide traceability from items to all deficiency documents written against them.

11.15.2 GENERAL RESPONSIBILITIES

11.15.2.1 DOE-WPSO

The DOE-WPSO will periodically monitor the controls exercised by the SA and the MOC over nonconforming items and conditions to ensure that deficiencies are promptly documented, contractually administered, and corrected or removed to prevent inadvertent use.

11.15.2.2 SA and MOC

The SA and MOC shall include appropriate administrative and QA requirements in documents involving their assigned activities to preclude the use of nonconforming items.
11.16 CORRECTIVE ACTION

11.16.1 GENERAL REQUIREMENTS

Measures shall be established and implemented to ensure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material, or equipment are identified and corrected as soon as practicable. In case of significant conditions adverse to quality, the measures will ensure that the cause of the condition is determined and appropriate corrective action taken by the responsible organization to preclude recurrence.

11.16.2 GENERAL RESPONSIBILITIES

11.16.2.1 DOE-WPSO

The DOE-WPSO is responsible for promptly identifying and reporting conditions adverse to quality. In addition, the DOE-WPSO shall review the significant conditions adverse to quality reported by the SA and MOC and take the appropriate action.

11.16.2.2 SA and MOC

The SA and MOC are responsible for promptly identifying and reporting conditions adverse to quality. Significant conditions adverse to quality shall be reported to DOE-WPSO and the condition evaluated for work stoppage.
11.17 QUALITY ASSURANCE RECORDS

11.17.1 GENERAL REQUIREMENTS

Measures shall be established for the preparation, collection, review, revisions, interim protection and timely turnover of quality assurance (QA) records. These measures include provisions for record classification, in-process controls, record validation, facility storage and retrieval.

**System** - A documented system shall be established which implements the DOE-WPSO records management program.

**Classification** - Records shall be classified as permanent (lifetime) or nonpermanent.

**In-Process Controls** - Records classified as permanent shall be controlled in a manner that prevents damage from moisture, temperature, pressure or other environmental conditions.

**Records Validation** - Documents shall be considered valid records only if stamped, initialed or signed and dated by authorized personnel or otherwise authenticated.

**Type of Facility** - A dual facility shall be established for retention of records requiring long-term retention and be located sufficiently remote from each other to prevent the chance of exposure to a simultaneous hazard. Alternately, a single record storage facility may be used, providing that the requirements of NQA-1, Supplement 17S-1, Paragraph 4.4.1 or 4.4.2 are satisfied.

**Retrieval** - The storage systems shall provide for retrieval of information in accordance with planned retrieval times based upon the record type and include a list designating those personnel permitted into the controlled area for access to files.

11.17.2 GENERAL RESPONSIBILITIES

The overall responsibilities for implementation of the QA records program during operation rests with the Owner (DOE-WPSO) and is implemented through the combined efforts of the DOE-WPSO, SA and MOC. The WIPP Facility Records Storage System identified herein is managed by the MOC. DOE-WPSO shall review and approve the WIPP Facility Records Storage System.
11.18 AUDITS

11.18.1 GENERAL REQUIREMENTS

11.18.1.1 Scheduling

Internal and external audits shall be scheduled in a manner to provide coverage and coordination with ongoing program activities and shall be initiated early enough in the activity to ensure an effective Quality Assurance (QA) Program is established and implemented.

Audits shall be scheduled at a frequency commensurate with the status and importance of the activity and shall include an evaluation of all applicable and active elements of the QA Program.

Regularly scheduled audits may be supplemented by additional audits e.g., supplier capability audits.

11.18.1.2 Planning

An audit plan shall be developed and documented for each audit performed.

11.18.1.3 Selection of Audit Personnel

The measures shall be established to select and assign auditors for each audit who are independent of any direct responsibility for and provided no direction or guidance for performance of the activities they will audit.

In the case of internal audits, personnel having direct responsibility for performing the activities being audited shall not be involved in the selection of the audit team.

The audit team shall consist of one or more auditors, and shall have an auditor appointed to lead the team and to organize, direct the audit, coordinate the preparation, approval, and issuance of the audit report, and evaluate responses to audit findings.

11.18.1.4 Auditing

The audits shall be performed in accordance with the written procedures or checklists by appropriately trained personnel not having direct responsibilities in the areas being audited.

Elements that have been selected for audit shall be evaluated against specified requirements.

Conditions requiring prompt corrective action shall be reported immediately to management of the audited organization.

Management of the audited organization or activity shall investigate audit findings, schedule corrective action, including measures to prevent recurrence, and notify the auditing organization in writing of action taken or planned.
11.18.1.5 Reporting

Documentation of the audit shall include audit plans, audit reports, written replies, and the record of completion of correction action.

11.18.1.6 Qualification and Certification of Audit Personnel

Personnel selected for QA auditing assignments shall have experience or training commensurate with the scope, complexity, or special nature of the activities to be audited.

Prospective lead auditors shall have training to the extent necessary to ensure competence in auditing skills.

Lead auditors qualifications shall be certified by authorized personnel.

11.18.2 GENERAL RESPONSIBILITIES

11.18.2.1 DOE-WPSO

The DOE-WPSO shall develop and implement an auditing program for the WIPP Facility to the requirements established herein.

11.18.2.2 SA and MOC

The SA and MOC shall develop and implement an auditing program to the requirements established herein.
Enclosure 2

FSAR Page Changes with Editorial Revisions
# LIST OF FSAR CHANGE PAGES
## (WITH EDITORIAL-TYPE REVISIONS)

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<th>FSAR CHANGE PAGE NOS.</th>
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<td>P-4, 1.1-6, 1.1-9, 1.2-3, 1.5-9, 1A-72, 1A-73, 1A.1-1, 1A.1-5</td>
<td>Correction of typos and/or minor format or style variations.</td>
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<td>2.2-3, 2.3-6, 2.3-46, 3.1-11, 3.3-2, 3.3-3</td>
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<td>3.3-13</td>
<td>To delete a duplicated paragraph on detailed discussions of redundant power supplies to the vital CMR loads.</td>
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<td>3.3-20</td>
<td>Correction of an FSAR error.</td>
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<td>3.5-6, 4-vi, 4.1-1, 4.2-3</td>
<td>Correction of typos and/or minor format or style variations.</td>
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<tr>
<td>4.2-9</td>
<td>Editorial change to revise a very minor aspect of description of usage of a building.</td>
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<td>4.4-9</td>
<td>Correction of a typo.</td>
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<td>Insertion of a missed part of a paragraph.</td>
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<td>4.4-120, 4.4-126, 4.6-1, 5.1-2</td>
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<td>Correction of an FSAR error and adding clarifications to the discussion.</td>
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<td>5.2-3, 5.4-1, 5.5-3, 5.6-2, 6.1-7, 6.1-9, 6.1-13, 6.1-17, 6.1-32</td>
<td>Correction of typos and/or minor format or style variations.</td>
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<tr>
<td>FSAR Addendum page 1-8</td>
<td>Correction of typos.</td>
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The EEG also provided a description of several items that are prerequisites to making a decision for full-facility operations at the end of the Test Phase. The first item deals with long-term performance. Specifically, the FSAR does not show compliance with any of the requirements of Subpart B of the EPA Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes (40 CFR 191), promulgated in September, 1985. These include:

- Probabilistic Risk Assessment
- Assurance requirements including the design of active and passive institutional controls, post-depositional monitoring, engineered barriers, and justification for the selection of the site by evaluating the favorable geological characteristics in light of potential future mineral exploration or extraction

According to the Working Agreement, Chapter 8 of the FSAR is to include a long-term performance assessment of the WIPP facility. Since this assessment will not be available until mid-1994, this portion of the commitment in the Working Agreement is not completely satisfied. Instead, Chapter 8 of this FSAR currently contains a description of the methodology that will be used to complete the performance assessment. This activity will result in the preparation of several intermediate reports. These include Consultation and Cooperation Agreement (C&C) required reports describing the communication modes through which postulated releases from the repository occur. These reports are due to be published in Fiscal Year (FY) 1990. In addition, annual summary reports are scheduled to report the status of the WIPP facility relative to the EPA standards. An initial summary status report is on the Secretary's Decision Plan for issuance in 1990. A final compliance report is currently scheduled to be published in mid-1994. Performance assessment will be completed in time to support the decision regarding the retrieval of waste or the initiation of full-scale operations.

Simultaneous with the performance assessment activity, an evaluation of possible engineering modifications to the waste form or the repository design are being evaluated. This activity has been initiated based on current analyses, which indicate potential problems in meeting the EPA Environmental Standards for Safe Disposal of TRU wastes (40 CFR 191, Subpart B) for certain breach scenarios. If modifications are proposed to the repository design and/or waste form, an analysis of the potential hazards will be performed together with their potential consequences and methods to control hazards to workers. The results will be published in an amendment to the FSAR prior to a decision to implement such modifications.

Modifications

SAR are controlled documents that are updated periodically. The designation "Final" is given to indicate that a SAR is for a facility that is ready to begin operating versus a "Preliminary" SAR, which generally refers to a facility in the design or construction stage. FSARs must be amended to reflect significant changes in operations, design or in the factors that affect operational safety. The Albuquerque implementation of Order DOE 5481.1B (AL 5481.1B) mandates review of the FSAR at least every three years to ensure full compliance with the intent of Order DOE 5481.1B. In addition to the commitments for the FSAR addendum to cover Test Phase activities, and detailed modifications to the FSAR in conjunction with a decision to use the WIPP as a repository, the basis for determining if further safety analysis is needed will be the degree to which proposed activities represent a "significant modification" from the safety analysis performed in this FSAR.

According to Order DOE 5481.1B, the factors that will be considered in determining whether a proposed physical or administrative change constitutes a significant modification are:

- Increases in the risk from a hazard beyond that previously analyzed and reviewed. This may stem from changes in operating characteristics such as speed, temperature, or pressure; increases in the quantity of hazardous materials; and/or changes in design features or administrative controls.
- Reductions in the reliability of any item for which credit has been taken for the reduction or control of a hazard.

May 1990
CH TRU and RH TRU wastes are stored at the WIPP facility in a 100-acre storage area on a horizon located 2150 feet beneath the surface in a deep, bedded salt formation. Waste is transferred from the surface to the storage horizon through a waste shaft using a hoisting arrangement.

The WIPP facility is designed for an operating life of 25 years. The facility and equipment are designed to allow for retrieval of CH TRU or RH TRU waste stored during the Test Phase. The design accommodates the time required to reach the waste and retrieve the waste, if such a decision is made. As discussed earlier in this section, the amount of wastes to be handled during the Test Phase has not been determined.

Decommissioning can be performed either after retrieval, or if it is decided to operate the WIPP without retrieval, after completion of its operational phase. Options for decommissioning are discussed in Section 8.11 of Reference 6 and include moth-balling or dismantling surface facilities, backfilling and sealing shafts, and backfilling underground areas. After decommissioning, no other active waste activities will be conducted at the WIPP facility.

1.1.4 SCHEDULE

The first receipt of waste will follow the full construction and operational checkout of the WIPP facility, the withdrawal of federal lands for the purpose of operating the WIPP facility, and the publication of a ROD regarding the SEIS, as well as completing other prerequisites detailed on the Secretary’s Decision Plan for the WIPP. This is expected to occur no sooner than July 1990 for CH TRU waste.

Initial emplacements of RH TRU wastes will be scheduled when all needed programmatic activities are completed. The Test Phase is expected to end in FY97. Full operations, if initiated, are anticipated to end in the year 2019.
1.2.3 UNDERGROUND STRUCTURES

The underground structures are located on the storage horizon and consist of the waste storage area, the shaft pillar area that contains the underground support area, and the experimental area.

1.2.3.1 Storage Area

The storage area has four main entries (two entries for fresh air and two entries for return air) and a number of storage rooms (Figure 1.2-5). The layout of the shafts and entries allows mining and storage operations to proceed simultaneously. The first storage panel is used to store waste while the next panel is being mined. Successive stages follow in a similar manner.

A typical storage panel consists of up to seven storage rooms. Each room is 33 feet wide, 13 feet high, and 300 feet long. The storage rooms are separated by pillars of salt 100 feet wide and 300 feet long. Panel entries at each end of these storage rooms are also 33 feet wide and 13 feet high. These panel entries will also be used to store waste, except in the first 200 feet from the main entries, which are of smaller size (22 feet by 14 feet) and will be used to install the panel plugs.

The underground station located at the lower end of the waste shaft provides access for personnel and equipment to handle the waste (Figure 1.2-6). A radiological control station is located adjacent to the waste shaft.

1.2.3.2 Underground Support Structures

A workshop and warehouse area is located in the shaft pillar area at the storage horizon. Shops consist of a repair bay, a welding bay, a lubrication bay, and electrical shop, several parking areas, and a warehouse. An office, electrical substation, lunch room, and sanitary facilities are also located at the storage horizon.

1.2.3.3 Experimental Areas

The area for experiments using simulated wastes and for geotechnical evaluations consists of several rooms and pillars that are used to perform rock mechanics tests, waste package and waste form experiments, and brine migration tests. In part, these tests provided information used in room and pillar design of the waste storage area.
References for Section 1.5


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<td>WIPP/DOE 207</td>
</tr>
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Note: WIPP Controlled Documents are not available for general distribution but can be reviewed at the WIPP facility.
CHAPTER 1A

SUMMARY SAFETY ANALYSIS

Consideration of the operational safety aspects as well as the long-term protection aspects of the WIPP facility began as early as the establishment of site selection criteria. As is detailed in Reference 1, site selection criteria included factors to minimize risks from natural disasters such as earthquakes, floods, volcanoes, and winds. Also included were factors to select a location with favorable geological and hydrological characteristics so as to minimize the risks associated with more gradual natural processes. Finally, site selection included factors associated with the geotechnical conditions needed to safely construct and operate a mined geologic repository.

Site and Preliminary Design Validation (SPDV) activities confirmed the favorable characteristics of the site for the WIPP facility and for the design of the underground structures.

The result of the systematic approach to site selection and underground structure design has been a minimization of risks due to natural hazards. This Final Safety Analysis Report (FSAR) considers the consequences of various natural and man-made conditions that may pose a risk to the safety of the worker, the public, or the environment. In accordance with Order AL 5481.1B, only conditions that pose risks of accidents with a probability of occurrence of greater than 10^{-4} per year are analyzed. Those natural conditions analyzed include wind, lightning, floods, earthquakes, tornadoes, and range fires. Man-made conditions analyzed include fires and explosions, loss of power, hazardous atmospheres, external disruptions, mine accidents, hazardous emissions, heat stress, equipment failure and criticality.

A summary of hazards considered in this FSAR is presented in Tables 1A-1 and 1A-2. These tables provide reference to those sections of the FSAR where detailed discussions of the hazard can be found. In addition, the tables list those monitoring and surveillance systems used to detect failures in systems and structures. Additional information on this topic can be found in the Final Environmental Impact Statement, and other documents listed in Appendix 1A.

1A.1 SITE ANALYSES

In designing the WIPP facility, design classifications have been assigned to structures and components. Design Class I structures are items whose function is essential to the prevention or mitigation of the consequences of an accident or severe natural phenomena that could result in a 50-year dose commitment beyond the Zone I boundary in excess of 25 rem to the whole body or 75 rem to specific organs. There are no Class I structures at the WIPP facility.

*Site selection criteria were principally specified by Oak Ridge National Laboratories and the United States Geological Survey. Reference 5 (EEG-1) contains an excellent compilation of site selection criteria from 59 different sources. The other structures and component systems at the WIPP facility are assigned to Design Class III.
from these water-bearing zones. Average moisture content of the Salado Formation is 1.5 percent by volume. The brines that make up this moisture content represent no special hazard to the WIPP operations. Since the waste container is not considered important to long-term isolation, corrosion of this container due to brines is not considered important.

1A.1.3 EFFECTS OF INDUSTRIAL, TRANSPORTATION, AND MILITARY ACTIVITIES

Nearby industrial, transportation, and military activities are far enough from the WIPP facility that they represent negligible risk to the surface facilities. There are no industrial sites, military sites, water transport routes or railroad routes within five miles of the center of the WIPP facility and the nearest highway is more than four miles from the center of the WIPP facility.

The nearest gas well is about two and one half miles from the center of the WIPP facility, while the nearest gas pipeline is slightly more than one mile away. At those distances, a gas explosion would not be expected to cause damage to the WIPP surface structures. Although two federal airways pass within five miles of the WIPP facility, the probability of an air disaster occurring at the WIPP facility is very small. Outside activities do not represent a significant risk to the WIPP facility.
CHAPTER 2

SITE CHARACTERISTICS

Information on the location of the WIPP facility and a description of the characteristics of the local environment that influence the design bases of the WIPP facility are presented in this chapter.

2.1 GEOGRAPHY AND DEMOGRAPHY OF THE AREA AROUND THE WIPP FACILITY

2.1.1 WIPP FACILITY LOCATION AND DESCRIPTION

The Waste Isolation Pilot Plant (WIPP) Facility is located in Eddy County in southeastern New Mexico (Figure 2.1-1). The center of the WIPP facility is approximately 103°47'27" W longitude and 32°22'11" N latitude.

Prominent natural features within five miles of the center of the WIPP facility are described in detail in Section 2.7 and include Livingston Ridge and Nash Draw, which are located about five miles west of the WIPP facility. Livingston Ridge, the most prominent physiographic feature near the WIPP facility, is a northwest facing bluff (about 75 feet high) that marks the east edge of Nash Draw (a shallow drainage course about five miles wide). Descriptions of Nash Draw and Livingston Ridge are presented in Section 2.7.1.

Other prominent natural features are the Pecos River which is about 14 miles west of the WIPP facility at its nearest point (river mile 430), and Carlsbad Caverns National Park which is more than 42 miles west southwest of the WIPP facility. The nearest prominent man-made features are the city of Loving (with a 1986 population of approximately 1450) which is 18 miles west southwest, and the city of Carlsbad (with a 1986 population of about 27,000) which is 26 miles west of the WIPP facility.

2.1.1.1 WIPP Facility Area

The area of land that lies within the WIPP Site Boundary and committed to the WIPP facility is a square four miles on a side. It contains 10,240 acres (16 mi²) including Sections 15-22 and 27-34 in township T22S, R31E. The area containing the WIPP facility surface structures is surrounded with a chain link fence and covers about 35 acres in Sections 20 and 21 of T22S, R31E. This fenced area is known as Zone I (Section 4.1.2.2). The location and orientation of the WIPP facility surface structures are shown in Figure 2.1-2. These structures include the Waste Handling Building (WHB) where radioactive waste is received and prepared for underground storage, a TRUPACT II Maintenance Facility for the inspection, maintenance, and minor repair of TRUPACT IIs, four shafts to the underground area, a Support Building containing laboratory and office facilities, showers, change rooms and equipment storage areas for underground workers, an Exhaust Filter Building (EFB), a water supply system, sewage stabilization ponds, and other auxiliary buildings. In addition, there are two mined-rock (salt) piles, and an evaporation pond for collecting salt pile runoff. A sanitary landfill location is shown on WIPP facility drawings, but a decision has been made not to develop this landfill at this time.

There are no industrial, commercial, institutional, recreational or residential structures within the WIPP Site Boundary and no through public highways, railways or waterways traverse the WIPP Site Boundary. County Road 802 crosses the WIPP Site Boundary as the south access road. There are four natural gas pipelines that traverse the vicinity of the WIPP facility. One
An on-site inspection of the immediate areas surrounding the WIPP facility revealed that sections of the 12-3/4-inch Eunice to Carlsbad Line (Figure 2.2-4) are completely void of overburden. It is not apparent whether exposed sections of the pipeline were caused by natural forces of erosion, i.e., wind, water, etc., or whether the pipelines were uncovered during various types of exploration and construction work that have been conducted in the area. Since on-site inspection did not include all pipelines in the area, sections of other pipelines may also be exposed.

The U.S. Department of Transportation (DOT) requires natural gas pipelines to be constructed with isolation valves located at points that are not more than 20 miles from each other throughout the total span of the pipeline. An isolation valve is also located at the site of each natural gas well and each natural gas pipeline. Eight pipelines extend beyond the boundaries of the five-mile radius area (Figure 2.2-4). The locations of the isolation valves that control the flow of the natural gas within a five-mile radius of the WIPP facility are shown in Figure 2.2-4.

Natural gas pipelines are regulated by the National Transportation Safety Board (NTSB) in 49 CFR 192. The NTSB establishes safety zones for habitation near high-pressure gas lines. This has been established as 220 yards on each side for pipelines similar to the one that crosses the WIPP Site Boundary. In addition, the Nuclear Regulatory Commission, in NUREG-0625 has established a standoff distance of 0.5 miles. Therefore, this pipeline poses no risk to the WIPP facility.

One major non-oil or gas pipeline lies within the WIPP Site Boundary. This is a 24 inch City of Carlsbad water pipeline that provides the WIPP facility with potable water. This line is described in greater detail in Section 4.4.4.1.

2.2.5 WATERWAYS

There are no navigable waterways within a five-mile radius of the WIPP facility. The nearest river is the Pecos River which is 14 miles west of the WIPP facility.

2.2.6 AIRPORTS AND AVIATION ROUTES

There are no airports within a five-miles radius of the site. The nearest airstrip, 12 miles north of the WIPP facility, is privately operated by Transwestern Pipeline Company. The nearest commercial airport is Cavern City, 28 miles west of the WIPP facility near Carlsbad. Other major airports in the area are Eunice (32 miles east of the WIPP facility), Carlsbad Caverns (42 miles southwest of the site), Hobbs Industrial Airpark (42 miles northeast of the WIPP facility), Jal (40 miles southeast of the WIPP facility), Lovington (45 miles northeast of the WIPP facility), and Artesia (51 miles northwest of the WIPP facility). The relationship of these airports to the WIPP facility is shown in Figure 2.2-5.

Portions of two federal airways are within five miles of the WIPP facility. Each airway is 10 miles wide. The centerline of low altitude airway V-102 is three miles northwest of the WIPP facility and high altitude airway J-15 is four miles northeast of the WIPP facility at their nearest points. These airways are shown in Figure 2.2-5. Traffic data for these airways are given in Table 2.2-2. The combined traffic on both routes is about 28 Instrument Flight Rule (IFR) flights per peak day. There are no approach or landing zones within five miles of the WIPP facility.

J-15 is a major northwest southeast airway that is also used by military aircraft. It can be assumed that from time to time military aircraft carrying ordnance will fly this airway. The ordnance could be carried by either military cargo or combat aircraft. The exact number of military flights carrying ordnance on this airway is unavailable.
2.3.2.3 Topography

The land surface in the vicinity of the WIPP facility is a semiarid, wind blown plain sloping gently to the west and southwest. Its surface is made somewhat hummocky by an abundance of sand ridges and dunes. The average slope within a 3-mile radius is about 50 ft/mi from the east to west.

A plot of terrain profiles from the center of the WIPP facility out to 5 miles is presented in Figure 2.3-3 for each of the 16 direction sectors.

2.3.3 ON-SITE METEOROLOGICAL MEASUREMENT PROGRAM

2.3.3.1 Measurements Through 1981

On site meteorological data were used to characterize the local meteorology of the region around the WIPP facility. These data have been presented, and their representativeness is discussed in Section 2.3.2. The meteorology station was located in T22S, R31E, Section 11 from January to June 1976, in Section 15 from June 1976 to May 1977, and in Section 21 from May 1977 until it was dismantled in 1981. These locations are shown in Figure 2.3-4 and are representative of local terrain conditions.

Until May 1977 the monitoring system consisted of the following seven sensors at the indicated heights above ground:

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Height Above Ground (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average wind speed</td>
<td>10</td>
</tr>
<tr>
<td>Wind direction</td>
<td>10</td>
</tr>
<tr>
<td>Humidity</td>
<td>10</td>
</tr>
<tr>
<td>Pressure</td>
<td>1</td>
</tr>
<tr>
<td>Precipitation</td>
<td>1</td>
</tr>
<tr>
<td>Sky radiation</td>
<td>3</td>
</tr>
<tr>
<td>Temperature</td>
<td>10</td>
</tr>
</tbody>
</table>

The meteorological system, as of November 1977, provided data as described in Table 2.3-20. The sensors are described in Table 2.3-21.

2.3.3.2 Measurements From 1984 Through Present

In 1981 the meteorological measuring system was dismantled except for the tower. In September 1984, an interim weather station was established with the installation of a 10-meter tower at the northwest corner of Zone I on which wind speed, wind direction, and temperature sensors were placed. In October, 1988 this station was relocated to the far field monitoring site, 1000 m northwest of the Exhaust Shaft. This relocation was necessitated by construction of the Air Intake Shaft. Up until March 1986, the analog signals from the 10-meter tower were continuously recorded on strip-chart recorders. After March 1986, the analog signals were hooked up to the Sum-X Data Acquisition System, which is now the primary data logger. Monthly precipitation has been recorded since June 1985.³⁴
Table 2.3-24

A BRIEF CHRONOLOGY OF THE CLIMATE OF THE SOUTHWESTERN UNITED STATES IN THE LAST 10,000 YEARS*

<table>
<thead>
<tr>
<th>Dates</th>
<th>Climate</th>
</tr>
</thead>
<tbody>
<tr>
<td>9000-6000 B.C.</td>
<td>Warm and arid in southern Arizona.</td>
</tr>
<tr>
<td>6800-5600 B.C.</td>
<td>Cool and dry, with possible extinction of mammals, particularly in Arizona and New Mexico.</td>
</tr>
<tr>
<td>5600-2500 B.C.</td>
<td>Warm and moist, becoming warm and dry by 3000 B.C. (Climate Optimum). Intermittent drought in the western United States after 5500 B.C.</td>
</tr>
<tr>
<td>2500-500 B.C.</td>
<td>Generally warm and dry with periods of heavy rains (after 660 B.C.) and intense droughts (near 510 B.C.) in the western United States.</td>
</tr>
<tr>
<td>330 A.D.</td>
<td>Drought.</td>
</tr>
<tr>
<td>800 A.D.</td>
<td>Start of moist period in Mexico.</td>
</tr>
<tr>
<td>1180-1215</td>
<td>Wet in the West.</td>
</tr>
<tr>
<td>1220-1290</td>
<td>Drought in the West.</td>
</tr>
<tr>
<td>1276-1299</td>
<td>&quot;Great Drought&quot; in the Southwest.</td>
</tr>
<tr>
<td>1300-1330</td>
<td>Wet in the West.</td>
</tr>
<tr>
<td>1500-1900</td>
<td>Generally cool and dry (Little Ice Age). Periodic glacial advances in North America (1700-1750). Drought in the southwestern United States from 1573 to 1593.</td>
</tr>
<tr>
<td>1880-1940</td>
<td>Increase of winter temperatures by 1.5°C. Drop of 5.2m in the level of the Great Salt Lake. Alpine glaciation reduced by 25% and arctic ice by 40%.</td>
</tr>
<tr>
<td>1920-1958</td>
<td>25% decrease in mean annual precipitation in the Southwest.</td>
</tr>
<tr>
<td>1942-Present</td>
<td>Worldwide temperature decrease and halt of glacial recession.</td>
</tr>
</tbody>
</table>

3.1.7 CLASSIFICATION OF STRUCTURES, SYSTEMS, AND COMPONENTS

This section defines the design classification system used for categorizing structures, systems, and components of the WIPP facility in accordance with the importance of their function relative to the health and safety of the public and on-site personnel during plant operations. The Design Classification System is a multilevel system that establishes the relative functional importance of nuclear safety, industrial safety, and reliability functions of systems, structures, and components. This system provides a method of correlating and specifying the special design, procurement, construction, and quality assurance requirements for plant hardware items. (In this discussion, structures, systems, and components are referred to collectively as "items" and individually as "item").

Classification categories are identified as Design Class I, II, or III, with Design Class III further subdivided into Design Class II A and II B, in accordance with the definitions provided in Section 3.1.7.1.

Where a single item performs two or more functions that could be assigned to more than one design classification, it is assigned to the more stringent class. Different portions of the same item that perform different functions may be assigned to different classes if the item contains a suitable interface boundary that meets the requirements of Section 3.1.7.2, Design Class Interfaces.

In addition to definitions of each design class, design class interface requirements and quality assurance criteria applied to each class are provided in this section. Severe natural phenomena, including design basis earthquake (DBE) and design basis tornado (DBT), are also discussed. Table 3.1-7 shows the basic design and quality assurance requirements applicable to each class at the time the structures, systems, and components were designed and installed. Table 3.1-8 lists the design class of plant structures, systems, and components in accordance with the design class definitions. Table 3.1-9 provides a glossary for Tables 3.1-7 and 3.1-8. Design classification of WIPP facility structures, systems, and components is defined in Ref 13. New structures, systems, and components are assigned a Design Class on an item-by-item basis in accordance with procedures in Chapter 9 of the WIPP Procedure Manual.

3.1.7.1 Design Class Definitions

3.1.7.1.1 Design Class I

Design Class I applies to items whose function is essential to the prevention or mitigation of the consequences of an accident or severe natural phenomena that could result in a 50-year dose commitment beyond the Zone I boundary in excess of 25 rem to the whole body or 75 rem to any other organs.

It should be noted that the above 25/75 rem limit is a classification dose limit that enables a determination to be made as to whether certain structures, systems and components should be designated Design Class I. Such items are required to retain their safety function under all normal and abnormal conditions. Thus, Design Class I items may be considered operational for accident mitigation in order to remain within the operational limits specified in Section 3.3.4.

Each WIPP facility item was evaluated against the design classification criteria. Application of these criteria has identified that there are no Design Class I items in the WIPP facility.

In applying the Design Class I definition, the consequences of accidents were evaluated based on conservative dose analyses. The analyses consider that initial plant parameters are at their limiting values consistent with the operating controls and limits imposed on plant operations. The dose analysis is performed using methods that reasonably account for the actual plant and site characteristics and that conservatively include the
The HEPA filtration system may be considered a secondary confinement barrier. This system connects with the dynamic ventilation system. The HEPA filters provide the last barrier to prevent contaminated airborne particulates from leaving the WIPP facility. The design is such that individual filters can be replaced without any air bypassing the HEPA system. The efficiency of the installed HEPA filters is tested periodically in accordance with ANSI Standard N510.²

3.3.1.2.3 Dynamic Confinement Barrier

The ventilation system is designated as a dynamic confinement barrier in the multibarrier confinement system. In the waste handling areas, the ventilation system maintains a static pressure differential between the primary confinement barriers and the environment. Air locks between different design zones of potential contamination separate areas in which critical pressure differentials are maintained to ensure airflow from areas of lower to higher contamination potential.

The ventilation for the underground areas is divided into three systems with a common air supply (Section 3.3.2.3) and a common exhaust. One system supports the radioactive waste storage operations, the second supports underground mining activities, and the third supports experimental activities. Separation of these air flows is maintained throughout the system until the flows are recombed at the exhaust shaft. A pressure differential is also maintained between the systems, so that any air leakage flows from the mining area to the waste storage areas.

Site generated liquid radwaste is confined by a holding tank. Gases from potentially contaminated shipping containers are vented through a sampling and filtering system to assure no releases of airborne contaminants or of excessive quantities of hazardous gasses.

3.3.2 AIR HANDLING

The WIPP facility air handling systems are designed to provide a suitable environment for personnel and equipment during normal plant operation. They also are designed to provide contamination control for anticipated operational occurrences and postulated waste handling accidents. Certain components of the air handling systems are also used for functions related to space cooling and removal of heat generated by the equipment and waste. These systems are discussed in Section 4.4.1.

The WIPP facility air handling systems serve three major plant areas: the surface nuclear facilities, the surface support facilities, and the subsurface facilities.

The air handling systems are designed so that the emissions meet the limitations in DOE Order 5480.11.³ They are designed to the following general guidelines:

Transfer and leakage air flow is from areas of lower to areas of higher potential for contamination.

In building areas that have a potential for contamination, a negative pressure is maintained so that the spread of contaminants to other areas is minimized.

Ventilation fans and filters are provided with adequate space around the units to facilitate maintenance and testing.

Consideration is given to the temporary disruption of normal air flow patterns due to scheduled and unscheduled maintenance operations by providing dual trains of supply and exhaust equipment, each rated at 50 percent of total capacity. Air handling systems are provided with features to re-establish designed airflow patterns in the event of a temporary disruption.
Generally, ducts that carry potentially contaminated air are routed away from occupied areas. In addition, potentially contaminated ducts are welded to the maximum extent practical to reduce system leakage.

The filtration system consists of prefilters and HEPA filters sized in accordance with design airflows utilizing the manufacturer's rating standards for maximum efficiency.

Dampers are described as flow control, balancing, shutoff, or back-draft. Dampers are classified by function, configuration, construction and leak tightness in accordance with Tables 5.7 through 5.10 of ERDA 76-21 as appropriate for their designated application. Damper selection is based on the requirements of ERDA 76-21, Table 5.12.

Valves used as isolation dampers are tested to verify the effectiveness of their seals, opening and closing periods, and the ability of the valve actuator to operate the valve at the maximum anticipated differential pressure.

Heating, ventilating, and air-conditioning (HVAC) components are sized so that some components can be taken out of service for maintenance, allowing the system to continue operation at reduced capacity.

Other codes and standards used in the air handling equipment design are as follows:

- Fans conform to the Air Moving and Conditioning Association (AMCA) Application Guide No. 201.
- Duct work conforms with applicable standards of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
- Water cooling coils conform to the standards of the Air Conditioning and Refrigeration Institute (ARI).
- Electric heating coils and applicable components and controls conform to the requirements of Underwriters' Laboratories (UL), the National Electrical Code of the National Fire Protection Association, and National Electric Manufacturers Association standards.
- Fire dampers are listed by Underwriters' Laboratories.
- Prefilters are rated in accordance with the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 52-76.
- High efficiency particulate air (HEPA) filters conform to the standards of U.S. Military Specification MIL-F-51068D.
- Installed air cleaning systems are tested in accordance with ANSI N510, Testing of Nuclear Air Cleaning Systems.
- ANSI Standard N509.

3.3.2.1 Surface Ventilation Systems for the Radioactive Materials Area

The ventilation systems for the WHB and Exhaust Filter Building are once through systems designed to provide dynamic confinement barriers to limit potential releases of airborne radioactive contaminants to levels ALARA, consistent with the requirements of DOE Order 5480.11. The ventilation systems are also designed to provide necessary heating, ventilating, and air conditioning for personnel comfort and to remove heat from equipment and waste.
A permanent hard copy record of system status is provided on both a scheduled and demand basis.

Audible and visual system alarms are provided locally and at the CMS consoles.

Direct in-plant communication capability is provided in the CMR. Under all conditions, the communications system provides for simultaneous communication from the control room to all stations in the plant. Off site communications for emergency services such as police, fire departments, and ambulance services is provided at the Emergency Operations Center and at the Guard and Security Building.
Table 3.3-3

VITAL CMS CONTROL FUNCTIONS

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<th>System</th>
<th>Control Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>In-plant signals broadcast over the PA system.</td>
</tr>
<tr>
<td></td>
<td>Evacuation signals broadcast over the PA system.</td>
</tr>
<tr>
<td></td>
<td>Two-way radio.</td>
</tr>
<tr>
<td></td>
<td>Telephone for emergency services.</td>
</tr>
<tr>
<td>HVAC</td>
<td>HEPA filter bypass.</td>
</tr>
<tr>
<td></td>
<td>Underground mining airflow reversal.</td>
</tr>
<tr>
<td>Electrical</td>
<td>Open and close 13.8 kV circuit breakers.</td>
</tr>
<tr>
<td></td>
<td>Open and close vital 480 volt circuit breakers.</td>
</tr>
<tr>
<td></td>
<td>Remote start/test capability of the emergency diesel generator.</td>
</tr>
</tbody>
</table>
References for Section 3.5

1. Westinghouse Electric Corporation; Results of Site Validation Experiments, Waste Isolation Pilot Plant (WIPP) Project, Southeastern New Mexico, TME 3177, Vols 1 and 2, 1983.


9. Memo from W.D. Weart (Sandia) to Distribution; Reference Creep Law and Material Properties for WIPP, July 31, 1981.


# CHAPTER 4
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CHAPTER 4

PLANT DESIGN

4.1 SUMMARY DESCRIPTION

4.1.1 LOCATION AND FACILITY LAYOUT

The WIPP facility is located in Eddy County about 26 miles east of Carlsbad, New Mexico. It covers 10,240 acres (16 Sections) (Figure 4.1-1). The surface structures shown in Figure 4.1-2 are located near the center of the facility in Control Zone I. Beneath the surface structures and extending to the boundary of Control Zone II, are the subsurface structures. A layout of the planned storage horizon is shown in Figure 4.1-3.

Access to the WIPP facility is provided by two access roads that connect with U.S. Highway 62/180 13 mi to the north and New Mexico Highway 128, four miles to the south (Figure 4.1-4). Rail access is provided from a spur of the Atchison, Topeka & Santa Fe railroad near the Western Ag Minerals Nash Draw mine which is about six miles to the southwest of the WIPP facility (Figure 4.1-4).

4.1.2 PRINCIPAL FEATURES

4.1.2.1 WIPP Site Boundary

The WIPP site boundary encompasses the 10,240 acres of the WIPP facility. There are several fenced areas associated with the WIPP facilities. These are described in Section 2.1 and include the Zone I boundary, the security area boundary and various other exclosures that isolate remote structures or biological study plots.

4.1.2.2 Secured Area Boundary

The Secured Area Boundary encloses Zone I and most of Zone II (Figure 4.1-2) and encompasses approximately 1400 acres. This area is surrounded by a barbed wire fence. Access through the fence is limited by no trespassing signs and cattle guards, and restricted to authorized personnel and vehicles.

4.1.2.3 Zone I Boundary

The Zone I boundary is a controlled area at the center of the WIPP facility (Figure 4.1-1). This area is surrounded by an eight-feet high chain-link fence, and topped by three strands of barbed wire for a total height of nine feet, which encloses all surface structures except the salt storage area. Entrance is through controlled gates. Public access in this area is restricted. Only employees and visitors with proper identification are admitted.
OP&RR in order to provide an additional measure of protection. The function of this structure is to enhance the As Low As Reasonably Achievable (ALARA) aspects of unloading, overpacking and decontamination operations which may be required.

This temporary structure will be separately High Efficiency Particulate Air (HEPA) filtered. A mobile floor supported hoist will be located within this enclosure for lifting operations. The enclosure will include entries for personnel as well as a 6-ton electric lift truck.

CH TRU Support Facilities

Facilities supporting CH TRU operations include a small equipment decontamination room, a personnel change room, and the site-generated waste room. Final packaging of solid site-generated radioactive waste will be accomplished in the site-generated waste room. This room also contains a storage tank for potentially contaminated liquid wastes as well as space for solidification equipment which may be installed, if required. The site-generated waste room connects to the Inventory and Preparation Area and the Overpack and Repair Room via air locks. Access to the personnel change and small equipment decontamination rooms is from the air lock, which separates the site-generated waste room from the OP&RR.

4.2.1.2 RH Waste Handling Area

The RH side of the WHB is a high bay area which includes structures and equipment for the unloading of shielded RH waste shipping containers and transferring the canisterized waste from the shipping containers to a shielded facility cask via the hot cell. This area will accommodate RH TRU as well as other wastes requiring shielded/remote operations. The major areas within the RH waste handling area are shown in Figure 4.2-1 and are described below.

Inventory and Preparation Area

The Inventory and Preparation Area of the RH side of the WHB is a high bay area for shipping cask receiving and subsequent handling operations. This area includes a 140-ton bridge crane used for lifting shielded RH shipping containers. The crane has a 25-ton auxiliary hoist. As is the case with the cranes in the CH TRU Inventory and Preparation Area, this crane is designed to stay on its rails and retain control of its load in the event of a DBE. Subareas include: a cask receiving area; a cask preparation area; and, a cask maintenance station.

Cask Receiving Area

The cask receiving area is used to unload shielded RH shipping casks from incoming transporters and to load empty shipping containers onto outgoing transporters. Both truck and rail transported casks can be accommodated in this area. The overhead bridge crane is designed to lift casks from the transporter and position the cask on the shipping cask transfer car which is located at the cask preparation station. The cask receiving area also provides laydown space for shipping cask tie-downs, impact limiters, and other components that must be removed as the shipping cask is unloaded from the transporter.

Cask Preparation Area

The cask preparation car is a self-propelled tracked car which travels between the cask preparation area and the cask unloading room which is a part of the hot cell complex. The transfer car supports the shipping cask and incorporates an integral work platform which provides personnel access to the head area of the shipping cask. Cask preparatory operations completed in this area include: radon checks; controlled venting of the shipping container cavities; removal of the outer closure; unbolting of the inner closure, and installation of a cask seal collar which will mate with the seal ring in the cask unloading room. The shipping cask transfer car is designed for a shipping cask weight of up to 50,000 lbs.
The hoist house is a separate steel framed building enclosed with insulated metal roofing and siding that contains a hoist room and an attached electrical equipment room. The hoist house and headframe are classified as Design Class IIIB and are designed in accordance with the Uniform Building Code. Lightning protection and grounding systems are provided for the headframe and hoist house. They are constructed of noncombustible materials.

4.2.2.4 Main Warehouse Building

The Main Warehouse Building provides space for plant equipment storage and shipping and receiving operations. The building also provides space for administrative personnel. The building is classified as Design Class IIIB and is designed in accordance with the Uniform Building Code. It is constructed of structural steel framing, insulated sandwich panel siding, steel roof deck and built-up roofing. A wet pipe sprinkler system and interior fire hose connections are installed throughout the building.

No radioactive materials are handled within this building.

4.2.2.5 Water Pumphouse

The Water Pumphouse is located adjacent to the two water storage tanks (Figure 4.1-2). The pumphouse contains two firewater pumps (one electric and one diesel) and three electric domestic water pumps, as well as space for water chlorination equipment and chemical storage.

The Water Pumphouse is an above ground steel frame and siding building. It is classified as Design Class IIIA and is designed in accordance with the Uniform Building Code. The building contains a wet pipe sprinkler system, portable fire extinguishers, and hose reels. For a complete description of the fire water system see Section 4.4.3.

4.2.2.6 Support Building

The Support Building is located adjacent to the WHB, with a common main corridor between buildings. The building houses general support services for all structures and activities at the WIPP facility. Figures 4.2-7 and 4.2-8 show the building layout. Support Building elevations are shown in Figures 4.2-9 and 4.2-10.

The Support Building is constructed of steel framing and sandwich panel siding. The building is classified as Design Class IIIA and is designed in accordance with the Uniform Building Code. However, to meet the interface requirements with the WHB, the structural portions of the building are designed for Design Class II loads and DBE.

The Support Building provides for administrative, operations control, technical support, and underground personnel support functions. The administration area provides space for performing the administrative functions that support plant operations. Included in this area are the technical and administrative offices, and technical library.

The operations control area is the central monitoring point for all activities within the WIPP facility. Included in the operations control area are the central monitor room and the computer room.
SHAFT LINING - The lining prevents water from seeping into the shafts and retains loose rock. The shaft linings will not be utilized as the eventual seal for the shaft. Portions of the liner will be removed, and specially designed seal plugs will be emplaced during final decommissioning.

SHAFT KEY SECTION - A circular reinforced concrete key extends into the salt and is founded in competent salt. The key's thickness varies, depending on the diameter of the shaft. The key design is based mainly on experience from the local potash mines.

Water seal rings are an integral part of the key. A 10- to 11-feet interval between the two rings is provided with eight two-inch diameter pipes to monitor any water escaping through the first ring. These pipes are drilled approximately eight feet into the salt. If a flow condition is detected through the upper ring, this condition is corrected by injecting additional chemical sealants or cement grouts to stop the leakage.

4.3.1.1.3 General Hoist Features

The Waste Shaft is equipped with a conveyance as described in Section 4.3.1.2.1. The Salt Handling Shaft is equipped with a conveyance (skip) as described in Section 4.3.1.2.2. The Air Intake Shaft (AIS) is equipped with a man and material conveyance as described in Section 4.3.1.2.4. There is no hoist at the exhaust shaft. The conveyances in the Waste Shaft and AIS are guided by steel cables (guide ropes). The Salt Handling Shaft conveyance is guided by fixed wooden guides and is equipped with safety dogs. The Waste Shaft is equipped with catch sprags in the hoist tower to prevent the conveyance or counterweight from falling into the shaft should it run against the upper crash beam and cause the hoist ropes to break. All hoist towers are made of structural steel.

The waste and SH hoists have two sets of brakes each which are designed so that either brake acting alone can stop the fully loaded conveyance under all emergency conditions. In the event of a power failure, the brakes will set automatically. The AIS hoist also is equipped with two independent sets of brakes.

A control system detects malfunctions or abnormal operations of the hoist system, such as overtravel, overspeed, power loss, circuitry failure, or starting in a wrong location, and triggers an alarm and automatically shuts down the hoist.

The waste and SH hoists are protected by fixed automatic fire suppression systems. Portable fire extinguishers are also provided at several points in each of the hoist stations and hoist houses.

For personnel safety, a fence with manually operated gates is provided around each shaft perimeter opening on the storage horizon level and at the collar station.

4.3.1.2 Specific Design Features

4.3.1.2.1 Waste Shaft and Hoist

The Waste Shaft is used to transport radioactive waste, underground mining equipment, materials, and underground radiation workers between the surface and the underground horizon. The conveyance contains an upper and lower deck. Personnel are carried on the upper deck. The inside diameter of the lined upper portion of this shaft is 19 feet. The shaft lining is unreinforced concrete. Figure 4.3-1 shows the Waste Shaft and hoist arrangements. The waste hoist conveyance (outside dimensions) is 30 feet high by 10 feet wide by 14 feet deep and carries a payload of 45 tons. During loading and unloading operations, the conveyance is steadied by fixed guides. At the station, rope stretch is removed by a chairing device. The hoist's maximum rope speed is 500 ft/min. A counter-weight of 50 tons is used to balance the waste hoist conveyance.
is exhausted through independent prefilters and HEPA filters before being discharged to the atmosphere via the exhaust stack. Sufficient exhaust capacity is provided to maintain the design pressure differential between the hot cell and the surroundings or to maintain at least 125 linear ft/min inward flow through the maximum credible breach, minimizing the possibility of contaminants escaping.

To keep the hot cell temperature below the design maximum temperature of 104°F, the supply air to the hot cell is provided with an air handling unit, which includes a cooling coil to condition the supply air drawn in from the RH cask receiving area.

The Waste Shaft is separated from the RH waste handling area by an air lock which maintains a physical barrier and minimizes the air movement between the RH waste handling areas and the shaft.

MAJOR COMPONENTS AND OPERATING CHARACTERISTICS - The ventilation system consists of separate supply and exhaust systems for each building subsystem and provides continuously circulating air in the various rooms within the areas served. Each supply air handling subsystem consists of roughing filters, evaporative cooling section, cooling coil, heating element, and a fan, with associated duct work. Filters are provided to trap large airborne particulates.

During winter and summer, the heating and cooling coils condition the incoming outside air as required. The supply fan distributes 100 percent outside air through the duct work to the various rooms of the areas served.

Exhaust air from the various design contamination zones is ducted to prefilters and HEPA filters to reduce the concentration of potential airborne radioactivity in the ventilation stack discharge and to confine potential airborne radioactive particulates.

Each exhaust subsystem provides a filtered air exhaust path consisting of one stage of prefilters, two stages of HEPA filters, and two 50 percent capacity exhaust fans. Exhaust air is discharged through the building stack. The final exhaust from the stack is continuously monitored for airborne radioactivity.

SAFETY CONSIDERATIONS AND CONTROLS - The exhaust system remains functional to the extent that confinement and differential pressures are maintained, exhaust air is filtered, and airflow reversal during the passage of a tornado is prevented by tornado dampers. Failures in other systems that are not Design Class II do not affect the exhaust filtration system.

In case of an off-site power failure, the capability exists to selectively switch one 200 H.P. exhaust fan to the backup power system in order to continue to exhaust air in the preferred flow pattern. The airflow, however, at a lower rate except for the CH TRU system. Its normal operation is one train operating with the other. The Facility Operations Manual, WP 04-1 provides procedures for applying backup power to the exhaust fans.

The supply and exhaust fans are designed and interlocked to maintain building in-leakage and the preferred airflow pattern. During normal operation, if one of the two exhaust fan fails on subsystems other than the CH TRU area, the corresponding supply fan is stopped in order to maintain the preferred flow patterns and pressure differentials. If the operating CH area exhaust fan fail, the corresponding supply fan is stopped and the standby train is started.

Sufficient remote instrumentation is provided to permit the operator to monitor equipment from the central monitoring room (CMR). The monitored parameters include fan operating status, filter bank pressure drop, level of radioactivity in the effluent, and static pressure differential in critical areas, i.e., hot cell, overpack and repair room, and cask preparation station. Fan failure and excessive radiation levels are annunciated. A low flow of fans 835 and 836 produces an audible alarm in the CMR.
A HEPA filter system upstream of the supply units, bypassed during normal operation, is automatically activated by the detection of airborne radioactivity levels above the sensor set point at Stations B or C.

100 percent equipment redundancy is provided for each of the following: supply air handler, air cooled condensing unit, and exhaust fan.

A Failure Mode and Effects Analysis (FMEA) has been performed on the Support Building CMR and Instrument Shop HVAC System to show the adequacy of the design and its effects on the operation and the safety of personnel. The analysis assumes the single failure of a component or system and presents the consequences of that failure. The results of this analysis are presented in Table 4.4-3. Should the CMR become uninhabitable, monitoring can be conducted from an alternate location in the Guard and Security Building.

MAJOR COMPONENTS AND OPERATING CHARACTERISTICS - Major components of this HVAC system consist of supply air handling units (containing fans, direct expansion cooling coils, and filters), air cooled condensing units, humidifier, duct heaters, exhaust-return fans, booster fan, HEPA filter unit, dampers, instrumentation and controls.

The schematic airflow diagram for the CMR and Instrument Shop area HVAC system is shown in Figure 4.4-7.

The CMR and Instrument Shop area is served by two 100 percent capacity air-conditioning units. One is normally on standby status, isolated from the operating system by shut-off dampers, but available for automatic start in the event that the normally operating unit fails.

Under normal operating conditions (recirculation mode), outside makeup air and return air are filtered by a two-stage air filter system. The first stage of filtration consists of nominal 2-inch thick low efficiency filters. The second stage consists of high efficiency filters rated at 85 percent efficiency (atmospheric dust) by ASHRAE Standard 52-76. After the second stage of filtration, the air supply is heated or cooled, as required, to maintain design temperatures.

The filtered and conditioned air supply is distributed to the various rooms within the CMR and Instrument Shop area by means of ductwork and air outlets. Temperatures are thermostatically controlled.

If excessive levels of radioactivity are detected at either of the effluent monitoring Stations B (underground ventilation filtered exhaust) or Station C (WHB filtered exhaust), the outside makeup air supply passes through a HEPA filter system before it enters the CMR and Instrument Shop area air handling unit.

SAFETY CONSIDERATIONS AND CONTROLS - The main function of the HVAC system is to provide a suitable environment that permits the CMR and Instrument Shop area to be occupied under normal and emergency operating conditions. This includes preventing airborne radioactive contaminants from entering the supply systems.

If excessive airborne contamination is detected by either Effluent Monitoring Stations B or C, the outside makeup air supply is automatically directed through the HEPA filters.

A backup air conditioning system (air handler, air cooled condensing unit, exhaust fan) is available. Automatic controls are employed to bring the backup components online in the event an operating component fails.

The supply and exhaust air handling systems are capable of being manually connected to the backup power system for operation during a loss of off-site power.
The system is designed to perform under three modes of operation: normal mode (HEPA exhaust filtration system bypassed), filtered mode (exhaust filtered through HEPA filtration system if the concentrations of radioactive contaminants exceed pre-set limits), and air reversal mode.

Provisions are included for detecting airborne radioactive contaminants in the waste storage areas, in the waste shaft and station, and in the discharge to the surface exhaust stack. The monitors used, their locations, and the expected radioactive releases to the atmosphere are discussed in Chapter 6.

The design airflow quantities are based upon standard local, state, and federal industrial and mining laws and practices. Air quantities supplied to all the underground areas were determined to meet or exceed the criteria specified in the Mine Safety and Health Administration Code. Operation of diesel equipment in the underground repository is limited to the available airflow in the area. Operations practices are in place to ensure compliance with Mine Safety & Health Administration (MSHA) code in this regard.

4.4.1.3.2 System Description

The ventilation system consists of five centrifugal exhaust fans arranged in parallel, two identical HEPA filter assemblies arranged in parallel, isolation and back draft dampers, filter bypass arrangement, and associated ductwork. Operation of the underground ventilation system is detailed in the Operations Administration Manual, WP 04-3.

The five fans are divided into two groups. One group consists of two fans which are used during normal operation to provide the required underground flow of 425,000 CFM. These fans are located near the exhaust shaft. The remaining three fans, rated at 60,000 CFM each and located at the Exhaust Filter Building, form the other group and are capable of being used during the filtered mode of operation. However, this mode of operation requires the use of only one of the three fans at any given time. All other fans (four total) are stopped and isolated.

Each filter assembly consists of two banks of prefilters and two banks of high efficiency particulate air (HEPA) filters arranged in series. Each assembly will handle 50 percent of the filtered mode airflow (60,000 CFM total).

The ventilation path for the waste storage side is separated from the mining side by means of air locks, bulkheads, and salt pillars. A pressure difference is maintained between the mining side and the waste storage side (mining side being higher) to assure that any leakage is to the storage side. The pressure differential is maintained by underground booster fans and/or airflow regulators.

A pressure chamber has been added to the west side of the Waste Shaft Station to ensure that no potential for leakage from RMA side to the mining side occurs during upset conditions. The pressure chamber is automatically activated when the pressure differential across it drops down to a predetermined value, even while the leakage is in the correct direction; thereby ensuring that leakage is always towards RMA.

Pressure differentials across this pressure chamber and another bulkhead between the mining and storage sides (located nearer to the storage panel) are continuously monitored from the CMR.

In the normal mode, the two main surface exhaust fans, located near the exhaust shaft, provide continuous ventilation of the underground areas during normal operation. All underground flows join at the bottom of the upcast exhaust shaft before rising to the surface for discharge to the atmosphere. In this mode, the filter assemblies are isolated and bypassed.
amount of fuel available in a single fire and therefore decreases fire intensity, smoke generation, and liberation of toxic by-products. At the same time, it serves to effectively limit fire spread to a single grouping of cabinets and their racked and shelf-mounted equipment.

In the CMR, the raised subfloor allows flexibility of cabling connections to the operator's console and panel-mounted equipment. This floor is of noncombustible and fire-resistant construction to limit the vertical spread of fire from the subfloor area.

Due to the limited amount of fuel, the intensity of any fire in fixed equipment in the CMR is limited and of short duration.

In addition, the CMR is of fire-resistant construction which limits the fire from spreading to adjoining administration areas. Furthermore, automatic fire dampers maintain Halon concentration within the CMR.

Transport vehicles used in the WHB are electrical and are required to have a fire extinguisher mounted on the vehicle.

Spontaneous Ignition fires resulting in the combustion of Class A materials are limited by the amount of combustible material present. However, if a fire of this nature develops, manual fire-fighting measures would be adequate, even with delayed detection, to effect immediate control. The fire would not extend beyond the room or area of origin because of fire-resistant construction materials and the limited amount of fuel available.

Some operations and processes at the WIPP facility involve the use and handling of highly flammable materials. For example, hydrogen is given off during forklift battery charging and the uninterruptible power supply (UPS) battery bank charging process. Hydrogen is a normal off-gas released from the lead acid battery during charging. On the surface, hydrogen is vented from the charging area through a separate exhaust system as shown in Figure 4.4-2 and is constantly diluted with room air to maintain a concentration of less than 1 percent by volume. This process ensures an adequate margin of safety from the lower explosive limit (LEL) of 4.1 percent at standard atmospheric conditions. In the subsurface area, battery recharging is also used for the electric vehicles. The hydrogen is diluted by normal air flow within the underground. Due to the small number of batteries, this is not considered a hazard.

Fires that may result from maintenance operations and thermally hot surfaces are mitigated at the WIPP facility. Enclosures are provided for heating elements of HVAC systems. Where required, high temperature cut-off safety circuits are provided that are independent of normal controls. Unscheduled maintenance operations can pose a serious threat to plant fire-safety by introducing unusual heat-producing operations, as well as assembling quantities of flammable material in an otherwise controlled area. In this case, fire control is mainly of an administrative nature. For each maintenance activity of this type, "safe work permits" are used. The permits specify precautions to be observed. Precautions may include "fire watch" standby, extra manpower, alerting of emergency services, and providing hose lays or other required fire-fighting equipment as outlined in the WIPP Fire Protection Program. The incorporation of these preplanning features ensures against late fire discovery and fire propagation beyond the point of origin.

Office Content Fires - Two office areas exist in the WHB. These contain sprinkler systems and fire extinguishers adequate for credible fire scenarios such as a trash can fire, paper, or equipment fire.

4.4.3.1.3 Building Features for Surface and Underground

A highly integrated building design incorporating features for fire prevention, control and extinguishment, and the control of fire hazards is provided throughout the WIPP. The plant design meets the "improved risk" level of protection defined in DOE 6430.1.
Core Storage Building

- Automatic Wet Pipe Sprinklers
- Portable Fire Extinguishers
- Fire Detection

4.4.3.2.3 Fire Protection System Design, Installation, Testing and Maintenance

The following standards apply at the WIPP facility.

- The Fire Suppression Water System (pumps, and hydrants) are designed, installed, tested, and maintained according to NFPA 20 and NFPA 24.
- The Automatic Wet Pipe Sprinkler Systems are designed, installed, tested, and maintained in accordance with NFPA 13.
- The Halon 1301 Total Flooding Fire Suppression Systems are designed, installed, tested, and maintained in accordance with NFPA 12A.
- The Dry Chemical Fire Suppression Systems are designed, installed, tested and maintained in accordance with NFPA 17.

4.4.3.2.4 Fire Detection and Alarm System Design, Installation, Testing, and Maintenance.

The Fire Detection and Alarm Systems are designed, installed, tested, and maintained in accordance with NFPA 72D and NFPA 72E.

4.4.3.2.5 Controls

The ventilation and exhaust system serves a vital function in the event of a fire in the underground area. Studies have shown that the dilution ratio is high enough to reduce fire temperatures from the storage area to less than 300°F at the Exhaust Shaft. Thus, the integrity of the final filter system is not compromised by excessive temperatures which could otherwise cause failure of the filters.

An emergency evacuation alarm system, which is installed throughout the plant, utilizes a distinct alarm characterized by a fundamental frequency of 450-1000 Hz that is 10 dB above ambient noise level, or at least 75 dB. The evacuation alarm signals for the underground are automatically actuated from the fire control system or by manual fire alarm boxes installed in all occupied areas. In areas where the noise level is perceived or indicated to be high enough to be difficult to hear an emergency message such as areas of high traffic or in remote areas where fans may be running, strobe lights will be used to indicate an emergency situation.

In addition to the evacuation alarm system, the paging and general announcement system is utilized to inform and advise of normal as well as emergency conditions. It operates from normal and UPS power and thus can function in a normal power outage. Loss of a single speaker in a fire area does not result in a loss of communication because there is a multiplicity of speakers throughout the area. This system can be used by the operator and fire personnel who have remote control capability over the evacuation alarm system and can suppress it for evacuation announcements.

Wherever practical, electrical wiring for the controls is protected from physical and fire damage by enclosure in conduit and raceways. Open cable runs (confined to the underground area) are Hypalon or neoprene jacketed for protection.
To prevent the passage of hot gases or smoke, penetrations through fire walls or floors are provided with seals of appropriate fire resistivity. Sealing compounds and devices are UL listed.

Transformer installations are well segregated from recognized hazards and dry types are installed indoors. Conventional oil filled types are installed only outdoors. These have a relatively small oil capacity and are provided with adequate separation. Switchgear, for the most part, is indoor type and installed in standard metal cabinets in accordance with the latest NEMA designs. No significant hazard is presented by this equipment.

4.4.3.3 System Evaluation

The design basis fire descriptions in Chapter 7 provide an in-depth evaluation of the fire hazards associated with the WHB and the underground storage horizon.

In addition, a Failure Mode and Effects Analysis (FMEA) has been performed for the Waste Handling and Support Buildings Fire Protection System to show the adequacy of the design and its effects on the operation and the safety of personnel. The results of this analysis are presented in Table 4.4-12.

4.4.3.4 Personnel Qualification and Training

The fire protection program is the responsibility of the Waste Isolation Division General Manager. The formulation and implementation of the program is assigned to the Safety, Security, and Environmental Protection Manager, who is responsible for administering the fire protection program. The Fire Protection Engineer is responsible for day-to-day fire protection program administration.

The Fire Protection Engineer is responsible to ensure training of plant personnel, including emergency services personnel, on plant fire protection systems and fire-fighting techniques is accomplished.

Emergency response teams are established by administrative procedure so that a designated team is on call during all hours to respond to fire emergencies.

4.4.4 WATER AND WASTE WATER SYSTEM

4.4.4.1 Water System

The primary function of the WIPP facility water system is to supply water for domestic use and fire protection. The operation of the WIPP facility requires a maximum domestic peak supply of 375 gal/minute. The average daily WIPP facility domestic demand is about 75,000 gal/day.

Water is furnished from the Double Eagle Water Co., which is owned by the City of Carlsbad. The water source is drilled wells located about 30 miles north of the WIPP facility. Water is supplied by gravity flow through a 24-inch diameter pipeline to a junction point about 13 miles north of the site at U.S. Highway 62/180 (Figure 4.1-4). This line is sized to provide 6000 gal/m for use by others in addition to the peak flow rate required by the WIPP facility. Controls at the junction point give the WIPP facility priority over flows to all other users. A 10-inch diameter pipeline supplies water from the tie in point to the WIPP facility by gravity flow.
At the WIPP facility, the water is chlorinated by a hypochlorinator before it enters two 180,000-gallon above ground storage tanks located adjacent to the pump house (Figure 4.1-2). These tanks are 32 feet in diameter and are constructed of welded steel. The water level in each tank is monitored in the CMR in the Support Building. Alarms in the CMR indicate low water levels. The WIPP facility has an on-site storage capacity of 360,000 gallons of water. Of that amount, about 160,000 gallons, or 80,000 gallons per tank, provides 2 days storage for domestic water. Domestic water includes all the water required for the following: sanitary facilities (estimated at 50 gallons per day per person), laboratory water, cooling water makeup, and for the operation of the heating, ventilating, and air conditioning systems.

Domestic water is not essential for the operation of the WIPP facility. Figure 4.4-15 shows the domestic water supply system. The remaining 200,000 gallons of water is dedicated to fire suppression. A diagram of the fire water distribution system is shown in Figure 4.4-13.

Separate sets of pumps for the domestic water and fire water systems are provided in the pump house. Domestic water is supplied by three electric-driven pumps, each rated at 50 percent of the system peak capacity. Fire water is supplied by one 100 percent capacity electric-driven pump. A backup diesel-driven 100 percent capacity fire-water pump is also provided in case of power failure or when maintenance is required on the electric pump. Each fire-water pump is rated at 1500 gpm at 125 psi. Fire-water pressure is maintained by an electric-driven jockey pump. During a fire, the fire-water pump is automatically started, and available domestic water is used first. Upon depletion of the domestic water inventory, the domestic water pumps are automatically shut off, and the dedicated fire water reserve is available for fire suppression use only.

The loss of off-site water due to a pipe break or other problems causes the domestic water supply to be shut off when the two-day reserve is depleted. Water would then have to be trucked to the WIPP facility until the water supply is resumed. Transient loss of domestic water would not adversely affect the safe operation of the WIPP facility. During a loss of off-site water, waste handling operations can continue without interruption. In the event of a loss of power to the WIPP facility, the domestic water supply shuts off until power becomes available. Through the operation of the diesel-driven pump, fire water is available at all times.

If a water line breaks, flooding is prevented by isolation valves. Water lines to potentially contaminated areas are isolated from the supply system by backflow preventers, which prevent potentially radioactive material from entering the water supply.

### 4.4.4.2 Waste Water System

The sanitary sewage system includes a buried sanitary collection system, a sewage treatment plant, and an effluent pond. Sewage from the underground areas is collected in tanks and transferred to the surface for disposal in the sanitary sewage system. Runoff and all radioactive and chemical wastes are excluded from the sanitary sewage system.

The sewage treatment plant uses a biological treatment process using facultative stabilization lagoons connected to a common effluent chlorine contact/holding pond. The system is designed for a 18,500 gal/day loading. Thus loading is based on 50 gallons per person per day, which allows for the complete span of the WIPP facility population variation during waste handling operations.

The facultative lagoon system consists of two trains of equally sized polishing cells with series operational capability. The dual primary ponds in series with polishing ponds is based on the need to produce a quality effluent of 30 mg/l BOD₃ and 30 mg/l TSS and to reduce bacterial concentration prior to disinfection.
FIGURE 4.4-4
Waste Handling Building Ventilation Equipment Room HVAC System Flow Diagram

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4.6 UNDERGROUND MINING EQUIPMENT

The underground is mined with continuous mining equipment. The mining operations require three primary types of equipment: continuous mining machines, underground haulage and auxiliary equipment.

4.6.1 CONTINUOUS MINING MACHINE

The continuous miners (CM) are crawler mounted, electrically powered (by cable) machines which use revolving cutting heads to provide continuous excavation (Fig 4.6-1). As the operator slowly advances the CM and mines the face, the broken salt is picked up by a loading apron and transferred through the machine chassis by means of a chain conveyor. The conveyor carries the material to the haulage vehicles. Two types of CM are employed: Drum type and Boom type.

4.6.1.2 Drum Type Continuous Miner

In the Drum type of CM the cutting elements (bits) are mounted on a series of drums across the cutting head. The cutting head rotates parallel to the mine face with the bits rotating from the top to the bottom. The mining procedure is to raise the cutter head to the height desired, sump the entire machine forward to maximum depth by means of the crawler drive and then shear downward until the cutter bits reach the desired floor level.

4.6.1.3 Boom Type Continuous Miner

The Roadheader or Boom type continuous miner operates with either a ripper or a milling head. The ripper head rotates perpendicularly to the axis of the cutter boom and the milling head rotates in line with the axis of the boom to excavate the salt. In the Roadheader the chain conveyor discharges the broken salt into a slewing conveyor belt which in turn, loads the haulage units.

4.6.2 UNDERGROUND HAULAGE VEHICLES

These are diesel powered, self propelled, rubber tired, articulated frame units. They are used to carry the mined salt from the continuous miners to the underground surge bin (Section 4.4.5, Salt Handling System). An articulated pivot point allows tight cornering and easy positioning behind the CM. Two types of haulage vehicles are used: Dump truck units and load haul dump units. The minimum safe operating envelope for the haulage equipment currently in use is 7 1/2 feet in height and 9 feet in width.

4.6.2.1 Dump Truck Units

These are dumping trucks where the flat bottom dump box is powered by a hydraulic cylinder (Fig 4.6-2). The operator cab is located in front of the unit. The dumping trucks have a 10-ton capacity, and up to 7 units are used.

4.6.2.2 Load Haul Dump Units

The load haul dump units have a front mounted bucket (Fig 4.6-3) powered by a hydraulic cylinder. The operator cab is located at the side of the unit. The load haul units are 3.5 cu. yd. capacity and up to 3 units are used.
5.1.1 FUNCTIONAL DESCRIPTIONS

The function of the CH TRU waste handling system is to receive the TRUPACT II shipping containers, bring them into the Waste Handling Building (WHB), remove and inspect the waste packages, and move the packages to the underground storage area. Damaged or contaminated packages are overpacked or decontaminated as appropriate. A schematic flow diagram of the operations sequence is shown in Figure 5.1-1. The CH TRU loading/unloading dock area consists of two docks, each capable of unloading two TRUPACT IIs at a time. The loading/unloading area can be accessed by any of the three air locks, although, only the middle air lock is normally used.

A Failure Mode and Effects Analysis (FMEA) has been performed on the CH TRU waste handling system to show the adequacy of the design and its effects on operation and personnel safety. The analysis assumes a single failure mode and presents the consequences of that failure. The results of this analysis are provided in Table 5.1-3.

5.1.1.1 CH TRU Waste Receiving

Each incoming shipment is given a receipt inspection, which involves checking the shipment manifest, verifying the shipment contents, performing a security check, and performing an exterior radiological survey of the shipment as it arrives on the site. If any levels of radiation, contamination or significant damage are found, then the actions of Section 9.4.4 apply. In addition to the administrative actions in Section 9.4.4, any contamination is controlled and the TRUPACT II container is moved into the boundary of the Radioactive Materials Area (RMA), the portion of the Radiologically Controlled Area (RCA) that is inside the Waste Handling Building, for further processing in accordance with the operating procedure for receiving TRUPACT IIs.

Following turnover of the shipping documentation, the driver transports and parks the trailer outside the RCA in the Security Yard Receiving Area. The driver is then released. The trailer is then attached to a yard tractor and brought into the RCA by Operations personnel. After unloading, empty TRUPACT IIs, loaded on the trailer are returned to the Security Yard Receiving area following radiological surveys and release. This action is also performed by operations personnel using the yard tractor.

The TRUPACT IIs are off-loaded from trailers outdoors in the RCA using 13-ton electric forklifts, transported through the air lock, and placed in a vacant unloading dock position. The electric forklift is used to minimize the impact of diesel exhaust particulates on the WHB HEPA filters. The physical arrangement and location of the air locks and docks is described in Section 4.2. Each air lock is sized to accommodate a TRUPACT II on a 13-ton electric forklift.

5.1.1.2 Inventory/Preparation Area

After entry into the WHB, the shipping container is placed on an unloading dock, the container opened, and the waste packages removed (see Figure 5.1-2). Before the packages are removed from the shipping container, radiological surveys are conducted on all accessible surfaces. As the packages are removed, further radiological surveys are conducted. If contaminated or damaged packages are found, the radiological conditions are reviewed and a decision made to decontaminate at the unloading dock location or close the shipping container and transfer it to the overpack and repair room for unloading under more controlled conditions in accordance with procedures in the Radiation Safety Manual, WP 12-5. The decision depends upon the magnitude and nature of the contamination found. If no contamination levels above Waste Acceptance Criteria (WAC) are noted, the unloading sequence continues.
The unloading dock provides a work platform for personnel to access the closure mechanism on the TRUPACT II. When the container is properly placed on the dock, personnel have a full 360 degree access to it.

The outer lid tamper seal is first removed and recorded. A vacuum is applied to the outer lid vent port to pull the lid down so the locking ring will rotate to unlock the lid. During this process, the atmosphere between the inner lid and outer lid is vented through HEPA grade roughing filters. The outer lid is removed and set aside with the aid of an overhead bridge crane and specially designed lifting fixture. The vacuum pull process is repeated for the inner lid. The only difference is that a Radiological Assessment filter, in addition, is attached to the vent port tool, upstream of the HEPA grade roughing filters. The inner cavity atmosphere is thus vented first through the Radiological Assessment filter and then the HEPA grade roughing filters. The Radiological Assessment filter is subsequently checked for contamination. If no contamination is detected, the closure mechanism is released and the inner lid is removed and set aside using the same overhead bridge crane and lifting fixture. The contents of the container is surveyed for contamination. If no contamination is detected, the overhead bridge crane and lifting device is attached to a TRUPACT II pallet in the bottom of the container and the entire contents of the container are removed. The contents are placed on a facility pallet near the dock and the lifting device removed. A typical TRUPACT II contains fourteen 55-gallon drums that are stretch wrapped or banded together into two seven-packs. Each seven-pack, or assembly, sets on a molded slip sheet that is made of high molecular density polyethylene. A second unmolded slip sheet is placed on top of the seven-pack and the entire assembly is held together by stretch wrap or steel banding.

Up to two SWBs may be used in place of the 55-gallon drums. These are specially designed to fit into the TRUPACT II and approximate the dimensions of the seven-packs. They are also removed or inserted into a TRUPACT II by hoisting. The need for slip sheets has been eliminated with SWBs as they are fabricated with their own lifting attachments.

The facility pallet is designed to hold two TRUPACT II pallets and their contents (28 drums or 4 standard waste boxes). These pallets are placed in recesses in the facility pallet using the overhead bridge crane. Final contamination surveys are conducted and the assembly IDs are recorded using a bar code reader system that is linked to the inventory tracking system. The loaded facility pallet is transported, using a 13-ton electric forklift, to the conveyance loading car inside the conveyance loading room air lock at the waste shaft.

After the waste packages are removed from the TRUPACT IIs, a final radiological survey and maintenance inspection are performed on the container and the unit is prepared for reuse and removal from the Waste Handling Building. This is accomplished by a series of inspections and by replacing the pallets and lids. The TRUPACT II is reloaded onto the trailer and prepared for departure to a shipping site.

5.1.1.3 Overpack Operation

As required, TRUPACT II shipping containers holding contaminated or damaged CH TRU waste packages are moved into the Overpack and Repair Room (OP&RR) through an air lock. A separate HEPA-filtered enclosure, sized to accommodate a TRUPACT II and also to permit controlled unloading is contained within OP&RR. The TRUPACT II is opened under appropriate radiological controls and the contaminated waste packages unloaded. The packages are decontaminated or overpacked, as needed. Operational experience at interim storage sites indicates that breached packages will not be received under any normal transportation conditions. Experience also indicates that contaminated packages are very seldom encountered. Consequently, the waste packages are expected to be intact and contamination free.

The activities in the overpack/repair area primarily involve handling contaminated material. The area contains radiation monitors, continuous air monitors, and alarms; personnel must wear appropriate anti-C equipment. Access to the area is limited to minimize unnecessary exposure.

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5.2.1.5 Transfer Cell and Cask Loading Room

The canister is transferred from the hot cell to the shuttle car in the canister transfer cell. The shuttle car has a capacity for seven canisters, one of which can be overpacked. The transfer cell can be used for temporary canister storage or movement of the canisters to the cask loading room. Closed circuit television (CCTV) cameras are used to monitor these operations. The transfer cell is an exclusion area when canisters are present. The following steps are performed:

The canister shuttle car is moved to position an empty tube directly under the hot cell shield valve. The hot cell/transfer cell shield valve is then opened.

Using the crane and grapple, the canister is removed from the inspection station and lowered into the canister shuttle car. The grapple is retracted and the shield valve closed.

The canister shuttle car is moved to position the canister directly under the cask loading room shield valve.

The facility cask is positioned horizontally on the facility cask transfer car in the cask loading room. As the facility cask is moved into position over the loading port, a rotating fixture engages the upper cask trunnions and rotate the cask to a vertical position.

The telescoping shield is raised to mate with the facility cask and the cask loading room shield valve opened.

The shield bell is mated with the upper shield valve on the facility cask and both facility cask shield valves opened.

The loading room grapple is lowered through the facility cask into the transfer cell. The grapple engages the canister lifting pintle of the canister positioned under the loading port and lifts the canister into the facility cask.

The facility cask lower shield valve and the cask loading room shield valve are then closed. The telescoping shield is retracted and the canister lowered onto the lower facility cask shield valve. The grapple is disengaged and retracted into the shield bell, and the upper facility cask valve closed. The shield bell is raised from the facility cask into its storage position.

As the facility cask transfer car is moved toward the waste hoist, the facility cask rotates from a vertical to a horizontal position. The rotating device is then disconnected.

The facility cask and facility cask transfer car move onto the waste hoist cage.

5.2.1.6 Hoist Cage Loading

The waste hoist cage is properly positioned, the shaft gates opened, the pilot rails positioned, and the facility cask and facility cask transfer car loaded onto the waste hoist cage. The hoist cage is lowered to the storage horizon. The facility cask and facility cask transfer car moves to the underground cask transfer area (Figure 5.2-3).

5.2.1.7 Cask Transfer Area

In this area the facility cask is removed from the facility cask transfer car by forklift and moved to the storage room.
5.4 PLANT-GENERATED RADWASTE SYSTEM

Although the WIPP facility operational philosophy is to start radiologically clean and remain radiologically clean, some radioactive waste may be generated as a result of decontamination operations following detection of contamination. The plant-generated waste could originate in both the surface and underground facilities. High activity waste is not expected to be generated during any normal operating sequences.

This section describes the process for handling the self-generated waste and includes worst case estimates of volumes produced. Equipment descriptions and locations are provided in Section 4.4.6.

5.4.1 LIQUID RADWASTE SYSTEM

Water used as a fire suppressant is potentially the largest nonroutine source of suspect liquid waste. Another source would be any liquid used for decontamination. The fire potential in waste handling areas is remote; consequently, contaminated water from fire fighting is not expected. If firewater is generated, it is collected in trenches and sumps throughout the Waste Handling Building. All suspect liquids are sampled and analyzed for radioactivity. If the liquid exceeds the uncontrolled release limit of Order DOE 5480.11, it is collected and made acceptable for disposal in the WIPP using a qualified process.

All non-fire water liquid wastes are collected in portable tanks or drums. The liquid waste is processed in 55-gallon drums for disposal using a qualified process.

The liquid waste accumulation tank located in the site-generated waste room is reserved for emergency use only. Since there are no lines to this tank, the liquids are transferred by a portable tank to the accumulation tank. Liquid radwaste will be handled in accordance with procedures in the Waste Handling Operations Manual, WP 05-1, and the Radioactive Mixed Waste Compliance Manual, WP 02-7.

5.4.2 SOLID RADWASTE SYSTEM

The solid radwaste system provides for the collection and packaging of site-generated solid radwaste. It is anticipated that all on site-generated waste will be contact handled, due to its low activity and the nature of the potential sources of site generated solid waste at the WIPP facility.

The worst case solid radwaste volumes generated at the WIPP facility are listed below.

<table>
<thead>
<tr>
<th>Source</th>
<th>Estimated Annual Volume (cubic feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Physics Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>Compactible (anti-Cs, rags, etc.)</td>
<td>200</td>
</tr>
<tr>
<td>Decontamination efforts</td>
<td>200</td>
</tr>
<tr>
<td>Non-compactible</td>
<td>5</td>
</tr>
<tr>
<td>Sweepings</td>
<td>8</td>
</tr>
<tr>
<td>TRUPACT II/Cask washdown facility filters</td>
<td>25</td>
</tr>
<tr>
<td>Filters*</td>
<td>400</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>842</td>
</tr>
</tbody>
</table>

* Assumes roughing filters are changed annually and first HEPA changed every five years.
These data are used during the waste emplacement and are available if the waste must be retrieved. Table 5.5-1 lists the information stored for each waste package, as specified by the WIPP Waste Acceptance Criteria (WAC). In addition to providing the inventory for the repository, the WWIS provides operational information, routine and special reports, and the reports required by Order DOE 5820.2A.

5.5.4.1 CH TRU Waste Emplacement

For inventory control purposes, waste container package identification numbers are checked against the data package in the WWIS at the time the waste is unloaded. These identifications are rechecked at the time the waste is placed in the storage array. The CH TRU waste handling procedure is described in detail in Section 5.1.

5.5.4.2 RH TRU Waste Emplacement

The identification number of each RH TRU waste canister is verified against the data package while the canister is in the hot cell. The RH TRU waste handling sequence is described in Section 5.2.
Ventilation fans and duct installation is advanced as the mining proceeds.

5.6.2 INTERFACE BETWEEN MINING AND WASTE STORAGE ACTIVITIES

Separate mining ventilation and storage ventilation circuits are maintained by means of temporary and permanent bulkheads. Air pressure in the mining side is maintained higher than in the storage side to ensure that any leakage results in airflow to the storage side.

Rooms being mined are within the mining ventilation circuit. Similarly, rooms under storage are within the storage ventilation circuit.

5.6.3 MINED MATERIAL

The salt removed during underground mining is brought to the surface by the salt handling system (Section 4.4.5). From the surge pocket, salt is loaded into the 8-ton salt handling skip with a skip measuring and loading hopper. The skip raises the salt to the surface and dumps it through a chute to surface haulage equipment. This equipment then transports the salt to an on-site storage pile.

5.6.4 VENTILATION

The underground ventilation system is discussed in Section 4.4.

Ventilation flow rates in the underground facility exceed 300 cfm per underground worker. Air quality is maintained at the levels required by the Mine Safety and Health Administration (MSHA) regulations. A pressure chamber has been added to the west side of the Waste Shaft Station to ensure that no leakage from the RMA side to the mining side occurs during upset conditions. The pressure chamber is automatically activated when the pressure differential across it drops down to a predetermined value; even while the leakage is in the correct direction; thereby ensuring that leakage is always towards the RMA.

Operation of diesel equipment in the underground is limited to available airflow in the area. Operational practices are in place in the WIPP Mining Operations Manual, WP 04-2, to ensure compliance with MSHA code.

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The entire facility is designed for operation with surface contamination levels maintained at unrestricted levels. Areas where the potential for radioactive contamination exists are assigned a different design contamination zone designation to identify the necessity for contamination control design features.

Specific design radiation and contamination zoning for each plant area is shown in Figures 6.1-1 through 6.1-5. The control of ingress or egress of personnel to controlled access areas and the procedures employed to ensure that radiation levels and allowable working times are within the limits prescribed by Order DOE 5480.11 are described in Section 6.1.5.

Egress from radioactive materials areas is through contamination control points where personnel are surveyed for contamination. Areas where radiation levels could cause a whole-body radiation dose in excess of 100 mrem in 1 hour are posted as High Radiation Areas and are kept locked except during periods when access to the areas is required.

### 6.1.3.4 Radiation Shielding

**Design Objectives** - The objective of radiation shielding is to minimize the exposure of personnel to the radiation sources described in Section 6.1.2. Radiation shielding is one of the methods utilized to maintain the exposure of personnel to radiation levels "As Low As Reasonably Achievable" (ALARA).

**Design Description** - To meet the shielding design objectives, the following general guidelines are used:

- Radiation shield thicknesses must ensure that the dose rate due to uncollided and scattered radiation through the shield are less than the maximum levels specified for each design radiation zone. Shield wall thicknesses are shown in plant arrangement drawings (Figures 6.1-6 through 6.1-8).

- Principal shielding materials are ordinary concrete/rebar, lead, steel, or salt. Shielding materials for viewing windows include leaded glass. Temporary shielding, such as lead blankets or bricks or other materials may also be employed, as required, during maintenance or other operations.

- Temporary shielding for openings such as doors, hatches, windows, ventilation ducting, and piping should be designed to prevent radiation streaming. Penetrations through primary shielding are placed so that they do not provide a direct line through the shield wall to the radiation source. Design features such as offset piping connections, stepped doors or hatches, shadow shields, and labyrinths are incorporated in the shielding design, wherever applicable. Examples of typical design configurations are shown in Figures 6.1-9 through 6.1-11. Shielding for large diameter penetrations is provided by additional concrete or steel around a penetration, as shown in Figure 6.1-9. Shielding can also be provided by the addition of shield collars or leaded grout around pipes and penetrations.

- Access to potentially high radiation areas involves passage through shield doors or labyrinth walls. This prevents direct radiation streaming into adjacent areas. Labyrinth shielding is designed so that the exposure due to uncollided and scattered radiation is less than the maximum levels specified for the radiation zone of the adjacent area.

The **CH TRU waste handling area** is arranged for efficient handling of the CH TRU waste containers. Traffic flow and adequate space for waste transfer activities are considered in the layout of this area. A separate enclosed area shielded by concrete walls is provided for temporary storage of CH TRU wastes that cannot be immediately emplaced and have surface dose rates greater than 100 mrem/h. In addition, space is provided in the storage area for installing temporary shielding.
travels through the shielding and the attenuating characteristics of the shielding materials, the geometric attenuation and material attenuation are determined. The point kernel representing the energy transferred by the uncollided photon flux along a line of sight path is combined with an appropriate buildup factor to account for the contribution from the scattered photons.

Gamma scattering calculations are used to estimate dose rates around labyrinth and shadow shielding. The G code and input parameters are used for gamma scattering calculations. The code calculates gamma scattering from a point source to a series of point detectors. The code evaluates the uncollided flux at specified scatter points and multiplies it by the product of the differential cross section for scattering toward the detector point and the number of electrons in the elemental volume associated with the scatter point (the center of the elemental volume).

The ANISN computer code with the Cask 40-group neutron/gamma cross section library is used for neutron and secondary gamma calculations to confirm adequate shield thicknesses. This code is a multigroup, multiregion, one dimensional, discrete ordinates transport code that solves the Boltzmann transport equation in slab, cylindrical, or spherical geometries for neutron and gamma radiation.

These computer codes are used to calculate dose rates for various shielding thicknesses. The radiation sources in the computer code are modeled as closely as possible to the actual geometries, dimensions, and physical conditions (see Section 6.1.2). The RH waste handling area shielding is designed to comply with the design radiation zone dose rate limits during the handling of experimental waste canisters. In the CH TRU waste handling area, the interim storage area shielding thicknesses are based on storing drums that contain the average gamma source strengths as described in Section 6.1.2. The separate shielded storage area shielding is based on the full-capacity storage of drums that contain the maximum gamma source strength.

Shielding Integrity and Verification - The integrity of the shielding and its design features is ensured by the adherence to the requirements and recommended practices described in ANSI N101.6-1972, with the following additional criteria:

In addition to the applied loads requirements listed in Section 4.3.3 of ANSI N101.6-1972, the concrete radiation shield structural analysis also considers steady-state and transient thermal loads.

Detailed thermal stress analysis in the design of reinforcement for controlling thermal cracking (temperature reinforcement) in specific concrete radiation shields is included in determining variables used in equations for bending moment and tensile stress, as described in Section 6.4 of ANSI N101.6-1972.

Reinforcing steel or other means are provided for transferring shear and other forces through construction joint, as described in Section 8.8.7 of ANSI N101.6-1972.

6.1.3.5 Ventilation

One purpose of the plant ventilation systems is to control the spread of potentially radioactive contamination. The design and operation of the ventilation systems ensure that doses to personnel and the general public, as a result airborne radioactive materials are, below the limits specified in the appropriate regulatory guidance. This is demonstrated in Section 6.1.6. Plant ventilation systems are described in Section 4.4 and are designed to provide ready access to necessary components and thereby reduce exposure to operations and maintenance personnel during servicing and inspection.

General Design Features To Maintain Radiation Exposures ALARA - Ventilation air flows from areas with less potential for radioactive contamination to areas of progressively greater contamination potential. This direction of airflow is provided by maintaining pressure differentials between the areas. The airflow directions are determined in conjunction with the contamination zone designations shown in Figures 6.1-1 through 6.1-5.

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6.1.4 ON-SITE DOSE ASSESSMENT

The following sections provide a summary of the dose assessments for the primary, occupationally exposed groups involved in waste handling operations at the WIPP facility. The results are representative values, determined by estimating dose rates based on shielding analyses, the characterization of the waste forms, time, and motion/manpower studies for the handling of the waste, and the estimated quantities of waste received. The time and motion/manpower information used is based on the current concept of staffing levels and the organization planned for WIPP facility operations. This assessment considers normal operation, nonroutine operational activities, and airborne contamination.

6.1.4.1 Radiation and Contamination Zones

For design purposes, the Waste Handling Building is divided into radiation and contamination zones as discussed in Section 3.3.1 and Section 6.1.3. Each zone is designed to minimize and confine both direct radiation and potential contaminants using static barriers, such as permanent and temporary walls and shielding, and by the dynamic controls provided by the ventilation systems. The design objectives ensure that the annual occupational doses are kept ALARA and less than 1.0 rem/person.

6.1.4.2 Normal Operation

Normal operations encompass the transfer of RH waste casks and canisters and CH TRU transporters and containers from the point of receipt to the storage area without an abnormal occurrence. These are described in the CH TRU Preoperational Checkout Reports. An abnormal occurrence is any event that disrupts the normal operation of the facility and causes radiation, airborne radioactivity, or contamination levels in excess of the regulatory limits, or the spread of contamination through passive or active barriers into uncontaminated areas.

Table 6.1-8 provides the estimated annual exposure during normal CH TRU and RH TRU waste handling operations.

The following items are inputs to the analysis:

The average dose rate for a contact handled transuranic (CH TRU) waste drum is estimated based on information provided by waste generators to be 14 mrem/h at an assumed distance of 4 inches from the surface and for the standard waste box (SWB) is estimated to be 5 mrem/h. The volumetric ratio of drums to boxes is taken to be about 60/40 for this assessment with an estimated annual throughput of about 230,000 cubic feet (6500 cubic meters).

The average dose rate for remote handled transuranic (RH TRU) waste transport casks and RH TRU waste facility casks is estimated to be approximately 2.0 mrem/h at 4 inches from the cask surfaces. For the purposes of this assessment, 250 canisters are assumed to be received per year.

The number of people who could receive radiation exposure in a given area is estimated based on projected manpower studies for the RH and CH TRU areas both aboveground and underground at the facility. The primary occupationally exposed groups considered in the dose assessment are waste handling personnel and radiation control personnel. Estimated exposure times are based on time and motion analyses of the functional steps constituting the preoperational checkouts. In unshielded areas, estimated exposure rates are based on the exposure rates from waste containers and the expected range of distances between radiation sources and
Portable instruments are normally calibrated in the calibration room using a shielded calibrator and/or other smaller sources. Prior to use, these instruments are checked for response with a check source containing a nominal amount of radioactivity.

Portable alpha detection instruments used at the WIPP facility have at least 20 percent efficiency and are intended for field use in making surface and personnel contamination surveys. The geometry of the detectors makes them suitable for use in both smear and total contamination surveys. In addition to the detectors, the rate meters are also provided with portable scalers. By using the portable scalers, it is possible to conduct contamination surveys in the field, thus reducing the burden on the counting laboratory instruments.

A variety of beta detectors and suitable rate meters for both surface and personnel contamination control are used at the WIPP facility. In general, these detectors are thin window Geiger-Mueller (G-M) tubes.

Gamma detector instruments include shielded G-M tubes, scintillation detectors, or ionization chambers. The shielding that covers the active area of the detector is sufficient to filter out beta radiation, thus allowing discrimination between penetrating and nonpenetrating radiation. Both directional and nondirectional detectors are provided. When coupled with a rate meter, these detectors are used for direct radiation surveys. Low-, medium-, and high-range instruments are available as follows:

- **Low-range instruments** are normally used for background monitoring outside of areas where radioactive materials are handled. They use either scintillation or high pressure ionization chambers as detectors. The range of detection is at least 0.05 to 5 mrem/h.

- **Medium-range instruments** are hand-held survey instruments used for general area radiation surveys. They have a range of at least 1 to 5,000 mrem/h and use either ionization chambers or scintillation detectors.

- **High-range instruments** fitted with telescoping probes are available for monitoring high-level radiation sources. In general, they have probes that can be extended over 10 feet to reduce exposure to the technician making the measurement. These instruments are either G-M tubes or solid-state detectors not subject to saturation at high fluxes and have a range from 0.1 mrem/h to at least 1000 rem/h.

Neutron detection instruments are portable instruments available for neutron surveys incorporating tissue equivalent, polyethylene cadmium shielded, BF₃-type detectors. These instruments are calibrated to read directly in mrem/h and are used in conjunction with the general area radiation survey program.

**Personnel Monitoring Instruments and Service** - Personnel monitoring instruments are used to measure the radiation dose received by personnel.

Personnel monitoring for external exposure utilizes thermoluminescent dosimeters (TLDs). The WIPP facility will have a personnel dosimetry program that conforms to the requirements of Order DOE 5480.15 (Department of Energy Laboratory Accreditation Program for Personnel Dosimetry), otherwise known as DOELAP. The program is DOELAP certified and will be conducted in accordance with the WIPP Dosimetry Program Manual, WP 12-3.

In the program currently implemented at the WIPP, card mounted lithium fluoride (LiF) TLDs are used. Three Li-7 enriched chips (TLD-700s) and one Li-6 enriched chip (TLD-600) are provided to allow discrimination of neutron doses. These cards are processed in an automated TLD reader, which inputs results from the TLD processor directly to a computer record system. A manually operated TLD reader capable of reading card mounted TLDs is available as a backup instrument. The TLD readers are calibrated both electronically and with chips exposed to known doses from NIST traceable sources prior to processing TLDs.
The results of the off-site environmental monitoring program are reported annually according to the guidance outlined in Order DOE 5400.1. For each environmental medium, the report includes the identification of the critical pathway, the sampling locations, the number of samples, the date of sample collection, the analytical method, and a discussion of any circumstances, which may affect the results. The report also substantiates that the estimated doses due to plant effluents are conservative and within established regulatory limits.

**Quality Control** - A quality control (QC) program is established to validate the precision and accuracy of the analyses performed by the vendors. The purpose of the QC program is to develop and maintain consistency in performance within the analytical process. To support the QC effort, the analytical laboratory selected will be required to participate in intercomparison programs such as the Department of Energy (DOE) interlaboratory quality assurance program as required by DOE Order 5400.1.

The QC program also includes the transfer of spikes, duplicates, and blanks along with the sample media shipment to the laboratory performing sample analyses. The spiked samples are added to test the precision of the radiochemical or mass spectrometric analyses. The duplicate samples are included to check analytical accuracy; the blanks are inserted to audit for possible contamination in the vendor’s counting system.

**Sample Library** - Environmental samples are archived in secured storage locations retained at the WIPP facility. These samples may be used, as necessary, for verification purposes in the event that the data are questioned later.

### 6.1.7 EXPOSURE TO HAZARDOUS WASTE

This section provides an assessment of the potential for occupational and public exposure to hazardous waste during the operational phase of the WIPP facility. This assessment considers potential release scenarios that may arise during routine operations. Potentials for exposure as the result of accidents are included in Chapter 7. Note, that in preparing this section it was necessary to develop assumptions regarding the amount of waste to be received during the first five years. This is necessary since assuming "normal operations", which would involve backfilling and sealing panels, limits exposures to a smaller quantity of waste than assuming some nominal amount of waste arriving during the first few years and all being available to contribute to exposure. Consistent with the Supplemental Environmental Impact Statement (SEIS) the assumed rates were based on an upper bound for waste receipt of ten percent of 6.2 million cubic feet of CH TRU waste. Although this quantity is not expected or planned for, it is used to maximize any exposures associated with the chemical component of the waste. The quantities herein should not be considered a commitment or justification for any specific amount of waste to be handled during the five-year program. It should be further noted that current estimates of actual quantities of waste are on the order of 5.4 million cubic feet. This quantity is the basis for calculation of radiological risks.

#### 6.1.7.1 Methodology

Environmental consequences of possible releases of hazardous chemicals destined for transportation to and emplacement in the WIPP facility are analyzed through a process of risk assessment. Risk assessment is a method of determining the likelihood and extent of adverse consequences to human health and the environment posed by certain activities or events. This section addresses the general methodology used to assess the potential risks posed by the hazardous chemical waste constituents.