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Data Report
on
Upgrade Alternative
for the
Pantex Plant
Pu Storage Operations

December 1995

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Mason & Hanger-Silas Mason Co., Inc.

Pantex Plant
P.O. Box 30020
Amarillo, Texas 79177

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1.0 Mission and Assumptions

The following section describes the general Complex-21 mission and assumptions to be used to develop the PEIS data and cost estimates for the Storage and Disposition of Weapons-Usable Fissile Materials.

1.1 Complex-21 Mission

The mission of the Complex-21 Upgrade is to satisfy the future requirements for nuclear weapons production in a safe, environmentally acceptable, and cost-effective manner. The three elements comprising Complex-21 are the Nonnuclear Manufacturing (NNM) element, the Nuclear Materials Production and Manufacturing (NMP&M) element, and the Research, Development, and Testing (RD&T) element.

1.1.1 Nonnuclear Manufacturing

The Complex-21 NNM element provides for the acquisition, production, storage, testing, assembly, and certification of nonnuclear components and subsystems of nuclear weapons. The NNM element is beyond the scope of these reports.

1.1.2 Nuclear Materials Production and Manufacturing

The Complex-21 NMP&M element conducts all operations involving nuclear materials and most operations involving high explosives (HE) that support the nuclear weapons stockpile.

Operations involving nuclear materials include recovery of materials from retired components, processing of materials to remove contaminants and decay products, and manufacture of new components. Nuclear materials are also stockpiled, in some cases, as components suitable for use in new weapons.

Operations conducted by the NMP&M element involving HE include formulation of HE materials, fabrication of small explosive components and main charge explosive components, and manufacture of explosive subassemblies (components of nuclear weapons).

Components containing nuclear materials, others containing HE materials, and still others produced within the nonnuclear element are brought together for assembly of weapons. Weapons are also disassembled for evaluation or retirement. Nuclear components from retired weapons are either reused directly, placed in reserve, or processed for recovery and recycle of nuclear material. With the exception of tritium, recovery and recycle operations meet the total demand for nuclear materials and no additional nuclear material production is required. Tritium production is anticipated to be required in the future to support Complex-21 operations; however, tritium production is beyond the scope of these reports.

The major functional elements addressed in these PEIS Data Reports are as follows:

- a. Plutonium recovery, processing and fabrication
- b. Plutonium storage
- c. Enriched uranium (EU) recovery, manufacturing, and storage
- d. Depleted uranium (DU) manufacturing
- e. Lithium production
- f. Nonnuclear manufacturing
- g. Tritium processing
- h. Explosives manufacturing
- i. Weapons assembly and disassembly

The nonnuclear manufacturing functional element listed above is different than the NNM element described in Section 1.1.1.

1.1.3 Research, Development, and Testing

The mission of the Complex-21 RD&T element is to design and test nuclear weapons, support manufacturing engineering, conduct exploratory research to avoid technological surprise, create advanced designs, and support national arms control objectives.

1.2 Complex-21 Assumptions

The following section details general assumptions used to develop the PEIS data and cost estimates for the Complex-21 Upgrade design.

1.2.1 Plant Capacity/Capability

- a. The Complex-21 upgrade design shall be based on a normal Guidance D production rate of X W88 equivalents per year, and a surge rate of 2X W88 equivalents per year. (The value of X is classified.) Surge production shall be achieved by increasing plant personnel and adding shifts to the extent necessary to maintain surge production for a number of years.

Complex-21 shall also include the capacity to support the stockpile evaluation program. This program requires the annual disassembly and rebuild of 110 weapons which are randomly selected from the enduring stockpile and new production stock. As is the current practice, Complex-21 shall supply the components required to build the test assemblies and to replace the parts damaged during testing.

- b. The PEIS data are based on surge conditions for Guidance D new build production. The PEIS analyzes impacts for the surge condition to ensure that the PEIS analysis covers the bounding case.
- c. There are nine weapon systems in the enduring stockpile consisting of five systems in active status, two in new build status (one entering and one in production) and two in retirement status.
- d. The enduring stockpile will consist of a mix of systems equivalent to the following existing weapons programs: B61, B83, W76, W78, W80, W87, and W88.
- e. The number of weapons retired will be nominally equal to the number of new weapons produced in a given year. No more than one new system enters production in any given year. Each new system is in production for approximately six years.
- f. The complex shall be designed to produce only materials or components required for nuclear weapons programs. The exception is the Tritium Processing Plant Upgrade, which also provides tritium for commercial sales.
- g. The complex shall be required to produce or procure all components and materials to support Guidance D weapon production, maintenance, and evaluation.
- h. The complex shall not be required to include additional capacity to perform retrofits and Stockpile Improvement Programs (SIPs). Retrofits and SIPs will be accomplished within the capability and capacity established to perform new builds and retirements.

- i. The complex shall be capable of producing materials and assembling new build components for two weapon systems in any given year. This capability may be achieved by either simultaneous or sequential campaigns, as long as the sum of the product shipments for the year meets the annual production goals.
- j. Complex-21 upgrade shall not be required to provide an overall capability to produce at higher than surge rates. Consequently, partial facilities such as foundation slabs, utility mains, and empty structures are not provided.
- k. Spare equipment and facilities shall be required to preclude a production loss in excess of three months. Spare equipment and facilities shall not be provided as a backup in case of low probability catastrophic natural or industrial events.
- l. Facility features, including additional floor space, shall be provided to accommodate future changes in product design, process technology, and process equipment.
- m. The Complex-21 upgrades shall not impact the ongoing plant missions, either during construction or during the life of the upgrade plant (i.e. until the year 2055). Ongoing plant missions are defined as those functions performed today.
- n. The Complex-21 upgrade sites shall only be required to incorporate new technologies where those technologies are necessary to meet ES&H and Guidance D requirements.

1.2.2 Plant Operating Basis

- a. Existing Complex-21 facilities may be operated according to the shift system currently in use at the plant so long as surge capacity can also be accommodated through use of multiple shifts. New facilities shall be designed to comply with the Programmatic Design Criteria (PDC) criteria for supporting normal production rates with single shift operations.
- b. The complex upgrade shall be designed for a 50-year operating life beginning January 2005. Upgraded facilities may be replaced any time during the 50-year plant operating life span.
- c. Facilities may be operated under existing site labor agreements.

1.2.3 Compliance

1.2.3.1 Rules, Regulations, Codes, and Guidelines

- a. The designs for all upgrade Complex-21 facilities, except for the support facilities described below, shall comply with the standards, requirements and criteria described in the final Programmatic Design Criteria (PDC). The PDC requires that the facilities comply with all applicable federal, state, and local laws and regulations, as well as the appropriate industry consensus codes and standards.

Existing shared support facilities shall not be required to comply with the PDC where:

- The facilities do not require modification or expansion to support Complex-21 operations, and
 - Three quarters (75%) of the output from the facilities supports non-Complex-21 operations.
- b. The PDC will be revised as shown below. The upgrades shall reflect this change.
- Requirements that resulted from the draft General Design Criteria 6430.1B will be modified to instead reflect the requirements of 6430.1A.
 - The requirements for a one-mile buffer zone will be deleted from Section 4.5.6.
 - The ban against using coal for power generation will be deleted from Section 5.3.3.
- c. If any part of a building or facility requires compliance with the PDC, the entire building or facility shall be upgraded to meet the criteria that is outlined in the PDC.
- d. Any proposed exceptions to the PDC shall be documented, and submitted to DOE for resolution and/or approval as soon as possible. Documentation shall include a description of why the PDC criteria can not be met, what criteria can be met, and what are the consequences of not meeting the requirements or how the requirements will be met by other means.
- e. Facilities that were under construction by July 1993 are assumed to be existing. Construction started after July 1993 shall be considered as part of the Upgrade Alternative.
- f. Existing facilities that are required to comply with the PDC shall not use paragraph 3, Section 0101-1 of 6430.1A to exempt these facilities from complying with the 6430.1A requirements.

1.2.3.2 Safeguards and Security

- a. Except for Pu Storage, upgrades shall not be required to include facility features to support International Atomic Energy Agency (IAEA) inspections or possible future treaty obligations.
- b. Production areas may be designed as nuclear material vault-type areas, which meet safeguards and security requirements to allow in-process work to remain in place when the process is unattended.
- c. All upgrades shall comply with the threat assessment guidelines in the PDC.

1.2.4 Environmental, Safety, and Health (ES&H)

1.2.4.1 Buffer Zones

- a. Distances between modules/facilities shall be based on technical, safety, and security considerations.

1.2.4.2 Decontamination and Decommissioning

- a. New facility design shall consider and incorporate provisions for decontamination and decommissioning.
- b. Where existing facilities are renovated or previously contaminated sites are to be designated for new construction; all resources, effluents and work force data for any required D&D effort are included.
- c. Old facilities orphaned and replaced by new facilities should be turned over to EM and shall not be considered as part of the Upgrade Alternative.

1.2.4.3 Toxicological/Radiological Exposure

- a. Worker exposure to radiation shall not exceed regulatory limits specified in 10CFR835. A system is in place at Pantex that establishes administrative control levels for radiation exposure at levels below the occupational exposure limits specified in 10CFR835 to administratively control and help reduce individual and collective doses. Both a DOE administrative control level (2 rem TEDE per year) and a Pantex administrative control level (1 rem TEDE per year) are implemented. This system includes a mechanism to review and approve individual requests to exceed these levels. These control levels are adopted to help implement the ALARA concept. The ALARA process will be implemented in the upgrade design for radiation exposure or workers.

- b. Public exposure to radiation at the site boundary from routine operations shall not exceed 100 millirem EDE per year per DOE 5400.5, Radiological Protection of the Public and Environment and the Radiological Control Manual. The ALARA process will be implemented in the design for radiation exposure of the public.
- c. Worker exposure to chemical and/or physical hazards should not exceed applicable permissible exposure limits.
- d. Facility upgrade design shall not require operators to wear respiratory protection in order to meet radiological exposure limits while conducting routine operations.
- e. The number of personnel required to work in contaminated areas is minimized and controlled.
- f. The use of carcinogens is minimized or eliminated, where possible, in weapons materials manufacturing and processing.

1.2.4.4 Waste Management

The waste quantities stated in this document represent best estimates using data from current Weapon Complex storage sites. The quantities are conservative so as to provide an upper bound. Once built and operating, the facility is expected to reduce the quantity of waste generation significantly over that stated in this report by incorporating design features that minimize waste generation and facilitate volume reduction.

Waste and residues generated at the Pantex Upgrade shall be disposed of as described:

- a. Generation of all wastes shall be minimized subject to the constraints of ALARA.
- b. Mixed low level wastes shall be treated and disposed of in accordance with an Agreed Order with the Texas Natural Resource Conservation Commission (TNRCC).
- c. LLW shall be disposed of at an approved site.
- d. Transuranic (TRU) waste and mixed TRU waste shall be packaged to meet acceptance criteria for an off-site approved disposal facility. The waste shall be stored on an interim basis and then shipped off-site to an approved DOE disposal facility.
- e. Hazardous waste, sanitary wastewater, sanitary and industrial solid waste may be treated the same as is the current practice at the site as long as it complies with the PDC.
- f. Storm water management system shall be designed to reduce pollutant discharges, to the maximum extent practicable, through the site management practices, control techniques and systems, design and engineering methods, and other appropriate methods.

1.2.5 Site Conditions

The upgrade PEIS data and cost estimate shall be based on the following site conditions:

- a. Off site resources (e.g. electricity, natural gas, and diesel fuel) shall be evaluated for compliance with the PDC and Guidance D. If improvements are required, the upgrade shall be included in the PEIS data and cost estimate.
- b. Process, utility, and HVAC systems shall be designed to site specific ambient temperatures.
- c. Meteorological data shall be based on regional conditions.
- d. Adequate electrical power and gas is available from local utilities. Fuel for the steam boilers is natural gas. Process water is obtained from underground wells.

1.2.6 National Environmental Policy Act Compliance

Facilities requiring construction, or modifications to support the storage and disposition of weapons-usable fissile materials at specific sites would be evaluated through the National Environmental Policy Act (NEPA) process to identify potential environmental effects, historical facility issues, and mitigating measures if applicable.

1.3 Plutonium Storage Missions

The Plutonium Storage mission is to provide safe, secure long-term storage of Plutonium material.

1.4 Pantex Plant Assumptions

Pantex Plant requirements and assumptions for the Plutonium Storage Upgrade are listed in the subsections below.

1.4.1 Pu Storage Capacity/Capability

- a. Stored Pu items shall be in the form of pits, metal ingots, and oxide. Weapon, power and fuel grade plutonium shall be stored.

- b. The upgraded plutonium storage facility will store the same quantity of Pu that would be stored under the no action alternative. Materials with less than 50% plutonium content shall not be included in the Pu Storage Upgrade Alternative. Pantex will provide sufficient additional capacity for storage of Pu from weapons yet to be disassembled to meet treaty requirements.
- c. Once the Pu (pits, metals, or oxides) is stored, it is assumed that under ordinary circumstances the material will remain in place and will not be shipped off-site at any time during the 50-year facility life, or until final material disposition is implemented by DOE. However, capability to ship and receive Pu from off-site shall be provided.
- d. All sites housing excess material shall provide provisions for third party inspections. Following basis shall be used for third party inspections:
- A separate room of about 1,000 square feet for the exclusive use in processing records, studying reports, calibrating and repairing instruments, and loading and unloading cameras, etc.
 - Cameras mounted in each vault, capable of monitoring the activity on a periodic (frame-by-frame basis). Each camera to have the capability to store three months of surveillance pictures.
 - A camera located at the vault entry point for recording the entry and removal of containers from the vault and identifying them by bar code number, etc., camera to be automatically triggered by the proximity of the material entering the vault.
 - Power to the equipment should be separate from the main facility, isolated from surges and should be non-interruptable.
 - Power and other utilities should be provided, but equipment will be provided by the inspection agency.
- e. Material Control and Accountability (MC&A) requirements specified in DOE 5633.3A shall be met without opening the storage containers.
- f. Facilities required for initially stabilizing and packaging plutonium materials prior to the start-up of Complex-21 are not included in the Upgrade Alternative.
- g. Plutonium materials shall be packaged in primary containment vessels within AT-400A comparable containers suitable for 50-year storage life.
- h. The facilities storing pits shall be able to package off-normal containers to the DOT requirements for shipment off-site to a national laboratory for remediation. Glove boxes will be provided for emergency stabilization.

- i. Surveillance and evaluation capabilities shall be provided to monitor the condition of pits, metals, and oxides.
- j. The non-contaminated waste data from the receiving facility shall be based on the assumption that 5% of the containers handled during intra-site receipts have damaged packaging materials.
- k. Waste generated by the processing support facilities shall be based on processing 0.1% of the metal and oxide containers stored or minimum one storage container per year. The processing and repackaging of a container shall nominally take two weeks.
- l. Pantex shall be the location for strategic material storage and shall consist of pits, metals and oxides. Five thousand (5,000) storage positions shall be allowed for strategic reserve. The strategic reserve will be stored within the existing Material Access Area. Pantex shall also store surplus material. Forty Thousand (40,000) storage positions shall be allowed for surplus pits, metals and oxides. The surplus material will be stored in a new facility located within Zone 12 South or Zone 4. Strategic and surplus plutonium materials shall be stored in separate vaults.
- m. For criticality control, the total quantity of metals and oxides in each storage container in the storage vaults shall not exceed 4.5 kgs.
- n. The storage vaults are designed to store the material using the Pantex Plant staging technology called "Stage Right" in which containers are stacked in stable 4 and 6 pack configurations using remotely controlled vehicles called Automated Guided Vehicles.
- o. Waste management functions are provided by existing on-site facilities. Analytical laboratory functions are provided by existing on-site facilities.

1.4.2 Plant Operating Basis

The Pu Storage operations normally operate five days per week, with one eight-hour shift per day, 240 days per year. However, the Pu Storage shipping container receiving and unpackaging, accountability measurement, and vault operations, including final vault preparations, as well as material stabilization and repackaging, will normally require longer operating hours and multiple shifts.

1.4.3 Compliance

The Pu Storage Upgrade will be designed, constructed and operated in compliance with all existing federal, state, and local laws and regulations.

1.4.4 Environmental, Safety, and Health (ES&H)

- a. Nuclear criticality safety controls (generally achieved through a composite of design and administrative measures) will ensure that operations involving Pu are conducted such that an adequate margin of subcriticality exists during all normal and abnormal conditions. Where feasible, inherently safe geometries will be employed.
- b. All fire sprinkler water discharged in process areas shall be contained and treated as process wastewater, when required.
- c. All liquid and particulate LLW shall be properly disposed of at an approved site.
- d. Facility design will use automation/robotics where cost effective and practical to reduce personnel exposure.
- e. Low level mixed wastes shall be treated and disposed of in accordance with an Agreed Order with the Texas Natural Resource Conservation Commission (TNRCC). The Agreed Order provides the mechanism for dealing with the generation and storage of mixed waste.
- f. Changes in process, land use, and facilities would be evaluated through the NEPA process to identify potential environmental and facility effects.

2.0 Pu Storage Operations and Facilities Descriptions

2.1 General Plant Description

Pu Storage Upgrade at the Pantex Plant is comprised of an incremental upgrade:

Incremental Pu Storage Upgrade is dependent upon the Assembly/Disassembly Operations Upgrade at the Pantex Plant. The Incremental Pu Storage Upgrade is integrated into the Pantex Plant infrastructure, security, waste, and Assembly/Disassembly Operating Systems. The Pantex Plant Assembly/Disassembly Operations Upgrade includes the upgrade of all support, security, and infrastructure systems needed by the Pu Storage operations. With the Incremental Pu Storage Upgrade, no additional upgrades of support systems beyond those identified in the Pantex Plant Assembly/Disassembly Upgrade Alternative are required. The incremental Pu Storage Upgrade is accomplished by constructing a new Fissile Material Storage Facility to augment upgraded and modified existing buildings for storage and storage support, and by using existing Balance of Plant (BOP) facilities at the Pantex site for support functions.

The Pu Storage Upgrade alternative is designed to comply with site-specific design criteria and DOE Orders covering design, construction, and safety of nonreactor nuclear Pu facilities. Facility layouts incorporates the safety, security, and environmental protection considerations as mandated by the DOE Weapons Complex. In addition, flexibility is designed into the facility to accommodate unknown changes in operational requirements.

2.1.1 Pu Storage Functional Description

The primary objective of the Pu Storage operation is to provide safe long-term storage of the Pu material. The Pu material consists of pits disassembled from nuclear weapons and metals and oxides received from Rocky Flats and other nuclear weapon complexes. The Pantex Upgrade material handling, storage and storage support functions are provided by upgrading Building 12-066 for strategic reserve storage, upgrading Building 12-082 for storage support, upgrading Buildings 12-116 and 12-117 for unpackaging/packaging and loading dock area, and constructing a new Fissile Material Storage Facility (FMSF) for the material handling, support functions, and storage of surplus pits, metals, and oxides. The new FMSF will be located in the northwest part of Zone 12 South or in Zone 4. The option to construct the facility aboveground or underground is available in either location. The primary systems included in the Pu Storage facilities are described as follows:

1. Shipping/Receiving & Preparation System - The Shipping/Receiving and Preparation operations shall include receiving/shipping, unloading/loading, unpackaging/packaging, material accountability and staging of nuclear materials.

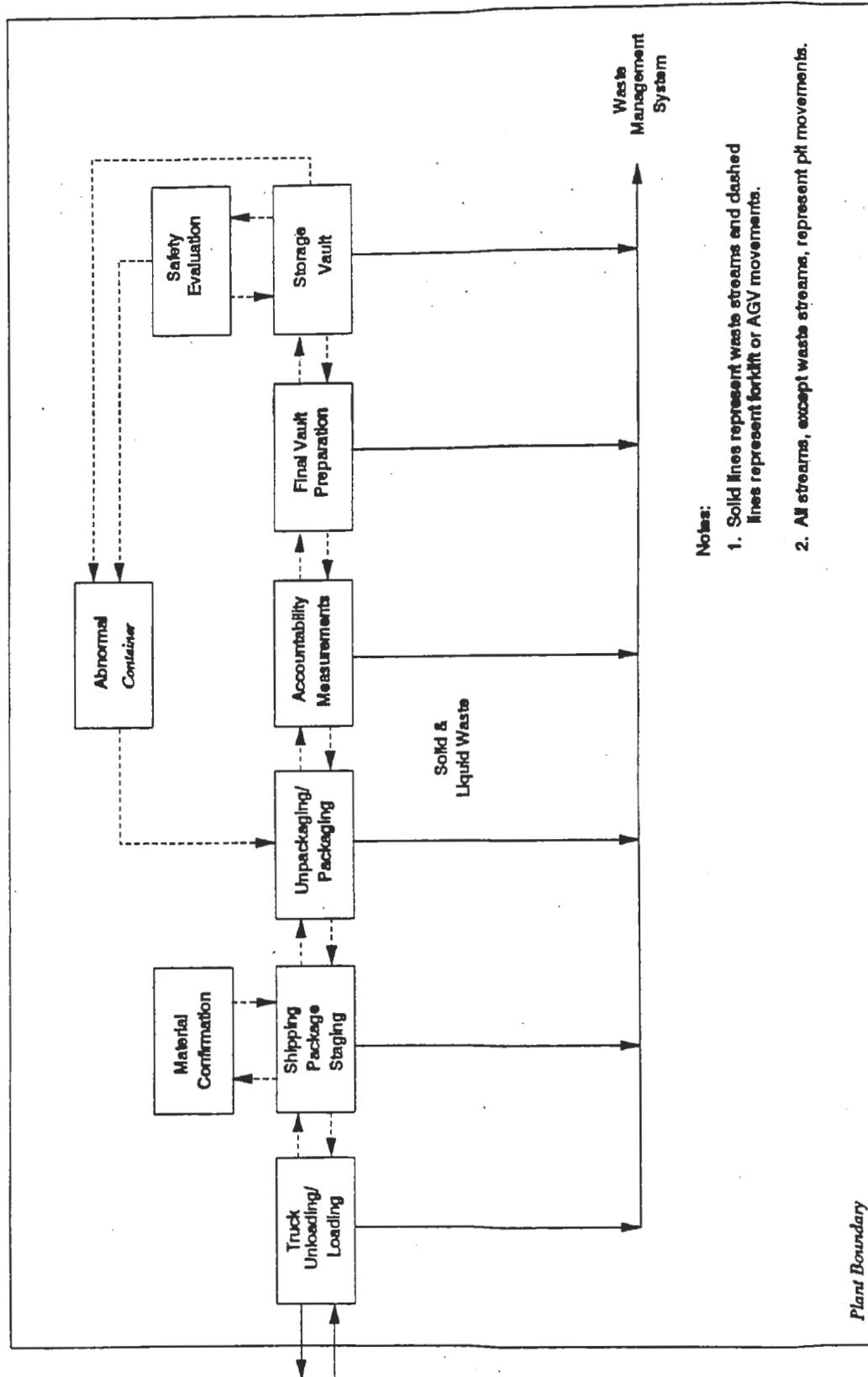
2. **Material Storage System** - The Material Storage operations shall include accountability/verification measurements, international inspections (surplus material only), long-term safety evaluations, inventory area, long-term storage of storage containers and delivery/removal of the containers from the vaults.

The overall block flow diagram for the Incremental Pu Storage Upgrade is shown on Figure 2-1. The shipping/receiving facilities provide staging capabilities to receive/ship 3,000 shipping packages per year. The staging facility includes automated handling equipment to reduce radiation exposure. The storage vaults are a modular design and incorporates "Stage Right" for pits and remote operations for metals and oxides to reduce the radiation exposure to personnel and to enhance safeguards of the material. The vault containing metals and oxides will be design to use one of the three methods discussed in section 2.1.3.1.2. The storage vault for strategic reserves (Building 12-66) has a storage capacity for 5,000 strategic reserve containers and the FMSF has a storage capacity for 40,000 surplus containers for pits, metals, and oxides.

The nuclear materials to be stored are shipped to the facility in Safe Secure Trailers (SSTs). The pits will be shipped in AT-400A containers. The metals and oxides will be shipped in AT-400A or comparable containers designed for long-term storage that are compatible with the AT-400A package handling equipment. The inner vessel of the AT-400A or comparable container is the primary containment vessel (PCV). The inner vessel is securely held in place by mounting brackets attached to the outer container to protect the contents during shipping.

Shipping packages are received at the Evaluation and shipping preparation area and material control measures are performed. The FMSF will have minimal Pu processing capabilities, therefore material control and accountability strategy will be developed so that an accountability system similar to that currently used for pits can be applied to the metal and oxide packages. The strategy will include verification by Pantex and any oversight agencies that the material is as stated and the assay of the material is properly validated by measurement assurance data. The packages are moved to the vault preparation area for material accountability/verification measurements and nonintrusive and long-term safety evaluations are preformed once in the vault storage preparation area. International inspection teams will witness the accountability/verification measurements of the surplus materials. The AT-400A's containing pits are secured into a "Stage Right" 4 or 6 pack configuration and remotely placed in the storage vault. The metals and oxides are remotely placed in the storage vault. The functions are capable of being performed in reverse order, as necessary, for outgoing shipments.

The AT-400A or comparable containers are monitored and sampled to determine their normality. If any container is found to be abnormal, the container will be processed through the preparation system using glove box operations to stabilize the material, then repackaged into the shipping container and sent off-site to a national laboratory via SST's.



Notes:

1. Solid lines represent waste streams and dashed lines represent forklift or AGV movements.
2. All streams, except waste streams, represent pit movements.

FIGURE 2-1
PLUTONIUM STORAGE
BLOCK FLOW DIAGRAM

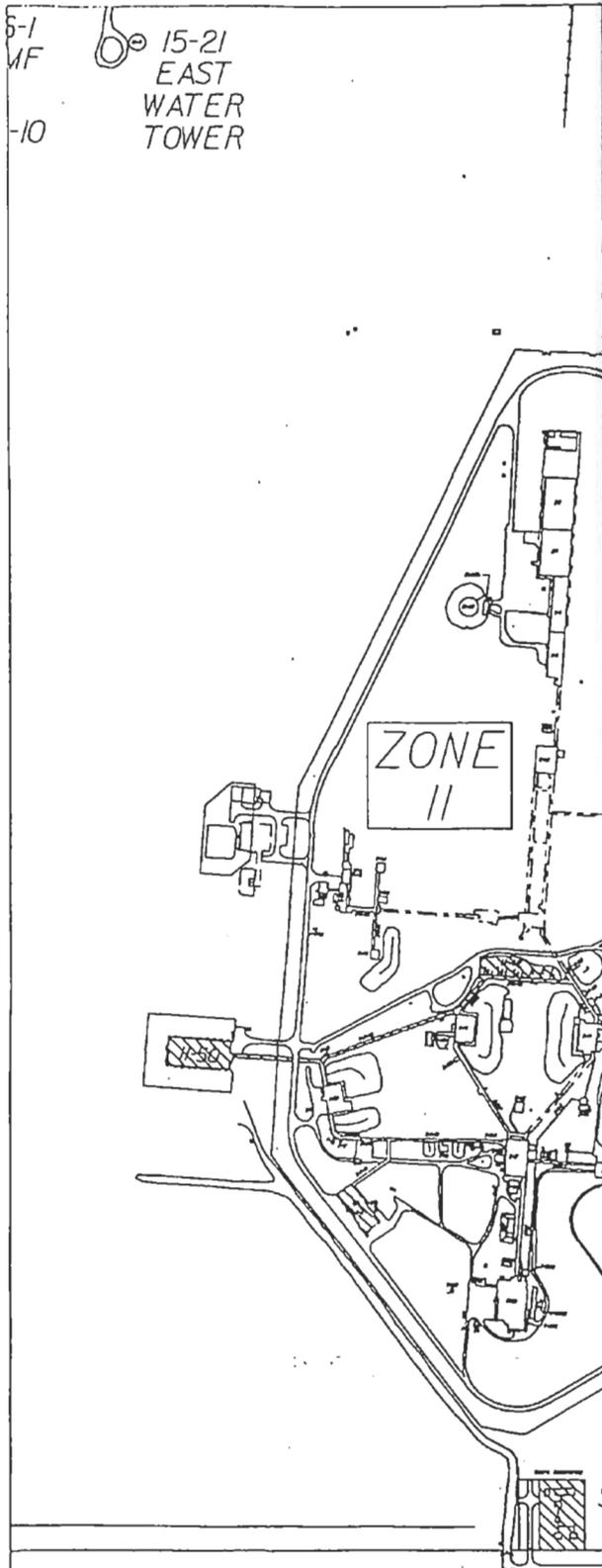
Solid waste collected from the Pu Storage Operations are routed to the Waste Management System. Solid wastes are characterized, segregated into LLW, hazardous, mixed, and TRU wastes, immobilized, and packaged for disposal. The Pu Storage Operations and Waste Management Systems are supported by an analytical laboratory. The laboratory facilities are essentially self-sufficient, and have the capability to perform all analyses required to support processing, and waste operations from Pu Storage operations.

2.1.2 Plot Plans

The plot plan for the Incremental Pu Storage operations is shown on Figure 2-2. This figure depicts the arrangement of plant buildings and site support areas anticipated for the upgrade of the HE/Assembly Operations at the Pantex Plant. The Plutonium Storage facilities are shown as additional upgrades to the HE/Assembly Operations at the upgraded Pantex Plant.

Also shown in the figure is the Material Access Area (MAA), Protected Area (PA), Limited Area (LA), and the Property Protection Area (PPA). The MAA contains all Special Nuclear Material (SNM) and is secured with a fence and personnel security screening devices. The PA is secured with a double fence and intruder detection systems. The PA and operations involving classified materials are contained within the LA. The PPA surrounds the LA and includes the buffer zone.





EAST GATE
16-9

NEW PLANT BUILDINGS FOR
HE/ASSEMBLY UPGRADE

CODE	DESCRIPTION
A	WASTE MANAGEMENT
B	HE SYNTHESIS
C	ANALYTICAL LABORATORY
D	ADMINISTRATION BUILDING
E	FIRE STATION/ EOC
F	WEAPONS STAGING
G	PHYSICAL TRAINING
H	COMMAND CENTER EXPANSION
I	ALTERNATE COMMAND POST
J	GUARD TOWER
K	GUARD TOWER
L	WEAPONS TACTICS & TRAINING
M	HAZARDOUS WASTE STAGING
N	HAZARDOUS WASTE STAGING
O	HAZARDOUS CHEM. STAGING

• LOCATED ON FIG. 3-1

LEGEND

- EXISTING FACILITIES REQUIRED FOR PU STORAGE UPGRADE
- ▨ FISSILE MATERIAL STORAGE FACILITY
- ▧ EXISTING FACILITIES REQUIRED FOR HE/ASSEMBLY UPGRADE
- ▩ NEW FACILITIES REQUIRED FOR HE/ASSEMBLY UPGRADE
- INACTIVE FACILITIES
- PROTECTED AREA
- MAA
- - - LIMITED AREA

WORKFILE	NO.	DATE	DRAWN	CHKD.	APPROVED	DATE
APPROVED						
BY	DATE	<i>Mason & Hanger-Silas Mason Co., Inc.</i> OPERATORS OF USDOE PANTEX PLANT AMARILLO, TEXAS INCREMENTAL PU STORAGE UPGRADE				
CHKD.						
REV.						
DATE						
BY						
CHKD.						
DATE						
BY						
CHKD.						
DATE						
DRAWN		ARCHITECT-DRAWING		FIGURE 2-2		
DATE		RECORDED		DRAWING NO.		
CHECKED		APPROVED		SHEET NO.		

5-1 MF
10
15-21
EAST
WATER
TOWER

WATER
TANK
15-28

NORTH
SUBSTATION

16-8

16-18

WATER
TANK
15-31

16-13

ZONE
II

SOUTH
SUBSTATION



EAST
GATE
16-9

NEW PLANT BUILDINGS FOR
HE/ASSEMBLY UPGRADE

CODE	DESCRIPTION
A	WASTE MANAGEMENT
B	HE SYNTHESIS
C	ANALYTICAL LABORATORY
D	ADMINISTRATION BUILDING
E	FIRE STATION/ EOC
F	WEAPONS STAGING
G	PHYSICAL TRAINING
H	COMMAND CENTER EXPANSION
I	ALTERNATE COMMAND POST
J	GUARD TOWER
K	GUARD TOWER
L	WEAPONS TACTICS & TRAINING
M	HAZARDOUS WASTE STAGING
N	HAZARDOUS WASTE STAGING
O	HAZARDOUS CHEM. STAGING

• LOCATED ON FIG. 3-1

LEGEND

- EXISTING FACILITIES REQUIRED FOR PU STORAGE UPGRADE
- ▨ FISSILE MATERIAL STORAGE FACILITY
- ▩ EXISTING FACILITIES REQUIRED FOR HE/ASSEMBLY UPGRADE
- ▧ NEW FACILITIES REQUIRED FOR HE/ASSEMBLY UPGRADE
- INACTIVE FACILITIES
- PROTECTED AREA
- ++++ MAA
- LIMITED AREA

WORKFLOW	NO.	DATE	STATUS	APPROVED	DATE
APPROVED					
DESIGN	BY	DATE	Mason & Hanger Silas Mason Co., Inc.		
CHECK			OPERATOR OF		
SECTION			USDOE PANTEX PLANT		
HEAD			AMARILLO, TEXAS		
PROJECT			INCREMENTAL PU STORAGE UPGRADE		
SAFETY			FIGURE 2-2		
PLANNING			PROJECT-DRAWER		
OFFICE			DATE		
HEAD			SCALE		
DESIGN			DRAWN		
NO. 100			DATE		
NO. 100			CHECKED		
NO. 100			APPROVED		
SCALE	1" = 500' - 0"		SHEET NO.		

2.1.3 Facilities Descriptions

This section describes the Pu Storage facilities required for the Incremental upgrade.

2.1.3.1 Incremental Pu Storage Upgrade Facilities Data

This section describes the Incremental Pu Storage Upgrade alternative at the Pantex Plant. The upgrade consists of using portions of existing facilities for strategic reserves and constructing a new Fissile Material Storage Facility for surplus pits, metals, and oxides and associated ramps. The existing facilities required and the new construction are listed in Tables 2-1A and 2-1B. The tables provide building number, description, type of building construction, gross square feet, additional square feet required, security access area, number of levels, and special operating materials for each existing facility required for the Incremental Pu Storage Upgrade.

**Table 2-1A Incremental Pu Storage Upgrade
Existing Facilities Data**

Bldg. No.	Description	Type of Constr.	Gross Sq Ft	Access Area	No. of Levels	Special Mat'l
12-066	Vault	Concrete	8,500 ¹	MAA	1	SNM
12-082	AGV Service	Concrete	3,400 ²	MAA	1	SNM
12-116	Unpackaging/ Packaging	Concrete	4,000 ³	MAA	2	SNM
12-117	Loading Area/Dock	Steel	6,200	MAA	1	None
	Ramps	Conc/Stl	3,300	MAA	1	None

- 1 Only this portion of the 25,900 sq. ft. facility is being utilized.
- 2 Only this portion of the 6,800 sq. ft. facility is being utilized.
- 3 Only this portion of the 48,000 sq. ft. facility is being utilized.



**Table 2-1B Incremental Pu Storage Upgrade
New Facility Data**

Bldg. No.	Description	Type of Constr.	Gross Sq Ft	Access Area	No. of Levels	Special Mat'l
12-XXX	Loading Dock\ Preparation\ Storage vault	Concrete	164,600	MAA	1	SNM

2.1.3.1.1 Strategic Reserve Storage

Building 12-066 will be modified and upgraded to serve as the strategic reserve storage vault. Modifications to the facility will be the construction of a concrete wall to separate the facility into two areas. One area will be used for the storage vault for strategic reserves and the other area will be used for secondary storage. The strategic reserve vault will be 6,100 sq ft with an additional 2,400 sq ft two story equipment room to house primary and secondary HVAC systems and HEPA filters. The strategic vault will store pits in AT-400A containers.

The Vault Support Building is immediately adjacent to the vault and provides areas required to support operations within the vault. The building contains the AGV service area and storage areas, accountability/verification measurement area, control rooms, long-term safety evaluation area, inventory area, utility systems, HVAC equipment, and other support functions. Building 12-082 will be modified and upgraded to provide these functions.

2.1.3.1.2 Surplus Storage

The new Fissile Material Storage Facility (Figure 2-3) will be placed within the existing Zone 12 South Protected Area or in Zone 4. In order to ensure isolation of any multilateral and/or bilateral inspection activities, the proposed new facility will be physically separated from the weapons assembly/disassembly areas within the Zone 12 South MAA. Isolation will be accomplished through the use of facility-specific access portals/gates and security procedures, as well as the installation of new MAA security fencing if located in Zone 12 South. In the case of using Zone 4, isolation will be accomplished by having zone separation. The new facility can be constructed underground or aboveground in either location.

The main area of the FMSF will be comprised of two vaults. One vault (40,200 sq ft) will be used to store up to 25,000 containers of surplus pits and the other vault (26,200 sq ft) will be used to store up to 15,000 containers of surplus metals and oxides. The pits will be stored in AT-400A containers and the metals and oxides will be in containers that are comparable with the AT-400A package handling system or in the primary containment vessel. The surplus pit vault will use "Stage Right" in a warehouse arrangement for storing the surplus pits in the AT-400A containers. The surplus metals and oxides vault can be designed to store the metals and oxides in one of the three following methods:

- 1). Storing metals and oxides in AT-400A or comparable containers using "Stage Right" in a warehouse arrangement,
- 2). Storing metals and oxides in the primary containment vessel on pegs in the walls or racks in bays,
- 3). Storing metals and oxides in the primary containment vessels in tubes.

Both vaults will be entirely encircled by walkways such that the vaults are physically isolated from each other. The walkways will provide for ready and complete verification, by the international inspectors, of the vaults' isolation.

Each vault will be provided with a vault preparation area adjacent to its entrance and an area for international inspectors.

An evaluation/shipping preparation area will be included for routine evaluation and handling of suspect containers. This area will contain five glove boxes, as part of a laboratory, for shipping/receiving evaluation and container examination, as well as international inspection and verification activities. The facility will be configured such that both vaults are provided with access to this area. The ability to secure complete isolation, from the non-using vault, will be included in the design.

Loading and unloading of tractor trailers/SST's will be accomplished at separate docks (one for each vault) each residing within an enclosed structure.

Equipment/mechanical rooms will be hardened to the same level of protection afforded the vaults. There will be redundancy of critical HVAC/HEPA equipment and functions to assure uninterrupted service.

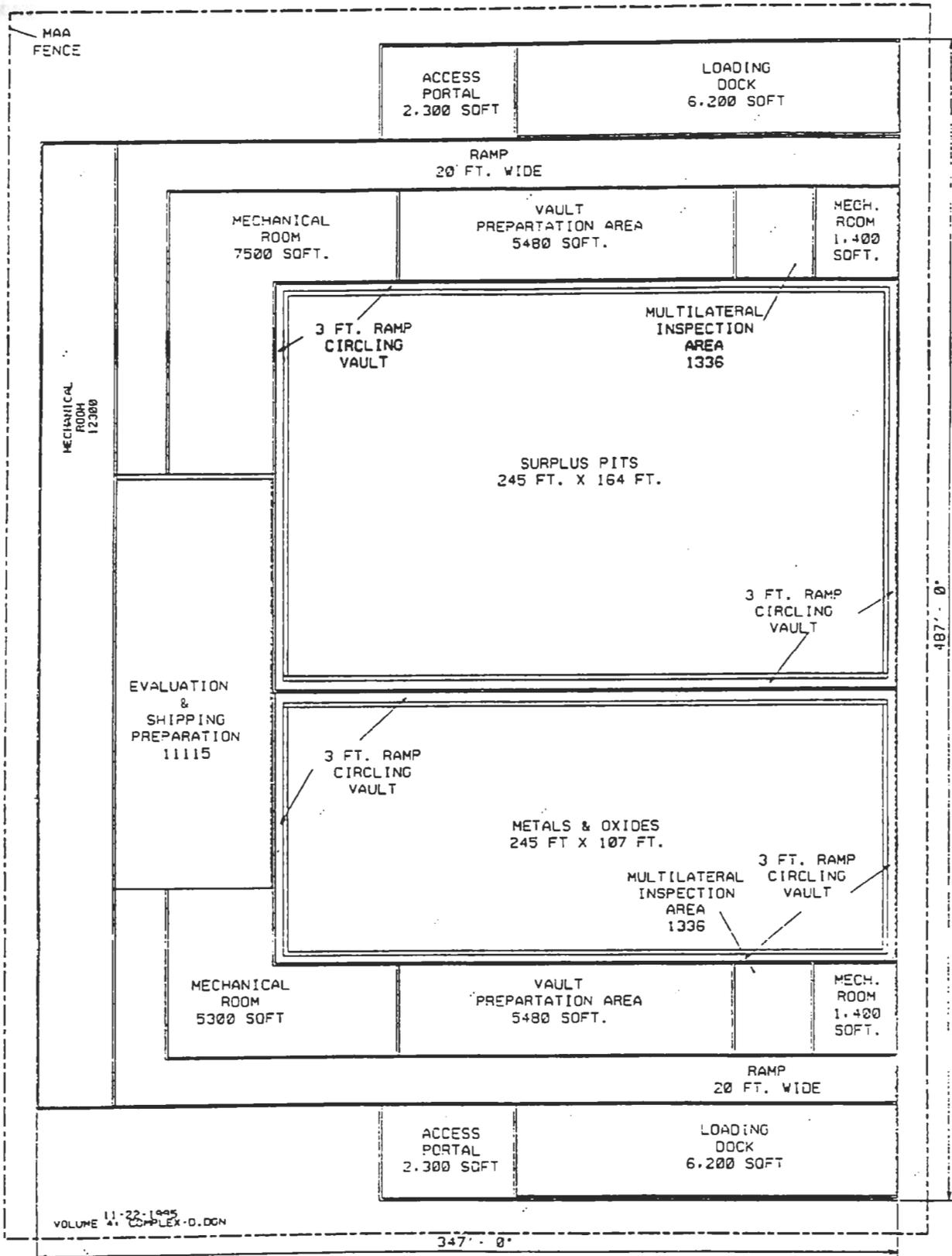


Figure 2-3 Fissile Material Storage Facility Layout

2.1.4 Existing Facilities Upgrade Descriptions

Modification or upgrading of some existing facilities is necessary to meet the Programmatic Design Criteria requirements. Existing facilities at the Pantex Plant required for the Upgraded Pu Storage operations will be evaluated individually to determine the degree of modification or upgrade needed. The following codes are used in the tables for items that are required in most of the facilities:

SB	Seismic Bracing for the fire suppression and other components
ADA	Building hardware, access/egress routes, visual/audio alarms, and toilet facilities to be brought into compliance with the Americans with Disabilities Act (ADA)
WC	Water closets, urinals, sinks, faucets and showers to be reconditioned, refitted or replaced to provide water conservation measures
EL	Additional exit and emergency lights to comply with NFPA 101
FA	Bring facility fire alarm into compliance with ADA
CSA	New component support and anchorage (piping, HVAC ducts, equipment, electrical, etc.)

These codes as well as additional upgrade facility information based on structural, architectural, mechanical, and electrical requirements for the Pu Storage upgrade are given in Table 2-2.

Table 2-2 Upgrade Data - Pu Storage Existing Facilities

Bldg. Number	Building Function	Required Upgrade Description			
		Structural	Architectural	Mechanical	Electrical
12-066	Vault	SB, CSA, Construct additional wall and modify rest room	Provide rad. shielding	Expand Mech. room, add HVAC, HEPA filter banks, remove fire protection	Replace electrical system
12-082	AGV Service	SB, CSA Construct walls	Provide rad. shielding	Replace HVAC, add HEPA filter banks	Replace electrical system
12-116	Unpackaging Packaging Accountability	CSA	ADA; WC	No work	FA
12-117	Loading Area/Dock	SB, CSA	ADA; WC	No work	FA

2.2 Design Safety

The following sections identify some important safety considerations to be incorporated in the design of DOE Complex-21 facilities. Performance goals commensurate with the associated hazard will be selected for all structures, systems, and components (SSCs). The term "hazard" is defined as a source of danger, whether external or internal. Natural phenomena such as earthquakes, extreme winds, tornados, and floods are external hazards to SSCs, whereas toxic, reactive, explosive, or radioactive materials contained within the facilities are internal hazards. Guidelines for design and evaluation of SSCs for each Performance Category and the corresponding performance goals are given in DOE Order 5480.28, *Natural Phenomena Hazards Mitigation*, and referenced document, Lawrence Livermore National Laboratory UCRL 15910, *Design and Evaluation Guidelines for DOE Facilities Subjected to Natural Phenomena Hazards* [to be replaced by DOE-STD-1020-92, *Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities* (draft)], and DOE Standards DOE-STD-1021, *Natural Phenomena Hazard Performance Categorization Criteria for Structures, Systems, and Components*, DOE-STD-1022-92, *Natural Phenomena Hazards Site Characterization Criteria* (draft), DOE-STD-1023, *Natural Phenomena Hazards Assessment Criteria* (draft), and DOE-STD-1024, *Guidelines for Use of Probabilistic Seismic Hazard Curves at DOE Sites* (interim).

2.2.1 Earthquake

The plant structures, systems, and components (SSCs) shall be designed for earthquake-generated ground accelerations in accordance with *Design and Evaluation Guidelines for DOE Facilities Subjected to Natural Phenomena Hazards*, UCRL-15910 (or DOE-STD-1020), with applicable seismic hazard exceedance probability of 2×10^{-3} for General Use (Performance Category 1), 1×10^{-3} for Low and Moderate Hazard (Performance Category 2 & 3) and 2×10^{-4} for High Hazard (Performance Category 4) SSCs.

Seismic design considerations for SSCs will include provisions for such SSCs to function as hazardous materials confinement barriers, and also for adequate anchorage of building contents to prevent their loss of critical function during an earthquake. In essence, design considerations are to avoid premature, unexpected loss of function and to maintain ductile behavior during earthquakes.

Characteristics of the lateral force design are just as important as the magnitude of the earthquake load used for design. These characteristics include redundancy; ductility; the combining of elements to behave as a unit; adequate equipment anchorage; considering the behavior of nonuniform, nonsymmetrical structures or equipment; detailing of connections and reinforced concrete elements; and the specified materials and construction.

In addition to structural safety, operation of emergency systems during and after an earthquake is essential. The fire protection system, emergency power, water supplies, and controls for the safety class equipment are examples of plant systems that must be available following an earthquake. As stated in Chapter 4 of UCRL-15910 under Survival of Emergency Systems, "earthquake-resistant design considerations extend beyond the dynamic response of structures and equipment to include survival of systems that prevent facility damage or destruction due to fires or explosions."

2.2.2 Wind

All new and upgraded plant structures, systems and components (SSCs) will be designed for wind or tornado load criteria at specific DOE sites in accordance with UCRL-15910 and the corresponding facility usage and performance goals. Wind loads shall be based on the annual probability of exceedance of 2×10^{-2} for the General and Low Hazard (Performance Category 1 & 2), 1×10^{-3} for the Moderate Hazard (Performance Category 3) and 1×10^{-4} for the High Hazard (Performance Category 4) SSCs. The sites for which tornadoes are the viable wind hazards shall be designed for the annual probability of exceedance of 2×10^{-5} as defined in Table 5-3, UCRL-15910 (or Table 4-2, DOE-STD-1020).

Wind design criteria will be based on annual probability of exceedance, importance factor, missile criteria, and atmospheric pressure changes as applicable to each performance (usage) category as specified in Table 5-2, UCRL-15910 (or Table 4-2, DOE-STD-1020).

As stated in UCRL-15910, characteristic safety considerations will be reflected in the design of the system in that, "the main wind-force resisting system must be able to resist the wind loads without collapse or excessive deformation. The system must have sufficient ductility to permit relatively large deformations without sudden or catastrophic collapse. Ductility implies an ability of the system to redistribute loads to other components of the system when some part is overloaded."

2.2.3 Floods

All facilities and buildings should preferably be located above the critical flood elevation (CFE) from the potential flood source (river, dam, levee, precipitation, etc.) or the site/facility should be hardened to mitigate the effects of the flood source such that performance goals are satisfied. Emergency operation plans shall be developed to safely evacuate employees and secure areas with hazardous, mission dependent, or valuable materials. The extent of the flood hazard will be determined using the appropriate usage (performance) category for determining the "Annual Hazard Probability of Exceedance"; 2×10^{-3} for General Use (Performance Category 1), 5×10^{-4} for Important or Low Hazard (Performance Category 2), 1×10^{-4} for Moderate Hazard (Performance Category 3), 1×10^{-5} for High Hazard (Performance Category 4) facility as defined in Chapter 6, UCRL-15910 (or Chapter 4 of DOE-STD-1020). For moderate and high hazard facilities located below the design basis flood (DBFL) elevation, the design must be developed so that continued facility operation is provided.

The CFE will be determined by obtaining the appropriate DBFL. The DBFL is the peak hazard level (flow rate, depth of water, etc.) corresponding to the mean "Annual Hazard Probability of Exceedance" or combinations of flood hazards (river flooding, wind-wave action, etc.) and corresponding loads associated with peak hazard level and applicable load combinations (hydrostatic and/or hydrodynamic forces, debris loads, etc.).

Site drainage must comply with the regulations of the governing local agency. The minimum design level for the Storm Water Management System is the 25-year, 6-hour storm, but potential effects of larger storms up to the 100-year, 6-hour storm will be also considered. However, Storm Water Management Systems must prevent the CFE from being exceeded. Accordingly, for some facilities, Storm Water Management Systems may have to be designed for more extreme storms.

Whenever possible, all facilities in performance categories above the General Use Category (Performance Category 1) shall be constructed with the lowest floor of the structure, including subsurface floors, above the level of the 500-year flood. This requirement can be met by siting and/or flood protection. Whenever possible, all facilities, including their basements in all performance categories, shall be sited above the 100-year floodplain. (DOE 6430.1A)

2.2.4 Fire Protection

The fire protection features for the plant and its associated support buildings are in accordance with DOE Orders and the National Fire Protection Association (NFPA) Fire Codes and Standards.

Redundant firewater supplies and pumping capabilities (electric motor drivers with diesel backup) will be installed to supply the automatic and manual fire protection systems located throughout the site. One supply tank and one set of pumps will be designed to meet DBE requirements. Appropriate types of fire protection systems will be installed to provide life safety, prevent large-loss fires, prevent production delay, ensure that fire does not cause an unacceptable on-site or off-site release of hazardous material that will threaten the public health and safety or the environment, and minimize the potential for the occurrence of a fire and related perils.

Specific production areas and/or equipment will be provided with the appropriate fire detection and suppression features as required with respect to the unique hazard characteristics of the product or process.

A fire hazards analysis will be performed to assess the risk from fire within the individual fire areas of the facility.

All fire sprinkler water that has been discharged in process areas during and after a fire will be contained, monitored, sampled, and if required, retained until it can be disposed.

2.2.5 Safety Class Instrumentation and Control

The safety classification of instrumentation and controls will be derived from the safety functions performed. This safety classification is based on DOE 6430.1A and DOE 5481.1B.

Safety class instrumentation will be designed to monitor identified safety related variables in safety class systems and equipment over expected ranges for normal operation, accident conditions and for safe shutdown. Safety class controls will be provided, when required, to control these variables.

Suitable redundancy and diversity will be used when designing safety class instrumentation to insure that safety functions can be completed, when required, and that a single point failure will not cause loss of protective functions. Redundant safety class signals must also be physically protected or separated to prevent a common event from causing a complete failure of the redundant signals. IEEE 379 and IEEE 384 are the design basis for redundancy and separation criteria. Safety class instrumentation will be designed to fail in a safe mode following a component or channel failure. Safety class UPS power will be provided when appropriate.

2.2.6 Nuclear Criticality

Where potential for nuclear criticality exists, the design of the facilities will include the basic controls for assuring nuclear criticality safety. Designs will satisfy the double contingency principle, i.e., "process designs shall incorporate sufficient safety factors so that at least two unlikely, independent, and concurrent changes in process conditions must occur before a criticality accident is possible" from DOE 6430.1A. Basic control methods for the prevention of nuclear criticality include:

1. Provision of safe geometry (preferred)
2. Engineered density and/or mass limitation
3. Provision of fixed neutron absorbers
4. Provision of soluble neutron absorbers
5. Use of administrative controls

Although geometric controls are used extensively wherever practical, there are cases where geometric control alone cannot practically provide assurance of criticality safety. In these cases, engineered controls can be used to control moderation, nuclear poisons, mass, and density.

2.2.7 Ventilation

The HVAC system design of the new and upgraded facilities will meet all general design requirements in accordance with DOE 6430.1A, Section 1550, and ASHRAE guides.

The HVAC system provides environmental conditions for the health and comfort of personnel and for equipment protection. In addition, the HVAC systems will provide temperature and humidity control for the pits (strategic and surplus), metals, and oxides. Typically, the ventilation system will be designed to maintain confinement to preclude the spread of airborne radioactive particulates or hazardous chemicals within the facilities and to the outside environment.

The design includes engineered safety features to prevent or mitigate the potential consequences of postulated design basis accident events.

3.0 Site Maps and Land Use Requirements

3.1 Site Maps

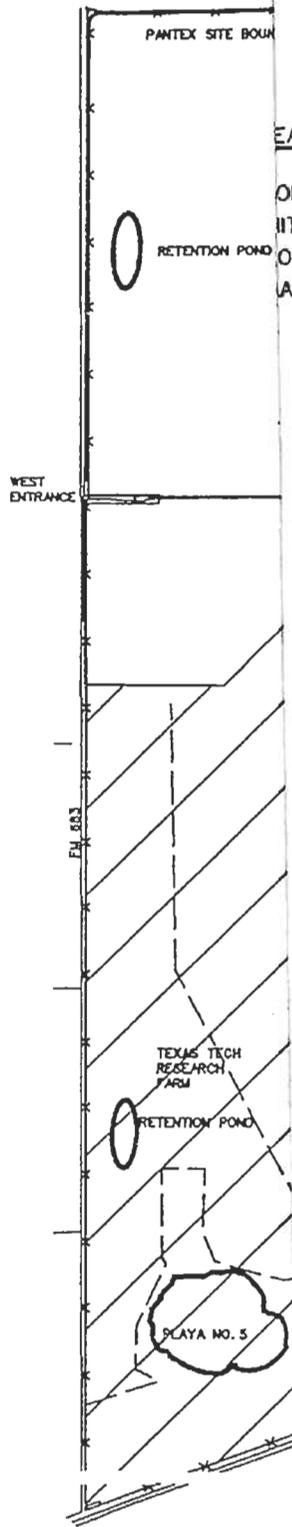
The site map for the Pu Storage Upgrade is shown in Figure 3-1. This figure shows the Incremental Pu Storage Upgrade integrated into the Pantex Plant infrastructure, security, waste and HE/Assembly Operating systems. The Pantex Plant HE/Assembly Operations Upgrade includes the upgrade of all support, security, and infrastructure systems required for the Incremental Pu Storage Upgrade.

3.2 Land Area Requirements During Operation

Tables 2-1A & 2-1B lists the required facilities for the Incremental Pu Storage operations and the area occupied by each building. The Incremental Pu Storage Upgrade at the Pantex Plant requires 1.6 hectare of land beyond that identified for the upgrade of the HE/Assembly operations.

3.3 Land Area Requirements During Construction

Construction of the Incremental Pu Storage Upgrade requires 0.8 hectare of land for construction laydown and warehousing, and 0.4 hectare for construction parking.



AREA TABULATIONS

PROPERTY PROTECTED AREA-	14808 ACRES
LIMITED AREA-	1124 ACRES
PROTECTED AREA-	260 ACRES
MAA AREA-	139 ACRES

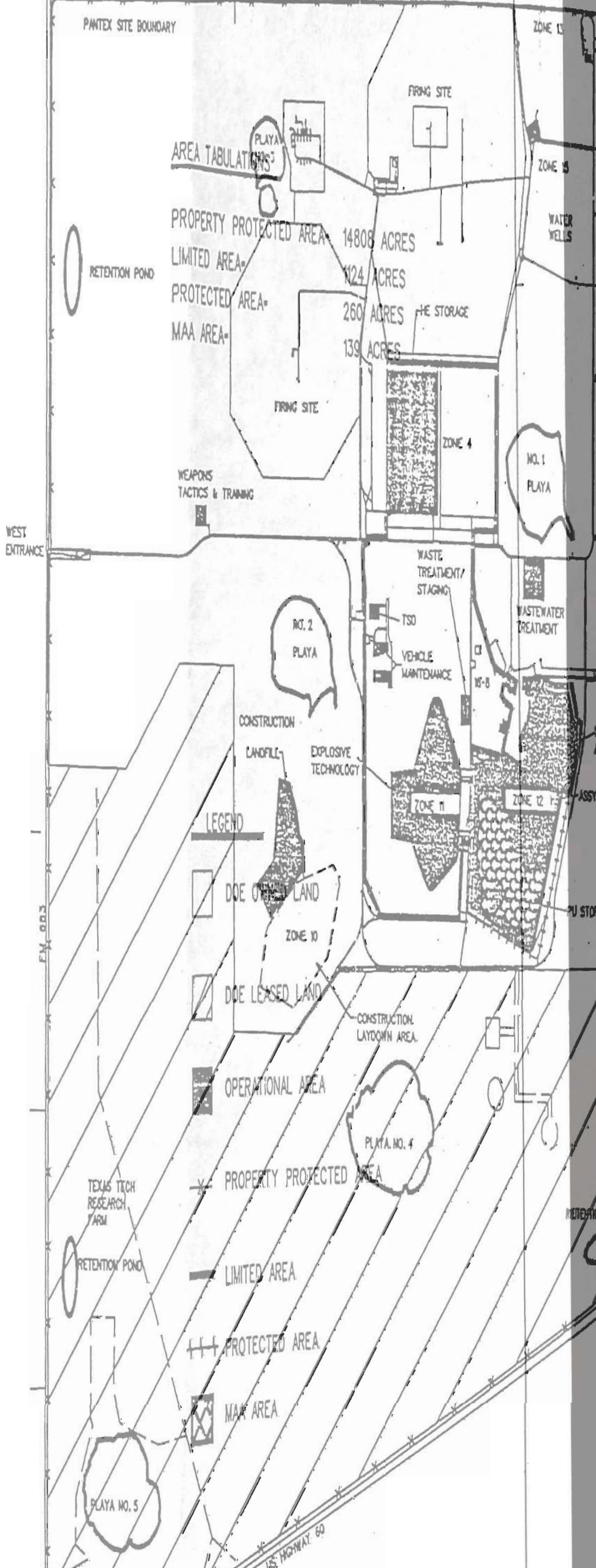
LEGEND

-  DOE OWNED LAND
-  DOE LEASED LAND
-  OPERATIONAL AREA
-  PROPERTY PROTECTED AREA
-  LIMITED AREA
-  PROTECTED AREA
-  MAA AREA

MASON & HANGER - SILAS MASON COMPANY INC. PANTEX PLANT, AMARILLO, TEXAS	
INCREMENTAL PU STORAGE UPGRADE	
FIGURE: 3-1	RECONFIG.005 1-94

FM 293

PANTEX SITE BOUNDARY



AREA TABULATIONS

PROPERTY PROTECTED AREA - 14808 ACRES

LIMITED AREA - 1124 ACRES

PROTECTED AREA - 260 ACRES

MAA AREA - 139 ACRES

RETENTION POND

FRONG SITE

FRONG SITE

WEAPONS TACTICS & TRAINING

ZONE 4

NO. 1 PLAYA

WEST ENTRANCE

WASTE TREATMENT/STAGING

NO. 2 PLAYA

TSD

VEHICLE MAINTENANCE

WASTEWATER TREATMENT

EAST ENTRANCE

CONSTRUCTION

LANDFILL

EXPLOSIVE TECHNOLOGY

LEGEND

DOE OWNED LAND

ZONE 10

DOE LEASED LAND

ZONE 11

ZONE 12

CONSTRUCTION LAYDOWN AREA

OPERATIONAL AREA

PLAYA NO. 4

PROPERTY PROTECTED AREA

TEXAS TECH RESEARCH FARM

RETENTION POND

LIMITED AREA

PROTECTED AREA

MAA AREA

PLAYA NO. 5

US HIGHWAY 69

RETENTION POND

6-19

6-2

SUPPORT AREA

6

6

6

6

6

6

6

6

6

FM 2373

FM 983

6

6

6

6

ZONE 13

ZONE 15

WATER WELLS

ASSY

PU STOR

RETENTION

The accountability measurement function includes equipment needed to perform nonintrusive nondestructive assay (NDA) of the PCV's.

The final vault preparation function includes putting the AT-400A or comparable containers in a 4 or 6 pack configuration for storage in the vault.

Abnormal containers are returned to the preparation area and shipped off-site.

4.1.1.2 Shipping/Receiving and Preparation Feeds

SST	AT-400A or comparable containers
Conventional Trucks	

4.1.1.3 Shipping/Receiving and Preparation Products

Storage containers	CRT's
AT-400A Containers or comparable	Empty CRTs
Primary containment vessels	

4.1.1.4 Shipping/Receiving and Preparation Utilities Required

Electricity	Plant water
Nitrogen	Potable water
Breathing air	Demineralized water
Instrument air	Fire water
Plant air	Helium

4.1.1.5 Shipping/Receiving and Preparation Chemicals Required

Decontamination solutions
Liquid nitrogen
Lubricants

4.1.1.6 Shipping/Receiving and Preparation Special Requirements

Airlocks are required to maintain negative pressure differentials in the facility for contamination control. Some operations are performed in gloveboxes/enclosures to prevent spread of contamination and to protect personnel. Appropriate shielding is required for assay equipment to eliminate the effects of background radiation. Stable temperature and humidity control is needed in some areas for proper functioning of instruments. Outgoing waste and empty shipping packages require monitoring to assure safeguarding SNM. Viewing capability is required in unpackaging/packaging, accountability measurement, and final vault preparation areas of the facility.

4.1.1.7 Shipping/Receiving and Preparation Wastes

Solids:

Glovebox Panels	Gloves
Windows and gaskets	Wipes
Filters	Masks
Batteries	Plastic bottles
Damaged AT-400A containers	Overalls
Damaged overpack materials	Damaged ESFs
Damaged Primary containment vessels	Failed equipment and instruments
Noncontaminated cleaning materials	Laydown plastic

Liquids:

Decontamination solutions	Process waste water
Lubricants	Hydraulic fluids

Gases:

Glovebox and hood exhaust

4.1.2 Material Storage System

4.1.2.1 Material Storage Function

The material storage function is to store strategic reserve pits and surplus pits, metals, and oxides in AT-400A or comparable containers or the primary containment vessels for the life of the facility and to prepare the storage container packages for return to shipping/receiving. The AT-400A or comparable containers or the primary containment vessels are transported through enclosed ramps via shielded forklifts to protect the operator and surrounding environment. Once in the vault storage area, the containers with pits are stored using "Stage Right" technology in which AGVs are used to move the 4 and 6 pack configurations of containers between the storage vault and the vault Preparation area. The containers with metals and oxides are stored using one of the three methods discussed in section 2.1.3.1.2 using some type of AGV to move the containers between the storage vault and the vault preparation area.

4.1.2.2 Material Storage Feeds

AT-400A containers or comparable	Primary containment vessels
----------------------------------	-----------------------------

4.1.2.3 Material Storage Products

AT-400A containers or comparable	Primary containment vessels
----------------------------------	-----------------------------

4.1.2.4 Material Storage Utilities Required

Nitrogen	Plant water
Breathing air	Potable water
Instrument air	Demineralized water
Plant air	Electricity

4.1.2.5 Material Storage Chemicals Required

Liquids
Decontamination Solutions
Detergents

4.1.2.6 Material Storage Special Requirements

The vault requires capability to meet inventory and surveillance requirements during the life of the facility. This requirement includes weighing, gamma fingerprinting, verification of bar codes of in-place primary containers, and verification of empty storage locations. The vault does not require routine entry by personnel. Operations are performed by remotely operated equipment to meet ALARA requirements. Temperature and humidity control are required for the stored SNM and instruments.

4.1.2.7 Material Storage Waste

Solids:

Glovebox panels
Windows and gaskets
Filters

Wipes
Masks
Plastic bottles

Batteries
Laydown plastic
Gloves

Overalls
Failed equipment
Failed instruments
Noncontaminated cleaning materials

Liquids:

Lubricants
Hydraulic fluids
Decontamination solutions

Gases:

Glovebox and hood exhaust

4.2 Pu Storage Waste Management System

4.2.1 Waste Management Function

The Waste Management System involves the collection, assaying, sorting, treatment, packaging, storage and shipment of radioactive, hazardous and mixed wastes from Pu operations, and hazardous and non-RCRA hazardous from the support operations.

- a. Initial sorting of solid waste transuranic (TRU), low-level waste (LLW), mixed TRU waste, mixed LLW, and hazardous waste is performed at the generation source. Classified shapes are mechanically destroyed, then segregated into separate streams (mixed, unmixed, organic, etc.) for processing. Solid wastes are treated by a variety of processes to ensure that they are in compliance with EPA, RCRA, and DOE requirements. The treatment processes include thermal treatment for combustibles and passivation for reactive metals. Waste products are immobilized and packaged to meet DOT and DOE requirements. Liquid organic wastes are separated and dispositioned, along with solid organics.
- b. Radioactive liquid wastes (aqueous chloride, aqueous nitrate, and laundry waste) are neutralized, filtered, precipitated, concentrated by evaporation, immobilized, and packaged for appropriate disposal.
- c. Mixed LLW will be handled as stated in the Agreed Order with the TNRCC for treatment of mixed wastes.
- d. Nonhazardous, nonradioactive solid, aqueous and gaseous wastes are treated in conformance with standard industrial practice. Solid wastes are either disposed of off-site or sent to a commercial recycle center. Aqueous wastes are discharged to natural drainage channels. Gaseous wastes are released to the atmosphere.

Block flow diagrams depicting the incremental upgrade Waste Management System is shown on Figures 4-1.

4.1.2.4 Material Storage Utilities Required

Nitrogen	Plant water
Breathing air	Potable water
Instrument air	Demineralized water
Plant air	Electricity

4.1.2.5 Material Storage Chemicals Required

Liquids
Decontamination Solutions
Detergents

4.1.2.6 Material Storage Special Requirements

The vault requires capability to meet inventory and surveillance requirements during the life of the facility. This requirement includes weighing, gamma fingerprinting, verification of bar codes of in-place primary containers, and verification of empty storage locations. The vault does not require routine entry by personnel. Operations are performed by remotely operated equipment to meet ALARA requirements. Temperature and humidity control are required for the stored SNM and instruments.

4.1.2.7 Material Storage Waste

Solids:

Glovebox panels
Windows and gaskets
Filters

Wipes
Masks
Plastic bottles

Batteries
Laydown plastic
Gloves

Overalls
Failed equipment
Failed instruments
Noncontaminated cleaning materials

Liquids:

Lubricants
Hydraulic fluids
Decontamination solutions

Gases:

Glovebox and hood exhaust

4.2 Pu Storage Waste Management System

4.2.1 Waste Management Function

The Waste Management System involves the collection, assaying, sorting, treatment, packaging, storage and shipment of radioactive, hazardous and mixed wastes from Pu operations, and hazardous and non-RCRA hazardous from the support operations.

- a. Initial sorting of solid waste transuranic (TRU), low-level waste (LLW), mixed TRU waste, mixed LLW, and hazardous waste is performed at the generation source. Classified shapes are mechanically destroyed, then segregated into separate streams (mixed, unmixed, organic, etc.) for processing. Solid wastes are treated by a variety of processes to ensure that they are in compliance with EPA, RCRA, and DOE requirements. The treatment processes include thermal treatment for combustibles and passivation for reactive metals. Waste products are immobilized and packaged to meet DOT and DOE requirements. Liquid organic wastes are separated and dispositioned, along with solid organics.
- b. Radioactive liquid wastes (aqueous chloride, aqueous nitrate, and laundry waste) are neutralized, filtered, precipitated, concentrated by evaporation, immobilized, and packaged for appropriate disposal.
- c. Mixed LLW will be handled as stated in the Agreed Order with the TNRCC for treatment of mixed wastes.
- d. Nonhazardous, nonradioactive solid, aqueous and gaseous wastes are treated in conformance with standard industrial practice. Solid wastes are either disposed of off-site or sent to a commercial recycle center. Aqueous wastes are discharged to natural drainage channels. Gaseous wastes are released to the atmosphere.

Block flow diagrams depicting the incremental upgrade Waste Management System is shown on Figures 4-1.

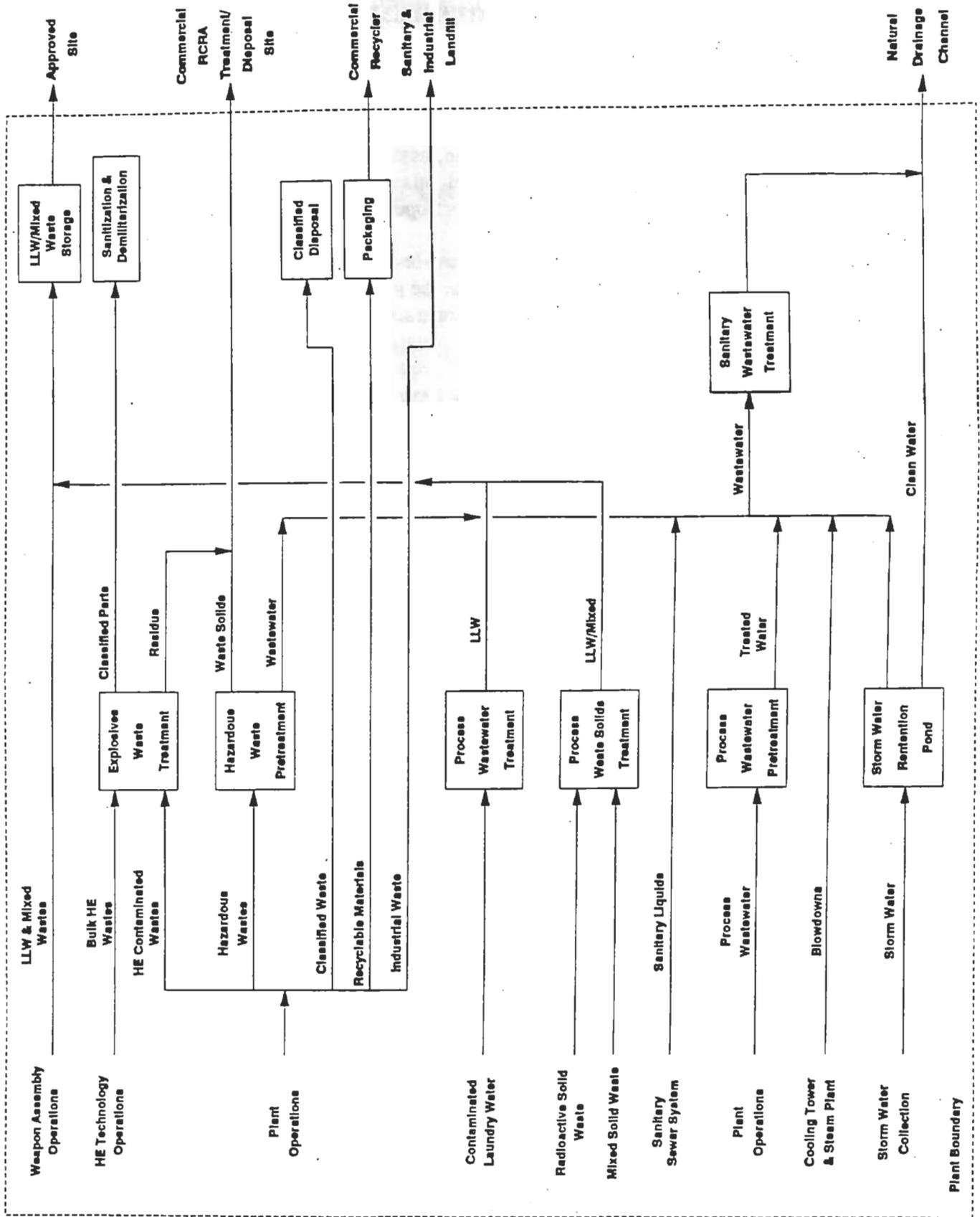


Figure 4-1 Pantex Incremental Waste Management Block Flow Diagram

4.2.2 Waste Management Feeds

Radioactive Waste

Solid (TRU or LLW):

Failed equipment/parts	Failed instruments
Plywood boxes	Packaging
Contaminated tools	Metal drums/containers
Plastics	Overalls
Batteries	Air masks
Gloves	Insulation
Wipes/Rags	Paper
Filters	Damaged ESFs
Scrubber waste	Spent crucibles

Liquids (TRU or LLW):

Decontamination solution	Laboratory wastes
Contaminated fire water	Laundry wastewater
Cleaning solutions	Hydraulic fluids
Spent lubricants	Paints

Hazardous Wastes

Solids:

Rags with hazardous components

Liquids:

Cleaning solvents	Paints
Hydraulic fluids	Pump oils

Nonhazardous, Nonradioactive Wastes

Solids:

Industrial waste from utility and maintenance operations
Office and cafeteria wastes

Liquids:

Sanitary water
Blowdown water
Rainwater

4.2.3 Waste Management Products

The waste management products include radioactive and nonradioactive waste that are generated in the Pu Storage and associated support facilities. The products are:

1. Solid TRU, LLW, and mixed wastes.
2. Hazardous liquids and solids.
3. Nonhazardous, nonradioactive solid wastes such as compacted industrial and sanitary waste, and recyclable materials; liquid wastes such as treated waste water and rain runoff.

These wastes are handled and disposed of in accordance with approved storage and disposal methods. These include:

1. Immobilized TRU and mixed TRU wastes sent to WIPP.
2. Immobilized LLW deposited in on-site disposal modules.
3. Mixed LLW stored on-site in storage buildings.
4. Solid industrial/sanitary waste deposited in an off-site industrial landfill.
5. Recyclable solid wastes are sent to off-site commercial recycle center.
6. Solid and liquid hazardous wastes sent to an off-site RCRA disposal site.
7. Rain runoff discharged to natural drainage channels.
8. Nonhazardous, nonradioactive clean gases discharged to the atmosphere.

4.2.4 Waste Management Utilities Required

Plant water	Breathing air
Demineralized/distilled water	Diesel fuel
Closed loop cooling water system	Low pressure steam
Positive pressure chilled water	Condensate
Cooling water	Dry vacuum
Instrument air	Fire water
Plant air	Electricity

4.2.5 Waste Management Chemicals Required

Sodium Chloride	Hydrogen peroxide
Polyphosphate	Polyelectrolyte
Sodium sulfite	Sulfuric acid
Aluminum sulfate	Phosphoric acid
Bentonite	Diethylaminoethanol
Organic Phosphate	Inorganic Phosphate
Hydrazine	Nitrogen
Calcium hydroxide	Chlorine

4.2.6 Waste Management Special Requirements

Some operations are conducted in gloveboxes and are provided with scrubbers to clean gaseous effluents.

5.0 Resource Needs

5.1 Materials/Resources Consumed During Surge Operation

This section presents the significant utility and chemical resource needs during surge operation for the Incremental Pu Storage Upgrade Operations at the Pantex Plant.

5.1.1 Utilities Consumed

The utilities consumed during operations include electric power, liquids fuels, natural gas and water. Annual utility consumption rates and peak electric power rates are shown in Table 5-1. The column titled "Plant" presents the actual utilities consumed in during 1994. The column titled "additional" presents the incremental utilities consumption associated with the addition of Pu storage at the plant.

Table 5-1 Incremental Pu Storage Upgrade
Utilities Consumed During Surge Operation

Utilities	Annual Average Consumption	
	Plant (1994)	Additional
Electrical		
Consumption (MWh)	94,420	6,950
Peak Load (MW)	13	1.1
Oil (l/yr)	1,775,720	0
Natural Gas (million m ³ /yr)	14.6	0.8
Water (million l/yr)	840	14

5.1.2 Chemicals Consumed

The additional quantities of chemicals and materials consumed during Pu Storage Operations are summarized in Table 5-2.

**Table 5-2 Incremental Pu Storage Upgrade
Annual Chemicals Consumed During Surge Operation**

Chemical	Quantity (kgs)
SOLID CHEMICALS	SOLID CHEMICALS
Sodium Sulfite	54
LIQUID CHEMICALS	LIQUID CHEMICALS
Sulfuric Acid	277
Oils & Lubricants	3
Polyphosphate	82
Liquid Nitrogen	118
GASEOUS CHEMICALS	GASEOUS CHEMICALS
Argon	2,500
Chlorine	168
Helium	50

5.2 Materials/Resources Consumed During Construction

This section presents the significant materials/resources consumed during construction of the Plutonium Storage Upgrade at the Pantex Plant. These resources include utilities, construction materials, liquid fuels and industrial gases. The total quantities consumed during the entire construction period and the peak electric power and water consumption are shown in Table 5-3.

**Table 5-3 Incremental Pu Storage Upgrade
Materials/Resources Consumed During Construction**

Material/Resources	Total Consumption
Electrical	
Consumption (MWh)	6,700
Peak Load (MW)	50
Water	
Consumption (l)	7,500,000
Peak Demand (l/day)	6,400
Concrete (m ³)	9,200
Steel (tonne)	1,850
Gasoline, Diesel & Lube Oil (l)	158,000
Industrial Gases (m ³)	3,400

6.0 Employment Needs

6.1 Employment Needs During Operation

The Pantex Plant normally operates five days per week, with one eight-hour shift per day, 240 days per year, except for some utility systems and security functions which operate continuously. Surge capacity is accommodated by operating multiple shifts. The number of operating personnel required for surge operations is summarized in Table 6-1. This data represents the Incremental Pu Storage employment requirements.

**Table 6-1 Incremental Pu Storage
Employment During Surge Operation**

Labor Category	Number of Employees
Officials and Managers	2
Professionals	17
Technicians	25
Office and Clerical	5
Craft Workers	10
Operatives	27
Laborers	0
Service Workers	4
TOTAL EMPLOYEES	90

6.1.1 Badged Employees at Risk of Radiological Exposure

In the Incremental Pu Storage alternative, approximately 25 employees involved with the Plutonium Storage Operations (in addition to the 250 radiological employees identified with the Assembly/Disassembly Operations) who routinely work in areas containing radiological materials are at risk of radiological exposure. Additional plant personnel and visitors are provided with dosimeter badges, but do not routinely enter the radiological work areas.

6.1.2 Labor Category Description

The labor categories used in Table 6-1 are defined below. These categories are standard Equal Employment Opportunity (EEO) categories.

Officials and Managers

Occupations requiring administrative and managerial personnel who set broad policies, exercise overall responsibility for execution of these policies, and direct individual departments or special phases of a firm's operations. Included in this category are: officials, executives, middle management, plant managers, salaried supervisors who are members of management, and purchasing agents and buyers.

Professionals

Occupations requiring either a college degree or experience of such kind and amount as to provide a comparable background degree. Included in this category are: accountants and auditors, architects, artists, chemists, designers, editors, engineers, lawyers, librarians, mathematicians, scientists, nurses, personnel and labor relations specialists, physicians, and teachers.

Technicians

Occupations requiring a combination of basic scientific knowledge and manual skill which can be obtained through two years of post high school education, such as is offered in many technical institutions and junior colleges, or through equivalent on-the-job training. Included in these occupations are: computer programmers, drafters, engineering aides, junior engineers, mathematical aides, practical or vocational nurses, photographers, radio operators, scientific assistants, surveyors, technical illustrators, and technicians (medical, dental, electronic, physical science).

Office and Clerical

This category includes all clerical-type work, regardless of level of difficulty, where the activities are predominantly nonmanual, though some manual work not directly involved with altering or transporting the products is included. Included in this category are: bookkeepers, collectors, messengers and office helpers, office machine operators, shipping and receiving clerks, stenographers, typists and secretaries, telephone operators, and legal assistants.

Craft Workers (Skilled)

Manual workers of relatively high skill level having a thorough and comprehensive knowledge of the processes involved in their work. Exercise considerable independent judgement and usually receive an extensive period of training. Included in this category are: building trades, hourly paid supervisors and lead operators who are not members of management, mechanics and repairers, skilled machining occupations, compositors and typesetters, electricians, engravers, painters, and pattern and model makers.

Operatives

Workers who operate machine or processing equipment or perform other factory-type duties of intermediate skill level which can be mastered in a few weeks and require only limited training. Included in this category are: apprentices, operatives, attendants, blasters, delivery workers, furnace workers, laundry operatives, motor operators, oilers and greasers (except auto), painters (manufactured articles), photographic process workers, stationary firefighters, truck drivers, welders and flamecutters, electrical and electronic equipment assemblers, inspectors, testers and graders, and handpackers and packagers.

Laborers (Unskilled)

Workers in manual occupations which generally require no special training who perform elementary duties that may be learned in a few days that require the application of little or no independent judgement. Included in this category are: garage laborers, car washers and greasers, groundkeepers, stevedores, laborers performing lifting, digging, mixing and loading and pulling operations.

Service Workers

Workers in both protective and nonprotective service occupations. Included in this category are: attendants (hospital and other institutions, professional and personal service, including nurses aides, and orderlies), cooks, counter and fountain workers, elevator operators, firefighters and fire protection, guards, stewards, and janitors.

6.2 Construction

The number of craftworkers, as well as construction management and support staff required during each year of construction to upgrade the Plutonium Storage Operations at the Pantex Plant are presented in Table 6-2.

**Table 6-2 Incremental Pu Storage
Number of Construction Employees Needed by Craft and by Year**

Employees	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Craftworkers						
Carpenter	2	9	3	0	0	0
Concrete Mason	2	7	2	0	0	0
Electrician	0	9	7	0	0	0
Iron Worker	2	11	2	0	0	0
Laborer	2	9	2	0	0	0
Millwright	0	3	2	0	0	0
Operator	1	4	1	0	0	0
Sheet Metal Worker	0	9	2	0	0	0
Pipe Fitter	1	6	4	0	0	0
Sprinkler Fitter	1	7	2	0	0	0
Teamster	1	5	2	0	0	0
Other Craftworkers	1	6	4	0	0	0
Total Craftworkers	13	85	33	0	0	0
Construction Management & Support Staff	1	9	3	0	0	0
Total Employment	14	94	36	0	0	0

7.0 Wastes and Emissions from the Pu Storage Operations

7.1 Wastes and Emissions During Operation

This section presents the significant gaseous emissions and wastes generated by the upgraded Pantex Plant for the Plutonium Storage Operations. The data reflects the incremental quantities of emissions and wastes associated with the Plutonium Storage Operations at the upgraded Pantex Plant.

7.1.1 Emissions

Emissions released from the incremental upgrade during operations are made up of gases used or generated as a result of various activities conducted in the Fissile Material Storage Facility. All gaseous effluent streams discharged from the storage facility are thoroughly scrubbed and/or filtered to remove or reduce the amount of undesirable particulates before they are released to the vent streams. Emissions to the atmosphere are shown in Table 7-1.

7.1.2 Solid and Liquid Wastes

Solid and liquid wastes generated during surge operations from the Pu Storage function are expected to be minimal. The total quantity of solid and liquid wastes generated during surge operations for the incremental alternatives are shown in Table 7-2.

**Table 7-1 Incremental Pu Storage
Annual Emissions During Surge Operations**

Chemical	Quantity (kgs)
Carbon Monoxide	590
Nitrogen Oxides	3865
Volatile Organic Compounds (VOC)	1800
Particulate Matter (PM ₁₀)	140
Sulfur Dioxide	22
Ammonia	32

**Table 7-2 Incremental Pu Storage
Annual Wastes Generated During Surge Operations**

Waste Category	Solid (m ³)	Liquid (l)
Radioactive Wastes		
High Level Waste (HLW)	NA	NA
Transuranic Waste (TRU)	1	0
Low Level Waste (LLW)	70	0
Mixed Wastes		
Transuranic Mixed Waste (TRU) *	1	0
Low Level Mixed Waste	8	190
Hazardous Waste	1	1,000
Nonhazardous Nonradioactive Wastes		
Recyclable	345	0
Sanitary/Industrial	140	4,500,000

* All TRU wastes that meet WIPP criteria, including TRU wastes containing hazardous wastes that exist as co-contaminants.

7.2 Wastes and Emissions Generated During Construction

This section presents the significant gaseous emissions and wastes generated at the Pantex Plant for the upgrade of the Plutonium Storage operations. The data reflects the Incremental quantities of emissions and wastes associated with the construction of the Plutonium Storage upgrades.

7.2.1 Emissions

Air pollutants are emitted during construction. The principle sources of such emissions are fugitive dust from land clearing, site preparation, excavation, and other construction activities, and exhaust from construction equipment and vehicles. The annual emissions generated during a one-year period with peak construction activity for the Incremental Pu Storage operations are shown in Table 7-3.

**Table 7-3 Incremental Pu Storage
Emissions During a Peak Construction Year**

Chemical	Quantity (tonne)
Sulphur Dioxide	0.05
Oxides of Nitrogen	0.73
Volatile Organic Compounds (VOC)	0.36
Carbon Monoxide	2.00
Particulate matter 10 microns and smaller	0.29
Total Suspended Particulates (TSP)	0.73

7.2.2 Solid and Liquid Wastes

The solid and liquid wastes generated during construction include concrete and steel waste construction materials and sanitary waste water. The steel construction waste material will be recycled as scrap metal. No radioactive or mixed wastes will be generated during construction. The total quantity of solid and liquid waste generated during the entire construction period for the Incremental Pu Storage alternatives are shown in Table 7-4.

**Table 7-4 Incremental Pu Storage
Total Wastes During Construction**

Waste Category	Quantity
Nonhazardous Solids	
Concrete (m ³)	18.8
Steel (tonne)	2.8
Nonhazardous Liquids	
Sanitary (million liters)	47.4
Hazardous Waste (m ³)	0.6

8.0 Intra-Site Transportation of Radiological/ Hazardous Materials

Intra-site transportation of radiological and hazardous materials for the Pu Plant services two main operations: Abnormal Containers and Pu Storage. The storage containers are transported by sheilded forklifts between shipping/receiving, preparation, and material storage via enclosed ramps. The containers are transferred in the material storage area between the staging area and vault via AGVs. Containers that have failed in storage are transported by sheilded forklifts to the material preparation area via ramps.

Waste products are transported to a common Waste Management Building. The waste generated from Pu storage is packaged and transported to the Waste Management Building by truck. The waste packages are either shipped off-site by commercial carriers or disposed on-site. Mixed wastes are stored on-site in long-term waste storage.

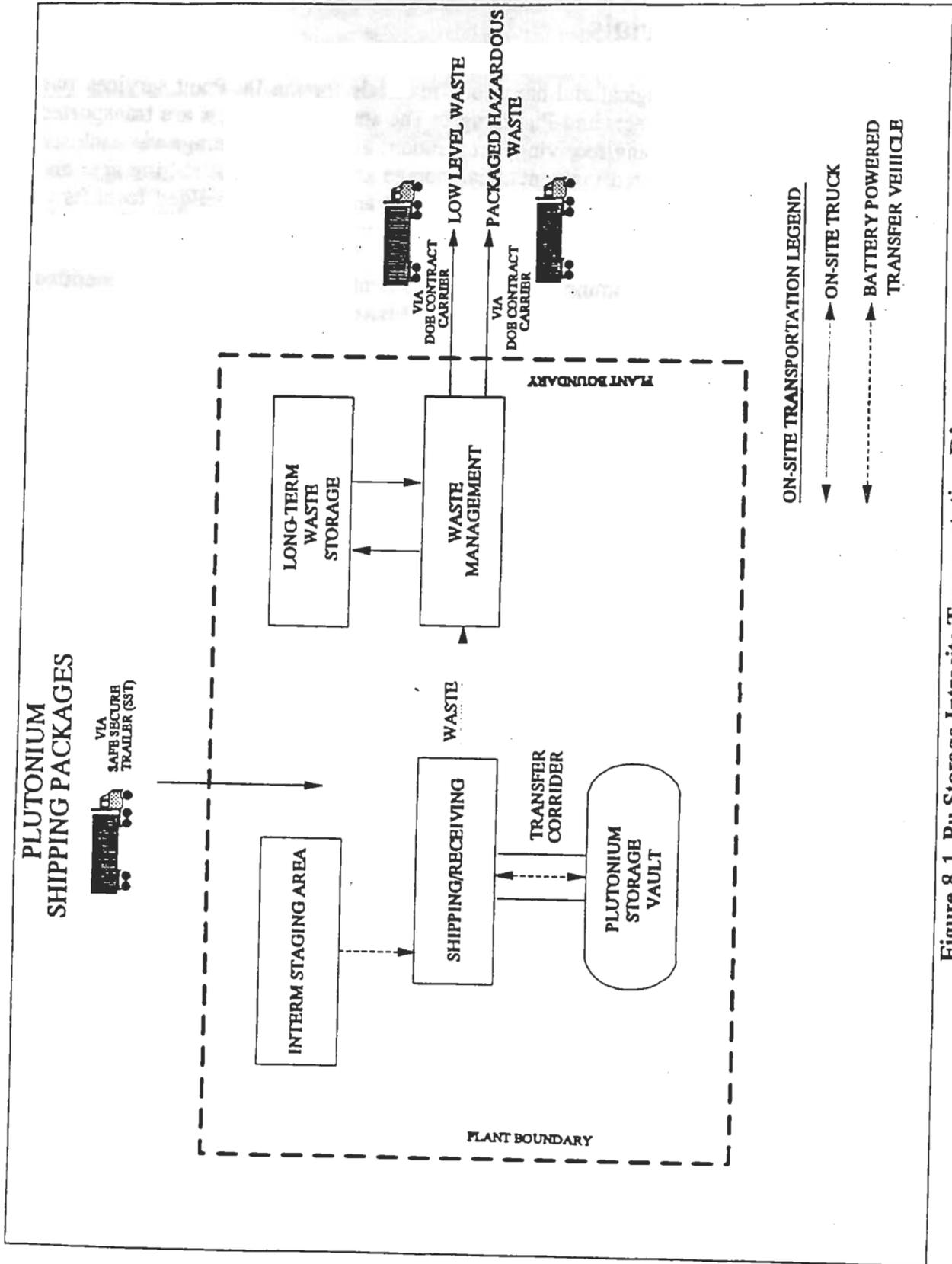


Figure 8-1 Pu Storage Intrasite Transportation Diagram

9.0 References

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Data Report on Plutonium Plant, Fluor Daniel, Inc., Programmatic Environmental Impact Statement, April 1993.

Design Criteria Manual, Weapons Complex Reconfiguration Program, Fluor Daniel, Inc., June 1993.

Memorandum from J.L. Brennan, Fluor Daniel, Inc., transmitting Upgrade Assumptions, Nov. 1993.

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CFE	Critical Flood Elevation
Ci	Curie
CRT	Cargo Restraint Transport
D&D	Decontamination and Decommissioning
DBA	Design Basis Accident
DBE	Design Basis Earthquake
DBFL	Design Basis Flood
DOE	Department of Energy
DOT	Department of Transportation
DR-CT	Digital Radiography-Computer Tomography
EDE	Effective Dose Equivalent
EEO	Equal Employment Opportunity
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
ESF	Engineered Storage Fixture (A fixture which is attached to the primary container prior to storage in the vault.)
ES&H	Environmental, Safety, and Health
EM	Environmental Management
FSAR	Final Safety Analysis Report
g	Gram
HE	High Explosives
HEPA	High Efficiency Particulate Air
HP	Health Physics
HVAC	Heating, Ventilation and Air Conditioning
IAEA	International Atomic Energy Agency
IEEE	Institute of Electrical and Electronic Engineers
kWH/y	Kilowatt hours/year
kg	Kilogram
LA	Limited Area
l	Liter
LLW	Low Level Radioactive Waste

m³	Cubic meters
M&O	Management and Operating
MAA	Material Access Area
MC	Material Confirmation
MC&A	Material Control & Accountability
MW	Megawatts
MWh	Megawatt Hour
NDA	Nondestructive Assay
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NMP&M	Nuclear Materials Production and Manufacturing
NNM	Nonnuclear Manufacturing
NPDES	National Pollution Discharge Elimination System
NRC	Nuclear Regulatory Commission
NWCR	Nuclear Weapons Complex Reconfiguration
OSHA	Occupational Safety and Health Administration
PCV	Primary Containment Vessel
PA	Protected Area
PDC	Programmatic Design Criteria
PEIS	Programmatic Environmental Impact Statement
PIDAS	Perimeter Intrusion, Detection, and Assessment System
PPA	Property Protection Area
ppb	Parts per Billion
PPE	Personal Protective Equipment
ppm	Parts per Million
PSAR	Preliminary Safety Analysis Report
psia	Pounds per Square Inch Atmospheric
Pu	Plutonium
RCRA	Resource Conservation and Recovery Act
RD&T	Research, Development, and Testing
REACTS	Radiation Emergency Assistance Center/Training Site

SAR	Safety Analysis Report
S&S	Security and Safeguards
scf	Standard Cubic Feet
SIP	Stockpile Improvement Program
SNM	Special Nuclear Material
SST	Safe Secure Transport
SSCs	Structures, Systems, and Components
TASP	Technology Assessment Selection Panel
TID	Tamper Indicator Device
TRU	Transuranic
TSP	Total Suspended Particulate
VOC	Volatile Organic Compounds
UPS	Uninterruptible Power Supply
W76	Weapon Program designation for the warhead employed by the Trident I submerged launch ballistic missile
W78	Weapon Program designation for the warhead employed by the Minuteman III ballistic missile
W80	Weapon Program designation for the warhead employed by the cruise missile
W87	Weapon Program designation for the warhead employed by the Peacekeeper ballistic missile
W88	Weapon Program designation for the warhead employed by the Trident II submerged launch ballistic missile
WIPP	Waste Isolation Pilot Plant
°F	Degrees Fahrenheit

A.0 Design Process for Accident Mitigation

A.1 Background

The experience gained in the design, construction, operation, modification, and decommissioning of the facilities of the existing nuclear weapons complex will be utilized in the design process for the Pantex Pu Storage Upgrade. This information will also be employed in the safety assessment to better estimate performance and improve the safety of the Pantex Plant.

Safety analysis reports and Defense Programs safety surveys provide information from which bounding accident scenarios have been selected. Bounding accident scenarios are those accidents of a class involving a particular hazard and that result in the largest potential consequence for a particular accident initiator. These selected scenarios provide a vehicle for explaining how the application of current safety assessment methodologies, design criteria, and industry consensus codes and standards will be used to provide a modern weapons complex with design features that prevent or mitigate the consequences of these accidents. It is emphasized that the design process for the Pantex Plant will be comprehensive and evaluate a broad spectrum of hazards and accident initiators as well as design approaches to risk reduction. The safety analysis will include deterministic accident analysis as well as Probabilistic Risk Assessment (PRA).

A.2 Design Process/Safety Analysis

A.2.1 Pantex Plant

One of the major design goals for the Pantex Plant is to achieve a reduced risk to facility personnel and to public health and safety relative to that associated with similar functions at the existing nuclear weapons complex. This goal applies to the Pantex Pu Storage Upgrade. Significant changes exist between the current facilities design criteria and safety standards, which will reduce total risk to the public associated with operation of the Pu Storage Plant. These changes include:

1. Design to the current DOE structural and safety criteria
2. Small throughput, batch size, and inventories of certain hazardous materials
3. Elimination of some hazardous materials.

This will reduce potential off-site health effects if a significant accidental release were to occur.

The upgrade of Pantex will be designed to comply with current Federal, State and local laws, DOE Orders, and industrial codes and standards. This will provide a plant that is highly resistant to the effects of severe natural phenomena, including earthquake, flood, tornado, high wind, as well as credible events as appropriate to the site, such as fire and explosions, and man-made threats to its continuing structural integrity in the event of any credible accident or event, including an aircraft crash, if such an accident is credible at that site.

The Pantex Pu Storage Upgrade is currently envisioned to be larger in capacity than any of the existing Pu Storage vaults. Recent international agreements will significantly reduce the weapons stockpile. Weapons that are now deployed with the armed forces will be returned for disassembly and their Pu components eventually placed into storage. This creates the need for a larger storage capacity than presently exists. From a risk viewpoint, a larger stored inventory of Pu incremental increases the risk of an accidental release. Therefore, the storage facility will be modularized and compartmentalized to limit the worse case consequences of any specific accident. The design of the storage facility will result in a public risk that complies with established DOE design criteria. It will also incorporate up-to-date safeguards and security features to protect against theft and sabotage.

The design process for the Plant will comply with the requirements for safety analysis and evaluation in DOE Orders 4700.1 and 5480.23. These orders require that the safety assessment be an integral part of the design process to ensure compliance with all DOE safety criteria by the time the facilities are constructed and in operation.

The safety analysis process begins early in conceptual design with identification of hazards having the potential to produce unacceptable safety consequences to workers or the public. As the design develops, failure mode and effects analyses are performed to identify equipment or human failures, or external events, with the potential to release hazardous materials. The events considered include industrial explosion, fire, earthquake, tornado, flood, spills, and aircraft crash. These potential events become focal points for design changes or improvements to prevent, or lessen the likelihood of, undesirable accidents. These analyses continue, as the design progresses, and eventually event tree and fault tree analyses are generated to better understand the estimated frequency of occurrence of accident scenarios. Deterministic safety analyses are performed to assess the need for safety class equipment to mitigate the effects of the accident scenarios and to assess the performance of this equipment in accident mitigation. Eventually, the safety analyses are formally documented in a safety analysis report and in a PRA. The PRA documents the envelope of frequency versus consequence for an entire spectrum of accidents which will help to identify where design improvements can be made to maintain this risk envelope within acceptable bounds.

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The first Safety Analysis Report (SAR) is completed at the conclusion of conceptual design and includes identification of hazards and some limited assessment of a few, enveloping design basis accidents. This analysis includes deterministic safety analysis and failure modes and effects analysis of major systems. The preliminary safety analysis report (PSAR) is started during preliminary design. A detailed and comprehensive PSAR is completed by the completion of detailed design and provides a broad assessment of the range of design basis accident scenarios and the performance of equipment provided in the facility specifically for accident consequence mitigation.

The safety review of this report and the supporting PRA is completed, safety issues resolved, and commitments accepted before initiation of facility construction. A final safety analysis report (FSAR) is produced that includes documentation of safety-related design changes during construction, and the impact of those changes on the safety assessment. It also includes the result of any safety-related research and development that has been performed to support the safety assessment of the facility. Final approval of the FSAR is required before the facility is allowed to commence operation.

A.2.2 Pu Storage Plant

The design of the Pantex Pu Storage Upgrade will consider a broad range of accident scenarios. As a result of the design process, the Plant may include design facilities to mitigate the effects of the scenarios considered in the safety analysis of existing facilities. The effect of each of the above-identified scenarios are:

Aircraft Crash and Fire

A severe accident that will be considered in the siting and design of the Pantex Pu Storage Upgrade is the crash of a large aircraft into the facility. Such an event may have the potential to disperse significant quantities of stored or in-process materials. The likelihood and frequency of such a crash is strongly dependent upon the location of the plant site and will be considered in the safety assessment. The design of the facility will ensure that the public risk from an aircraft crash into the building is in compliance with DOE guidelines. Unless the risk analysis demonstrates that the risk from an aircraft crashing into the facility is less than the threshold for credible events, potential aircraft crashes will be considered among the man-made missiles that structures will be designed to withstand.

Criticality

The Pantex Pu Storage Upgrade will incorporate design features to prevent a criticality by limiting mass, shape, and geometry of nuclear material; and by designing plant features to mitigate the potential for a criticality, even if two unlikely, independent events were to occur. The Pantex Pu Storage Upgrade will be designed to maintain structural integrity for severe, rare earthquakes, large fires and design basis accidents, including accidental criticality. The structural design criteria will be more stringent than those used for the existing facilities. The effects of a large aircraft crash will also be considered in the criticality analysis and the design of the Pantex Pu Storage Upgrade. For plutonium-containing solutions and solids, the plant will rely on geometrically-favorable design and will be designed with favorable geometry, storage racks, transfer systems, criticality favorable enclosures, fixed neutron absorbers, and administrative controls, in order of preference.

Overpressurization

The Pantex Pu Storage Upgrade facility will only accept material that has been certified as being chemically stable before shipment to the plant. Several steps are being considered for assuring the long-term stability of stored Pu and, therefore, minimizing the likelihood of an overpressurization incident. Parameters for safe storage, such as chemical form and concentration of impurities, are being defined. Items to be stored would then be tested to make certain that they are within the safe storage parameters. Also, storage conditions necessary to ensure safe long-term storage (e.g. temperature) would be defined and the vault designed to maintain these conditions. During storage, containers would be statistically sampled and tested for container integrity and leakage and radiographed to ensure stability of the stored items. Finally, the containers in which Pu will be stored are expected to be quite robust; they are not expected to rupture at pressures to which they are likely to be exposed. The design process will include a comprehensive assessment of possible accident scenarios involving material in storage. Mitigating design features will be incorporated as required by the safety analysis.

Fire

The automatic sprinkler systems located in the Pantex Pu Storage Upgrade will be safety class to insure their operability and to minimize the possibility of a release due to fire. In the event the loading dock system is taken out of service, compensatory measures (e.g. constant fire watch) would be implemented.

The site will have its own fire department and trained fire brigade to respond to all fire emergencies, thus minimizing the response time and minimizing the size of the fire.

In addition to the automatic sprinkler systems, the Pantex Pu Storage Upgrade will have smoke detection systems installed throughout the facility.

In the unlikely event that all active fire detection and suppression systems are simultaneously removed from service, the building will be designed with passive fire rated barriers to withstand the maximum possible fire and contain the fire within the given compartment.

A.2.3 Safety Goal

The Pantex Pu Storage Upgrade Plant will provide a level of public health and safety superior to that experienced for facilities of the existing nuclear weapons complex. DOE has adopted two quantitative safety goals to limit the risks of fatalities associated with its nuclear operations. These goals are the same as those established for nuclear powerplants by the Nuclear Regulatory Commission (NRC) and, like the NRC goals, should be viewed as aiming points for performance. The goals are:

The risk to an average individual in the vicinity of a DOE nuclear facility for prompt fatalities that might result from accidents should not exceed one-tenth of one percent (0.1%) of the sum of prompt fatalities resulting from other accidents to which members of the population are generally exposed. For evaluation purposes, individuals are assumed to be located within one mile of the site boundary.

The risk to the population in the area of a DOE nuclear facility for cancer fatalities that might result from operations should not exceed one-tenth of one percent (0.1%) of the sum of all cancer fatality risks resulting from all other causes. For evaluation purposes, individuals are assumed to be located within 10 miles of the site boundary.

REFERENCES

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3. Final Safety Analysis Report, Building 371, EG&G Rocky Flats, Inc., June 1981.
4. Final Safety Analysis Report, Building 779, EG&G Rocky Flats, Inc., Revised June 1987.
5. Safety Analysis Report Addendum-200 Area, Savannah River site, Separations Area Operations Storage of Plutonium in the 247-F Facility; DPSTSA-200-16; Addendum, Westinghouse Savannah River Company, April 1992.
6. Safety Analysis-200 Area, Savannah River Plant Building 235-F Vaults; DPSTSA-200-10, Sup-15, E.I. du Pont de Nemours and Co., August 1986.
7. U.S. Department of Energy "Nuclear Safety Policy", SEN-35-91.

