DOE/EH-0525

2

Highly Enriched Uranium Working Group Report

on

Environmental, Safety and Health Vulnerabilities Associated with the Department's Storage of Highly Enriched Uranium

Volume II: Number 9

Pantex Plant

Working Group and Site Assessment Team Reports

U.S. Department of Energy

December 1996

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WORKING GROUP AND SITE ASSESSMENT TEAM REPORTS
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PART A

WORKING GROUP ASSESSMENT TEAM REPORT

DEPARTMENT OF ENERGY

HIGHLY ENRICHED URANIUM ES&H VULNERABILITY ASSESSMENT

WORKING GROUP ASSESSMENT TEAM REPORT

PANTEX SITE

JUNE 1996

From: L. C. Phillips, Classification
PX/710

Subject: Review of the Highly Enriched Uranium Vulnerability Assessment

To: Michael K. Hooper, WGAT HEU Team Lead

A review of the Highly Enriched Uranium Assessment performed by the Amarillo Area Office and Pantex (dated June 1996), and the assessment performed by the Department of Energy Team headed by M. K. Hooper, have been reviewed and are Unclassified and not UCNI.

The same determination applies to associated photographs and viewgraphs.

L. C. Phillips
Classification Office

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ACRONYMS

AAO	Amarillo Area Office
ALARA	As Low As Reasonably Achievable
BC	Back Course
BIO	Basis for Interim Operation
CAM	Continuous Air Monitor
CSA	Canned Sub-assembly
CSS	Critical Safety System
CSSM	Critical Safety Systems Manual
DBE	Design Basis Earthquake
DNFSB	Defense Nuclear Facilities Safety Board
DOE	Department of Energy
DOP	Dioctyl - Phthalate
DP	Defense Programs
EH	Environment, Safety and Health
EIS	Environmental Impact Statement
EMD	Emergency Management Department
EOC	Emergency Operations Center
ES&H	Environment Safety & Health
FAA	Federal Aviation Association
FMEA	Failure Mode/Efforts Analysis
FSAR	Final Safety Analysis Report
GPS	Global Positioning System
HE	High Explosive
HEPA	High Efficiency Particulate Air (Filter)
HEU	Highly Enriched Uranium
HIT	Hazard Identification Team
HVAC	Heating, Ventilation, and Air Conditioning
JCO	Justification for Continued Operation
LANL	Los Alamos National Laboratory
LCO	Limiting Conditions for Operations
LLNL	Lawrence Livermore National Laboratory
MAA	Material Access Area
MC&A	Material Control and Accountability
MCE	Maximum Credible Earthquake
MCNP	Monte Carlo Neutron/Proton
MIP	Maintenance Implementation Plan
MSL	Mean Sea Level
NESS	Nuclear Explosive Safety Study
NFPA	National Fire Protection Association
NRC	Nuclear Regulatory Commission
O&I	Operations and Inspections
ORRs	Operational Readiness Reviews
OSHA	Occupational Safety and Health Act
OSRs	Operational Safety Requirements
PMT	Post Maintenance Testing
PNL	Pacific Northwest Laboratory
POD	Plan-of-Day
PSS	Plant Shift Superintendent

Ju

EXECUTIVE SUMMARY

Based on the site visit and walkdowns, the Pantex Highly Enriched Uranium (HEU) Environment, Safety, and Health (ES&H) Vulnerability Assessment Working Group Assessment Team (WGAT) found the Site Assessment Team (SAT) report and question sets to be a factual assessment of the facilities.

As a result of the SAT and WGAT's reviews, five (5) ES&H vulnerabilities (two by the SAT and three (3) by the WGAT) were identified for further consideration by the Department of Energy (DOE) HEU Vulnerability Steering Working Group preparing the final report. The vulnerabilities identified by the SAT and WGAT are described below. No ranking or priority is implied by the order in which the vulnerabilities are listed. In addition, the WGAT has included issues for consideration by the Pantex Plant and DOE management.

The vulnerabilities identified by the SAT and WGAT are summarized below. The vulnerabilities are also included as Appendix C, Vulnerability Assessment Forms.

#Pantex Site/Magazines-Bays/SAT 1/WGAT/1

The WGAT concurs with the findings of the SAT Vulnerability, Pantex Site, SAT 001 regarding Aircraft Crash into Zone 4 or Zone 12.

#Pantex Site/Cells/SAT 2/WGAT/2

The WGAT concurs with the findings of the SAT vulnerability Pantex Site,SAT 002. Additional, leak paths were identified through blast valves.

#Pantex Site/Plant/WGAT/3

Pantex needs to analyze the potential for accidental HEU release from CSAs.

#Pantex Site/Plant/WGAT/4

Pantex needs to improve and implement functionality testing and calibration procedures for alpha Continuous Air Monitors (CAMs), a critical safety system.

#Pantex Site/Staging Bays/WGAT/5

Lack of approved shipping containers results in HEU remaining onsite longer and workers handling canned sub-assemblies (CSAs) twice.

Magazines

The WGAT reviewed the SAT response to the question set and found the response to be accurate. The team conducted a walkdown of a representative number of the 11 HEU magazines used for HEU storage and found the general conditions to be exceptional. No vulnerabilities were identified by the WGAT.

Staging Facilities

The WGAT reviewed the SAT report and found the responses to be accurate. The WGAT conducted a walkdown of all of the five (5) bays used for storage of HEU and did not identify any vulnerabilities.

Cell Facilities

The WGAT reviewed the SAT response to the question set and conducted a walkdown of a majority of the four (4) cells currently used for HEU operations. The WGAT concurs with the SAT Vulnerability, Pantex Site, SAT 002 regarding Potential for Higher Release Consequences due to increased leakage paths in the cells. The WGAT identified one (1) additional potential leakage path from the cells to be included in this vulnerability.

No additional vulnerabilities were identified.

Bays

The WGAT reviewed the SAT response to the question set and conducted a walkdown of 25 percent of the eight (8) bays where HEU operations are currently conducted. The WGAT did not identify any vulnerabilities.

Transportation (Intra-Plant)

The WGAT reviewed the SAT response to the question set and conducted assessment of the transportation equipment and documentation.

No additional vulnerabilities were identified.

Sources

The WGAT reviewed all holdings of sealed sources onsite. The site has recently inventoried and consolidated all of its sealed sources. Nine (9) sealed sources exist onsite that have HEU as their major component. All are kept in one facility, in a locked file cabinet. This cabinet is located in a locked, "Sealed Source" room which has limited personnel access. The team agrees that there are no vulnerabilities associated with the sealed source holdings.

Other Issues

The following, although not explicitly HEU ES&H vulnerabilities, represent issues which the WGAT wanted to identify for future consideration by the Pantex Plant and DOE management.

- Inconsistency in Plant Standards and Procedures related to responsive action taken while transporting nuclear components or explosives during abnormal weather condition.
- Lack of establishment of combustible loadings for non-nuclear facilities/ areas.
- Shortage of Radiation safety technicians.
- High Explosive (HE) detonation probabilities for cell disassembly operations.
- Potential inadequacy of criticality safety documentation and its independent review.

Noteworthy Practices

Finally, noteworthy and good Conduct of Operations practices found at the Pantex Plant are documented in Section 4.0.

1.0 INTRODUCTION

On February 22, 1996, Department of Energy (DOE) Secretary Hazel R. O'Leary commissioned a comprehensive assessment to identify and prioritize the environment, safety, and health (ES&H) vulnerabilities that arise from highly enriched uranium (HEU) in the DOE facilities and determine which are the most dangerous and urgent. The ultimate goal of this assessment is to facilitate the safe and stable interim storage and handling of HEU materials held by the Pantex Plant.

The assessment was commissioned because of general concerns over increasing inventories of HEU, concerns regarding deficiencies in criticality safety programs and storage in process, concerns regarding aging facilities and loss of experienced people, and degradation of packaging. Overall Pantex holds approximately 16.7 metric tons of HEU, the exact amount fluctuates depending on the internal operations at Pantex and ability to ship materials to other sites for processing. Pantex performs no processing activities for HEU. The Pantex assessment included 28 facilities and employed a Working Group Assessment Team (WGAT) process. The HEU Working Group combined the talent of DOE Federal staff, operating contractors, and consultants. Stakeholders participated in the process. The WGAT developed plans and technical approaches for the Pantex assessment and evaluated and validated the assessment results.

At the beginning of the assessment, it was established and agreed that the scope of the HEU assessment would be divided into the following grouped areas. None of the grouped areas are partitioned.

- magazines
- staging
- bays
- cells
- transportation onsite
- sources

Further, it was agreed, that composite pits were excluded from the assessment since these materials were assessed during the prior nationwide Plutonium (Pu) assessment.

The Draft Site Assessment Team (SAT) Report was prepared by the local DOE - Amarillo Area Office (AAO) and Pantex Plant contractor staff. The objective of the SAT was to perform a self-assessment of their operations and facilities and to identify ES&H vulnerabilities concerning the handling and storage of HEU. The Draft SAT Report was provided to the WGAT prior to the WGAT arrival at the Pantex Site.

The objective of the WGAT was to review, evaluate and validate information presented in the Draft SAT Report, to walkdown HEU operations and facilities, and to identify additional HEU ES&H vulnerabilities and issues, if necessary.

In performing its objectives, the WGAT ensured that the SAT was fully involved in the assessment process and reviewed all WGAT conclusions for factual accuracy. Both AAO and Pantex management were afforded an entrance and closeout briefing by the WGAT prior to release of any WGAT report data.

The HEU WGAT assessment at the Pantex Plant was conducted June 11-27, 1996. The Pantex operational and facilities HEU assessment consisted of specific walkdowns of a significant sampling of all Pantex HEU facilities, a crosscut walkdown of a weapon disassembly and HEU canned sub-assembly (CSA) removal through staging operations, and discussions with Pantex staff regarding similarities of facilities for those HEU facilities not physically visited.

A list of WGAT visited HEU facilities were:

•	Zone 4 Magazines	2 of 11 HEU, 1 empty
•	Staging Building 12-58	2 of 2 HEU bays
	Building 12-60	3 of 3 HEU bays
•	Cells Building 12-44	1 of 1 HEU cell
	Building 12-85	1 of 1 HEU cell and 1 other vacant cell
	Building 12-96	0 of 1 HEU cell
	Building 12-98	1 of 1 HEU cell plus 1 additional cell
•	Bays Building 12-64	1 of 3 HEU bays

disposal. The inventory contains both sealed and unsealed HEU sources.

3.0 EVALUATION OF SITE TEAM REPORT AND SITE TEAM VULNERABILITIES

In order to assess the Pantex facilities in a timely manner and to validate the contents of the Draft SAT Report and question set responses, the WGAT first developed a list of specific concern areas, categorized the concerns into subcategories, and divided the WGAT into four subteams:

- Subteam 1 - Management barriers, procedures and organization.
- Subteam 2 - SAT Question Set response and Transportation
- Subteam 3 - HEU Facilities Operations, Maintenance, Barriers
- Subteam 4 - Materials and Sources

The team members interacted with designated Pantex counterparts including facility managers, SAT Report authors and other experts to address WGAT questions and issues. A summary evaluation of each assessed area is provided in the following sections.

3.1 Crosscutting Areas

The WGAT assessment and findings or issues included in this section, crosscut more than one of the grouped areas identified as in-scope in this WGAT report.

3.1.1 Storage Container Review

The general issue of shipping and staging containers was reviewed for weaknesses that may lead to longer than necessary storage onsite and workers handling CSAs twice. The WGAT found that, due to lack of approved shipping containers, the workers are exposed to a small increase in radiation dose and the chance of industrial accident is higher. See WGAT vulnerability #5, Appendix C.

3.1.2 Review of HEU related program activity

The WGAT followed a weapons disassemb process from the removal of the CSA to th placing of the CSA into the staging area rea for shipment. It was observed that procedure relating to all disassembly activities a excellent. Workers cut no corners whe procedures were concerned while working wi any of the materials or conditions presented the process. Once loaded into an approv shipping container, the CSA is loaded and tak to a leak test bay where the container is test for appropriate sealing. Again the practic observed while moving the unit on a forklift a the testing activities were noteworthy. The u was then moved with

similar care to the staging bay for fut shipment. This cradle to grave assessm yielded no vulnerabilities or issues.

3.1.3 Ventilation System/HEPA Filters

The Pantex Plant Basis for Interim Operat (BIO) and Critical Safety Systems Ma (CSSM) designate the ventilation systems associated intake and task exhaust Efficiency Particulate Air (HEPA) filters as c safety systems for defense-in-depth purp Ventilation systems for cells and bays three (3) alarm interlocks that affect operati the ventilation system and trigger evacuat workers. A high alpha alarm indicatin contamination shuts off both the intake an exhaust fans to isolate contamination involved cell or bay. In selected locations uranium is the principle risk, the Continuous Air Monitor (CAM) would m uranium contamination. A high beta indicating tritium release takes precedenc an alpha alarm, shuts down the intake f turns on the task exhaust fan to remove from the cell or bay. A fire alarm precedence over both alpha and beta and shuts down both the intake a exhaust fans. If the ventilation syster operable or fails during an asse disassembly operation, the CSSM operations to cease any current action a the cell or bay into a safe an configuration.

The CSSM also requires annual Dioctyl - Phthalate (DOP) testing of the intake and task exhaust HEPA filters. Because routine operations are not expected to involve contamination, the ventilation system normally operates in the recirculation mode with the task exhaust system turned off and the intake fan providing only a small amount of makeup air. The primary safety function of the intake ventilation system is to provide mitigation of consequences to workers in adjacent cells or bays if explosive dispersion of radioactive material occurs. The primary safety function of the task exhaust system is to mitigate potential consequences of a tritium release to workers within the involved cell or bay.

Walkdown of the ventilation systems and discussions with operations personnel found no issues or vulnerabilities related to HEU with respect to ventilation systems and HEPA filters.

3.1.4 Aircraft Crash

SAT Vulnerability #Pantex/Site/SAT/001

The SAT vulnerability due to aircraft crash probabilities for Zones 4 and 12 was cited by the SAT as a weakness which would cause the probability for an explosive dispersal of HEU (or Pu) to be higher than previously calculated ($<10^{-6}$/year). The new draft Environmental Impact Statement (EIS) indicates the crash probability to be about 2.9×10^{-5} events/year for Zone 4 and 2.4×10^{-5} events/year for Zone 12. These probabilities are primarily derived from historical crash site data in the vicinity of U.S. airports and from the enroute crash history per mile for each category of aircraft.

The probabilities which result from studies, new and old, are a consequence of the input assumptions to the models. The newer draft EIS study, uses conservative input assumptions in series which resulted in an increase in the crash probability by about a factor of 10. The input assumptions are discussed in Appendix G.

The consequence analysis of an aircraft crash into a Zone 4 Magazine indicates that the crash probability would have to increase by three orders of magnitude (by 1000) before an increased cancer risk to an individual from Pu dispersal would exceed 0.1% of the individual's normal risk. The risk contribution from HEU would be much less than from Pu by a factor of 3000 on a mass equivalent basis.

The Safety Analysis Report (SAR) for Zone 4 of the Pantex Plant was updated by Battelle Pacific Northwest Laboratory (PNL) in 1992. That report indicated that an aircraft crash scenario resulting in the release of respirable Pu was incredible (probability $<10^{-6}$/yr). Subsequently, Sandia completed a report on Pu dispersal consequences in which an aircraft crash was assumed to cause a dispersal from a Zone 4 Magazine. For this analysis two cases were considered: (1) the burning of aircraft fuel with Pu; and (2) the HE assisted dispersal of Pu from impacted assembled nuclear weapon devices. This classified study concluded that the risks of increased latent cancer fatalities was negligible for both cases when compared to the criteria given by the Nuclear Regulatory Commission (NRC) (NUREG-1150 of 1991). That criterion is basically that the increased cancer risk from a nuclear facility per individual should not exceed 0.1% of the existing (everyday) risk from cancer. Given a 10^{-6}/year probability of the aircraft accident, the reported results yielded a risk which was three (3) orders of magnitude less than the above cancer risk criteria.

The Sandia results were further confirmed at the request of DOE/DP-62 in an independent analysis of consequence calculations completed by DOE consultants.

The WGAT team agrees with the SAT vulnerability assessment that the event is considered to be extremely unlikely with a probability of approximately 10^{-5} per year that an aircraft may crash anywhere in Zone 4 or Zone 12. It is not expected to occur in the lifetime of the facility. This vulnerability is of low relative consequence.

3.2 Zone 4 Magazines

101, 108, 118, 127, 130, 131, 133, 135, 137, 141, and 142

The WGAT reviewed the SAT response to the question set and found the responses to be accurate.

All of the HEU is contained in CSAs or pits. No processing or assembly/disassembly operations are allowed; the magazines are a secure storage area for intact weapons and containerized components. This area is strictly a warehouse area.

Three (3) Zone 4 HEU approved Steel Arch Constructed (SAC) magazines were walked down by the WGAT. One (1) was empty and two (2) contained intact weapons, containers of CSAs and one (1) pit stored in a single planar array on the floor. The weapons and other containers were in good repair with no external evidence of corrosion. The concrete floor was dry and no evidence of water seepage on the interior are of the magazine or the floor was noted. The steel doors are protected externally

WGAT for

3.3 Stag

The SAT Re essment for the Staging Bays in Bu and 12-60 are accurate. A walkdo ng 12-58, Bay 4 and Building 12 erified that material limits were being tracked and monitored per administrative limits and that CSAs were being staged in approved containers. In addition, the WGAT walked down the movement of a CSA, and observed the DT-23 shipping container with the CSA inside transported into Building 12-58, Bay 5 for staging.

The corrugated metal ramp outside of Building 12-60, that deformed and cracked because of excessive foundation settlement, was also observed. (has been i loads caus ramp and framework measured through t because o framewor condition

As stated in the SAT report, there no radiation monitoring systems in (2) buildings so, in the event material release were to occur, i detected. However, an event su puncturing an 8000 series cont unlikely because damage would h the CSA, inner container, and out leakage to occur and at most would be localized. Interim stag HE in Building 12-54, Bay 14 wh been approved per PX authorizes up to 300 lbs. of HE SIO administrative limits an because this building does not interlocks. This Unreviewed Determination (USOD) was accommodate both limited quant containers available for one sp weapons program and awaiting a shipping container for and program.

Staging of HEU as pits or CSA also authorized in magazines material limits and the us containers. Discussion with indicate that the long term pl CSAs out of the magazines into

The vulnerabilities associated facilities are the same as tho Vulnerability Assessment Form which is associated with the lo integrity due to an aircraft cras

3.4 Cells

Buildings 12-44, Cell 4, 12-85, C 12-98, Cell 3

The members of the WGAT Buildings 12-44 (Cell 6) and 12-

subjected to adequate functional tests. This vulnerability is further discussed in Section 3.8.4 and Appendix C. Further, a generic issue regarding the lack of quantitative limits that define minimal and excessive combustible loading was developed and is described further in Section 3.8.8.

A walkdown was performed in Building 12-99, Bay 8 which is a typical assembly/ disassembly Bay. The Bay is allowed up to 300 pounds of HE. The Bay has a deluge type sprinkler system that provides fire protection.

The same CAM and aircraft crash vulnerabilities identified for Building 12-64, Bay 14 exist for this Bay and are discussed further in Appendix C. Also, the generic issue of combustible loading, as discussed for Building 12-64, Bay 14 is applicable for this bay and is discussed further in Section 3.8.8.

A summary of the WGAT assessment for Bays includes the identification of one vulnerability regarding CAMs and validation of one SAT identified vulnerability regarding Air Crash. In addition, the WGAT identified one issue regarding combustible loading limits.

3.6 Onsite Transportation

The transfer of nuclear components or explosives within the Plant is governed by requirements in several plant standards and operating procedures. Transportation management and the Plant Shift Superintendent (PSS) had a clear understanding of the actions to be taken with respect to the transport of nuclear explosive and nuclear components during tornados, electrical storms and severe weather alerts or actual conditions. However, the standards do not address this uniformly. It is stated in STD-3161 that for lightning warnings "trucks enroute with explosives or nuclear explosives continue to their destination." However, for tornadoes they do not address the requirements placed on transportation. In STD-3160 on Tornado Evacuation Procedures, the transportation requirements are not addressed.

The STD-3160, July 7, 1993, has specific requirements for the PSS during tornados while STD-3161, January 11, 1996, contained specific requirements for the Occurrence Management Department but not the PSS. In the BIO, Rev. 3, November 3, 1995, the risks for postulated accidents are shown in Table F-5. The assumption for a tornado is that the "consequence (is) based on administrative control that no transportation activities take place when tornado warnings are present." This does not address the issue where the hardened truck is caught between zones when either an alert or an actual tornado occurs.

To determine the safety risk for onsite transportation, the Transportation Facility Manager shall evaluate on a case-by-case basis the transport of explosives during inclement weather. Vehicles enroute with nuclear explosives when inclement weather strikes may continue to their destination before ceasing operations. Again, no generic or specific guidance is given for transfer between zones if a tornado alert or actual tornado occurs.

With respect to providing actual warnings about severe weather and tornadoes, the Emergency Operations Center (EOC) is well equipped with many systems to aid in identifying and notifying the plant staff and management and the PSS understands the systems and his responsibilities very well.

The nuclear explosive safety study (NESS) for general-use handling and transportation equipment was reviewed to validate the conclusions in the authorization basis with respect to onsite transportation of HEU. It was noted that the aforementioned NESS listed several recommendations with respect to a postulated accident involving impact of the tractor trailer with onsite energy sources (i.e., fuel oil tanks, a natural gas tank, natural gas piping, etc). The NESS recommended that this hazard be reassessed, that isolation measures be identified, and that an action plan for implementing any new or improved isolation measures be developed. Subsequent to this, a General Plant Project was prepared. approved, and completed that implemented an upgrade to isolate the fuel sources in front of the steam plant from the roadway. A tour of the transportation route found that a concrete barrier now exists adjacent to the roadway in front of the steam plant to prevent tractor trailer impacts with nearby fuel oil and natural gas sources.

In summary, the WGAT assessment of transportation concludes that there were no associated vulnerabilities but one issue regarding procedures and appropriate guidance was noted.

3.7 Sources

The WGAT reviewed all holdings of sealed sources onsite. Sealed sources exist onsite that have HEU as their major component. The site has recently inventoried and consolidated all of its sealed sources. All are kept in one facility, in a locked file cabinet. This cabinet is located in a locked, "Sealed Source" room which has limited personnel access.

The team agrees that there are no vulnerabilities or issues associated with the sealed source holdings.

The WGAT reviewed the question set response for the Pantex Site and found no significant issues regarding their response.

Building 12-2 was visited by the WGAT where all HEU sealed sources were inspected. No vulnerabilities or issues were noted.

The WGAT finds no additional vulnerabilities associated with the HEU source holdings at the Pantex Site.

3.8 Pantex Plant Programs

3.8.1 Conduct of Operations

Implementation of a formal, well-defined Conduct of Operations program is essential to maintaining a high level of performance and therefore contribute to safe and reliable HEU operations. A graded approach to Conduct of Operations is used at Pantex to assure resources expended are commensurate with potential impact. Conduct of Operations for direct work on weapons is outstanding. One violation in the facility maintenance area (dealing with post maintenance testing) was noted which contributes to the CAM vulnerability #4 and documented in Sections 3.5, 3.8.4 and Appendix C.

Pantex has a thorough Conduct of Operations Manual for implementation of and compliance to DOE Order 5480.19. In many cases the Manual exceeds the minimum requirements of the Order.

Disassembly and separation of an HEU containing CSA was observed by the WGAT. The procedure used was extremely thorough and procedure compliance very rigorous. A reader was employed to read each step and document completion. Work was stopped when shipping container bolts could not be removed by applying designated torque. Later, new shipping container fasteners were tested outside the radiation area and a problem identified and corrected before entering the radiation area which demonstrates good ALARA dose practices.

No Conduct of Operations vulnerabilities or issues were observed during the disassembly and transfer of the HEU CSA.

A Plan-of-day (POD) meeting was observed by the WGAT. The POD integrates all planned activities and potential interruption that would affect a facility during the next 24 hours. The meeting was efficiently conducted with broad attendance from affected groups and all present were well prepared to discuss issues and actions.

The WGAT witnessed a number of other instances where good Conduct of Operations are employed. Some of these include: duties and responsibilities of the PSS, operator aid postings, equipment and pipe labeling, and communications. The Conduct of Operations is an effective program at Pantex.

A review of Pantex Plant standards and directives found that a formal, documented configuration management program is required for plant systems that help prevent or mitigate potential releases of HEU. This program includes provisions for updating as-built drawings for each Critical Safety System (CSS) covering associated design requirements and design bases, developing system design description documents for each CSS, and managing modifications to these systems. Updating CSS engineering drawings and design requirements/bases are approximately 86 percent complete. Development of related system design description documents is about

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Cells:

The cells containing HEU components in Buildings 12-44, 12-85, 12-96 and 12-98 were originally designed for a DBE of $0.085g_o$. This is less than the acceleration of $0.13g_o$ currently recommended for the DBE in DOE-STD-1020-94. The maximum credible earthquake is $0.33g_o$. During SAR preparation, analyses conducted for both the DBE and MCE indicated that no failure will occur during a seismic event.

Bays:

The bays approved for HEU operations are located in Buildings 12-64, 12-84, 12-99 and 12-104. These buildings were originally designed for a DBE of $0.14g_o$. These four (4) buildings were analyzed for the DBE and MCE during SAR preparation. Analyses indicated that no failure of the buildings would result due to the DBE and MCE.

A walkdown of representative samples of Zone 4 magazines (107, 108, 131), staging bays (Bldg. 12-58, Bldg. 12-60), cells (Bldg. 12-44, Bldg. 12-85) and bays (Bldg. 12-64, Bldg. 12-99) did not reveal any visible seismic deficiencies or vulnerabilities. A review of the facility SARs also did not reveal any seismic deficiencies.

3.8.3.2 Tornado Assessment

The Pantex Plant is located in an area with a relatively high frequency of tornados. DOE-STD-1020-94 specifies a fastest-mile wind speed of 132 mph at a height of 10 m for Performance Category 3 facilities. (A fastest-mile wind speed of 132 mph is equivalent to a 150 mph tornado). The Pantex Facility Design Criteria Manual specifies wind speed for a moderate tornado as 150 mph and for a severe tornado as 250 mph. Damage from tornados is generally caused by high winds

and tornado-borne missiles. DOE-STD-1020-94 specifies the use of two missiles for a tornado analysis: a 15 lb 2 in. × 4 in. wooden plank and a 75 lb 3 in. dia. steel pipe.

Zone 4 Magazines:

SAR analyses indicate that the magazine structures would not fail as a result of a 150 mph or a 220 mph tornado, assuming that the magazine doors are closed during the event. Operating procedures require that the magazines be secured during the onset of severe weather. Thus, it is not considered credible that the magazine door is left open during a tornado.

Staging Bays:

SAR analyses indicate that Building 12-58 bay doors are susceptible to penetration by tornado generated missiles in the event of a direct hit. To release radioactive material a tornado generated missile would have to not only penetrate the doors of the bay but also hit and damage a nuclear explosive assembly. The combination of these events is categorized as "beyond extremely unlikely." Analyses for Building 12-60 indicate that bays are not vulnerable to the high winds or missiles that may be produced in a tornado.

Cells:

Analyses for the SAR show that the assumed missiles will penetrate the covering of the facility corridors but will not penetrate blast doors, concrete walls, or roofs of cells. Because the facility design incorporates features to protect against explosions, the cells are not vulnerable to the high winds or missiles that may be produced in a tornado.

Bays:

Bays have been analyzed for wind speeds of 150 mph and 250 mph for the Design Basis and Maximum Credible Tornado and the associated tornado generated missiles. The analysis shows that the assumed missiles will penetrate the covering of the facility corridors but will not penetrate blast doors, concrete walls, or roofs. Because the facility design incorporates features to protect against external explosions, the cells are not vulnerable to the high winds or missiles that may be produced in a tornado.

Transportation:

The covering over loading ramps and corridors in front of cells and bays is expected to fail during the design basis tornado. Operations and administrative controls that are in effect during a

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operating controls required by the BIO. When questioned during walkdown on their response relative to the condition of critical safety systems, personnel referred to Operations and Inspection (O&I) Standards with Limits and Action Statements flowing down from the BIO and CSSM. The BIO and O&I building standards that flow down authorization basis requirements are kept up to date by the application of the Pantex Plant USQ process.

With the exception of Buildings 12-64, 12-60, and transportation activities, which have no SARs, older SARs, not meeting 5480.23 requirements, are identified in the BIO for each of the HEU facilities. Pantex has an Implementation Plan (MNL-PX0005) for developing SARs and Technical Safety Requirements (TSRs) to meet DOE 5480.22 and DOE 5480.23 requirements. Draft SARs have been issued by Pantex for many facilities and are in the DOE review/approval stage.

The following discussions were based on WGAT review of the authorization basis documents including the older SARs, newer draft SARs, and USQ determinations:

- In the review of the USQ determinations, two USQDs related to potentially higher release consequences due to increased leakage paths from an explosion were identified. The first, addressed in PX-USQD-94-10, was initiated by the discovery of a blast valve that failed to latch during scheduled preventive maintenance. The safety evaluation in this USQD estimated (for the purpose of determining the safety classification of blast valves) that if the blast valve failed during an explosion in the cell, the offsite cumulative dose would increase by 2.5 times, thus requiring the designation of the blast valves as a safety class component.
  The discovery of a second increased leakage path is addressed in PX-JCO-5-003. A USQ determination was not prepared, but it was recognized that this issue involved a USQ because the consequences for a previously evaluated accident were increased, a malfunction of equipment important to safety was identified, and the implied safety margin was reduced. A Justification for Continued Operation (JCO) was written to limit cell operations and identify a list of actions to correct the situation.

  Since both these discoveries involve about the same magnitude of increase in leakage path, (75 sq in. for the blast valve, 45 to 140 sq in. for the door gap), the WGAT has identified the "blast valves" as an additional leakage path.

  The two leakage paths identified have been included as a WGAT vulnerability, the details of which can be found in Appendix C.

- The Pantex BIO, the new draft Cell SAR, and the SAT Report were reviewed with respect to the likelihood of HE detonation in cells during weapons disassembly operations. The BIO lists the annual frequency of occurrence of HE detonation during disassembly in cells as being extremely unlikely (10^{-4} - 10^{-6}). The new draft cell SAR shows the overall frequency of occurrence for HE detonation assuming 2000 disassembly operations per year as being 1.0×10^{-6}. The SAT Report estimates the frequency of HE explosion in total events per year to be less than 1×10^{-6} events per year (beyond extremely unlikely). Detailed safety studies conducted within the past year relative to cell disassembly operations for two (2) different weapons programs were reviewed in an effort to validate the above likelihood estimates. However, both of these studies lead to the conclusion that the annual frequency of HE detonation in cells, assuming between 100-200 disassembly operations in a year would be somewhere between 2×10^{-4} and 4×10^{-4} events per year. Extrapolating these estimates to the total number of disassemblies done per year in cells (i.e., assuming approximately 2000 operations similar to those evaluated in aforementioned studies) results in an estimated overall likelihood of HE detonation in cells to be somewhere between 2×10^{-3} and 4×10^{-3} events per year (i.e., unlikely). Nonconservatism in HE detonation likelihood estimates could result in decisions to allow larger quantities of material at risk in cells. If the aforementioned likelihood estimates were to be substituted for the 1.0×10^{-6} HE detonation frequency contained in the new draft cell SAR, several of the release

scenarios that are shown as beyond extremely unlikely or incredible would move to the extremely unlikely category.

Based on this review, the WGAT has identified the issue that the likelihood estimates for HE explosions in cells that are contained in authorization basis documentation may significantly underestimate the actual frequency of HE detonation within cells during weapons disassembly operations.

- A review of current and draft authorization basis documents found that the consequences of exposing CSAs to drops, fires, and transportation accidents have not been analyzed therein. As a result, events involving breach of CSA barriers have not been assessed to determine how workers should respond to potential HEU release scenarios. Classified studies done within the last year for specific weapons programs mention the potential for CSA drops but they do not carry the analysis to the point of postulating the likelihood and consequences to workers of potential releases of HEU that might be associated with such events. Since 1992, Pantex has had one (1) event where a CSA was dropped and one (1) near-miss. During the event in 1992 the CSA was not breached and no contamination was detected. (Los Alamos National Laboratory (LANL) was consulted concerning what actions were appropriate for this event). However, in the absence of any prior analysis of such an event, the potential existed for operating personnel to be exposed to radiological and chemical hazards that had not been adequately characterized within the authorization basis. Failure to perform analysis of the risk of accidents to workers involving the breach of CSAs constitutes a potential vulnerability with respect to consequences to workers. This vulnerability is further discussed in Appendix C as WGAT Vulnerability #3.

3.8.6 Criticality Safety

In the HEU assessments efforts, the WGAT references the "Criticality Safety" section of the Pu WGAT Report dated September 1994 for assessment regarding fissionable materials handled, staged, and stored at Pantex. Cursory review by the WGAT substantiated the Pu assessment except that for HEU, the WGAT does not have the concern expressed by the Pu WGAT that Pantex uses bounding generic criticality safety analysis and specific analysis for deviations of operations when required. The WGAT observed that Pantex does not allow operations without criticality safety analysis.

In addition, the HEU WGAT assessed the current Pantex staffing for criticality safety to ascertain if retirements or downsizing have affected Pantex capabilities. Based on the rationale that Pantex does not process fissile materials, that HEU is in encapsulated forms, and that Pantex main operations are assembly/disassembly, storage, and shipping three (3) full-time criticality safety analysts appears sufficient for the current workload even though the experience levels may not be ideal.

The assessment identified that there was no evidence of program delays, internal respons turnarounds were very good, and the program i well documented using sound safety evaluatio The staff appears pro-active during walkdown and production workers are permitted to input t the criticality safety studies. Pantex maintain an independent criticality safety committee th performs an annual program self-assessme related to the DOE/Pantex contact.

In performing this assessment, the HEU WG found no evidence of any HEU related critical safety vulnerabilities at the Pantex Plant. However, an issue has been identifi regarding documentation of double continger for criticality safety and independent reviews criticality safety related changes.

3.8.7 Maintenance

Proper maintenance of critical safety system HEU containing bays, cells, and magazine essential to assure protection of workers, public and the environment. The Par maintenance program has made signifi progress over the past few years tow improving the formality of maintenance implementation of the concept of DOE C 4330.4B. Many programs show evidenc excellence, however, other programs are fully implemented. (See item on lack of

the wood is either pressure treated for fire resistance or coated with a fire retardant material. Since the structure does not appear on any design drawings and has been attached to the exterior of cell, it is construed as a temporary structure.

The team went to Building 12-44, Cell 6, to view the gap reduction modifications installed for the equipment interlock doors. These doors are identified with exit signs as exit doors and a means of egress. With the installation of the modifications, the actions to operate these doors is not in compliance with NFPA-101, Life Safety Code. The non-compliance consists of having to perform two (2) functions to operate the door. NFPA-101 allows only one (1) function to be performed to activate an egress door. Further, if the incident causes failure of the air supply, these doors become inoperable due to the pneumatic switch that has been installed.

The WGAT assessment of HEU related to Conduct of Operations did not reveal any vulnerabilities but did identify one issue related to combustible loading.

3.9 Issues

Combustible loading is not adequately addressed. Pantex procedures don't provide quantitative limits for determining minimal or excessive combustible loading. Pantex procedures do not address the introduction of transient combustibles. A USQD is in formulation to address these issues.

Attrition in the staffing level of Radiation Safety Technicians may result in a growing backlog of routine surveys.

Potentially nonconservative estimates of the likelihood of HE detonation in cells during disassembly operations was identified as an issue. This issue is discussed in more detail in Section 3.8.5.

Although Transportation Management and the PSS have a clear understanding of the actions to be taken when transporting nuclear components and explosives during severe weather conditions, applicable standards do not address action taken in a consistent manner. For example, transportation requirements for action to be taken in the event of a tornado not addressed.

The SAT report in response to Question 2 barriers for all partitioned areas except Sou depends on the following classified docum (still unapproved and subject to an unrevie safety question determination by DOE): Pa Criticality Safety Program Analysis (U), Febr 28, 1996, Mason-Hanger Risk Manage Division (RMD). This document purport establish that a criticality event at Pant incredible but individual partition areas ar discussed therein. A discussion consid criticality safety related operations maximum likelihood of criticality in va partition areas would be prudent. Further above-mentioned criticality doc recommends removal of some very c restrictions that currently control operati the cells and bays at Pantex. The docume been reviewed by one of the two members Risk Management Division according internal procedure IP-8600 and there documentation of a Pantex independent It is recommended that the cognizant w laboratory be requested to provi independent review when important char proposed.

4.0 NOTEWORTHY PRACTICES

The following noteworthy practice observed during the HEU WGAT visit:

- Pantex Criticality Safety

  Pantex has a very proactive critica program that is well documented sound practices in safety ev Although the staff is limited, the safety staff should be commende successful efforts in their walkd the degrees to which they i workers in a criticality safety stuc

- Pantex Bio

  Pantex should be commended fo approved BIO as an Authorizat compliance with DOE Orders 5 5480.23. The BIO, along with provides a very workable chara the safety envelope establis

operations at Pantex and demonstrates good use of the USQ process.

- Pantex Maintenance Modeling

The Plant Maintenance Training Department has developed a very effective and inexpensive (<$10,000) simulator of the CSS alarm system. By combining out-of-service alpha and beta (Tritium) radiation monitors and spare parts, associated control systems and components and a mock-up of a cell or bay, Pantex has constructed an effective and inexpensive training tool for manufacturing and operations personnel, technicians and engineers.

This system is used to demonstrate the interrelationship between detection, alarm, ventilation and emergency actuation systems and to train personnel how to respond to alpha and beta radiation alarms and to safely evacuate the facility. The model is also used to teach personnel how to replace the radiation monitors and how to set their controls correctly. If engineers need to modify a given control system this simulator allows them to make the proposed changes and study their effects on the entire CSS.

- Pantex Safety Incentive Programs

The safety incentive programs at Pantex are highly commendable and exemplary models of employee involvement and management commitment. A few of the programs reviewed by the WGAT includes: Star Application for the VPP, the Safe Work Award Program (SWAP), and the Hazards Identification Teams (HIT).

The programs involve Pantex employees and unions. In May 1996 Pantex submitted to DOE-HQ its VPP Star Program application. The application manual was developed using significant employee involvement and the results of the program demonstrate that Occupational Safety and Health Act (OSHA) requirements are consistently being exceeded.

The VPP SWAP initiative has been approved by DOE as a two year pilot program. The program offers various levels of monetary rewards for both individual and group (plant employees) minimizing OSHA recordable, lost workday, and late reporting events.

The HIT performs an inspection quarterly and is comprised of plant employees who are volunteers for the team.

The enthusiasm and commitment to safety is truly outstanding. The WGAT supports the reward of the Star status to Pantex for the DOE-VPP.

- Pantex Hazard Analysis Methodology

The document entitled "Hazard Analysis for W55 Mechanical and Physics Package Disassembly" dated May 1995 was found to be an outstanding example of a hazards analysis. The detailed task-by-task analysis of the disassembly operation contained a clear picture of the hazards associated with each individual step in the disassembly process. The Failure Mode/Effects Analysis (FMEA) contained a concise rollup of the hazards identified in the task analysis. Finally, presentation of the descriptions, likelihood, and consequences of the dominant accident scenarios was clear and concise. This analysis provided an easily understood, quality, defensible approach for establishing the authorization basis for the operation being evaluated.

- Suspect/Counterfeit Parts Program

Pantex has a thorough Suspect/Counterfeit Parts Program. A Plant standard has been developed which established guidelines and responsibilities for the identification, evaluation, removal, and control of suspect/counterfeit fasteners. All load bearing areas of hoists/cranes and forklifts have been inspected and suspect/counterfeit parts have been replaced.

APPENDIX A

Working Group Assessment Team
Membership and Biographical Sketches

APPENDIX A

Working Group Assessment Team Membership and Biographical Sketches

Name	WGAT Expertise	Home Base
Sushil K. Bhatnagar	Criticality Safety	Headquarters
Eugene L. Bird	HEU	Oak Ridge
Ralph D. Crowe	Authorization Basis	WHC
Hans Dahlke	Seismic	Headquarters
Henry Harper	Crit. Safety, Safety Analysis	ANL, Idaho
Mike Hooper	Team Leader	DOE, Livermore
Darrell Huff	HVAC/Authorization Basis	Headquarters
Brent Ives	Deputy Team Leader	LLNL
John L. Jones	Operations & Maintenance	WSR
Jo Kersh	Administrative Assistant	Headquarters
Jack Sendy	[illegible]	M.H. [illegible], Richland
Anthony L. Takacs	Industrial Hygiene	DOE, Portsmouth
Gerald Van Gelder	Fire Protection	NUS, SRS
Deidra Yearwood	Criticality Safety	Los Alamos

NAME:	Hans J. Dahlke
EDUCATION:	Ph.D. Structural Engineering
EXPERTISE:	Natural Phenomena (Earthquakes, Winds, Tornadoes, Flo Operations Analysis (ORPS)
EXPERIENCE	Mr. Dahlke has 20 years experience at several Departmen sites in providing seismic (and other natural phenomena) a various facilities. He is currently employed by Lockheed M Technologies and, since October 1994, has been perman DOE Headquarters at Germantown to perform Defense P operational self-assessments from DOE-wide occurrence the Occurrence Reporting and Processing System. He h member for two Spent Fuel Vulnerability Assessment Stu Safety, and Health (EH) and Environmental Waste Manag Plutonium Vulnerability Assessment Study for EH.
NAME	Henry A. Harpe
EDUCATION:	Ph.D Nuclear Engineering, Texas A&M University M.Engr. Nuclear Engineering, Texas A&M University B.S. Physics, University of Texas Naval Nuclear Power Training Naval Submarine School
EXPERTISE:	Criticality Safety, Nuclear Safety Analysis Team Leader - Navy Magazine Safety
EXPERIENCE	Dr. Harper has 30 years professional experience in provi and management oversight in nuclear plant operations,

Prior assignments include institutional management of the LLNL with an annual budget of $900M; Senior Site Representative for construction and operation of sodium pump test facilities; design and construction responsibilities for all Oakland sites; project manager for major systems acquisitions; program manager for OAK fossil, solar and geothermal activities; director of the Star Wars Free Electron Laser Program; and responsible for the environmental, safety and health, and the safeguards and security DOE oversight programs at LLNL.

NAME: Darrell A. Huff

EDUCATION: B.S. Applied Nuclear Physics, Brigham Young University with specialized training in: Statistical Methods for Control of Special Nuclear Material, Battelle Laboratories; Nondestructive Assay of Fissionable Material, Los Alamos National Laboratory; System Reliability and Safety Analysis, Nuclear Regulatory Commission; System Safety, George Washington University; Pressurized Water Reactor Safety - Advanced Course, NRC Technical Training Center; Chemical Analysis of Uranium and Plutonium, New Brunswick Laboratory; Hazard Evaluation - Quantitative Methods, Process Safety Institute; and Preparation of Safety Analysis Reports & Technical Safety Requirements, DOE.

EXPERTISE: Safety Analysis and HVAC Systems

EXPERIENCE: Mr. Huff has over 18 years of experience in Environment, Safety, and Health (ES&H) oversight and technical assistance while working at the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Department of Energy (DOE). Work-related duties and responsibilities have included the following: Licensing reviews of reactors and uranium/plutonium fuel facilities; review of spent fuel storage cask technologies; activities involving implementation of Nuclear Waste Policy Act requirements; inspection and enforcement of safety and safeguards requirements at reactors and fuel facilities; independent assessment of the adequacy of ES&H programs and documentation for more than 20 NRC-related commercial projects and facilities; DOE Coordinator for the Interagency Nuclear Safety Review Panel's independent safety evaluation of the use of nuclear power sources for the Galileo and Ulysses Space Missions; member of the General Design Criteria Planning Board that recommended and resolved comments related to DOE Order 6430.1A; member of the Tritium Task Group that reviewed the operations and management of DOE's tritium facilities; safety and health team leader for the Tiger Team followup Progress Assessments done at the Fernald Environmental Management Project and the Y-12 Plant; member of the working committees associated with the development of DOE directive on natural phenomena hazards mitigation, nuclear reactor safety design criteria, equipment qualification, and nonreactor nuclear facility design criteria; ES&H team leader for the Plutonium Disposition and the Spent Fuel Vulnerability Studies; member of the working group that developed DOE-STD-3009; member of the Projects Subteam to the Life Cycle Asset Management Process Improvement Team; ES&H representative on the team that conducted the Plutonium Facility Ventilation System Study; and review & evaluation of safety analysis and environmental compliance documents and their bases for over 35 DOE projects and facilities.

NAME: Brent H. Ives

EDUCATION: B.S. Organizational Behavior, University of San Francisco

EXPERTISE: HEU Deputy Site Team Leader
Lawrence Livermore National Laboratory

EXPERIENCE: Mr. Ives works for Lawrence Livermore National Laboratory (LLNL) as the Deputy Section Leader for the Nuclear Materials Management Section. He led numerous projects regarding enhanced nuclear material management, handling of plutonium in enclosed environments, and plutonium stabilizatio activities. He has managed several compliance based, complex-wide assessments of the Livermore site as well as others. Mr. Ives was the LLN Site team leader for the Plutonium Environment, Safety, and Health Vulnerability Assessment. He has extensive knowledge in the characteriza of plutonium and the instruments, hardware and procedures governing suc activities. Mr. Ives has over 10 years experience in plutonium related technologies.

Prior to his experience working with nuclear materials, Mr. Ives supported engineering efforts on several LLNL Laser Systems and SDIO programs.

NAME: John L. Jones

EDUCATION: B.S. Electrical Engineering, University of South Carolina

EXPERTISE: Facility Operations and Maintenance

EXPERIENCE: Mr. Jones is a Registered Professional Engineer with 30 years nuclear m production experience in both the reactor and chemical separations area has held a broad spectrum of technical and management positions in engineering, maintenance, design and project management. Recently he served in the Modular Plutonium Residue Feasibility Team sponsored by Alamos National Laboratory and is currently a Senior Project Engineer in Savannah River Sites' (SRS) Mission Development Group.

Previous assignments at SRS include Technical Assistant to the Nuclea Materials Stabilization Program Chief Engineer, Assistant Manager for F Maintenance during three reactor operations and Maintenance Manger Reactor during the intensive restart period.

NAME: Jo E. Kersh

EDUCATION: N/A

EXPERTISE: Coordinator for Readiness Assessments and Operational Readiness Assessments

EXPERIENCE: Ms. Kersh is a coordinator for Operational Readiness Reviews (ORR Readiness Assessments (RAs) for the Department of Energy (DOE), Programs (DP), Office of Engineering, Operations, Security and Tran Support, Operations Support Group (DP-45). She has 10 years of g service, including nine with DOE. Ms. Kersh assists in the planning a scheduling of ORRs and RAs encompassing comprehensive, functic managerial, and programmatic verification of DP nuclear facility safe coordinates logistics, travel, and other arrangements for ORRs and DOE programs which deal with DP's (and other programs as reque nuclear projects, operations, and facilities. She assists in selected ORRs and RAs by reviewing and analyzing limited areas of an adm

EDUCATION: B.S. Fire and Safety Engineering Technology, University of Cincinnati
A.A.S. Fire Protection Technology, Monroe Community College

EXPERTISE: Fire Protection Engineer

EXPERIENCE: Mr. Van Gelder is a Fire Protection Engineer specializing in fire hazard analyses and fire protection assessments. He has 28 years of experience in the Fire Protection field in the commercial and government nuclear industries. He supports the U.S. Department of Energy, Savannah River Operations Office, in developing Lines of Inquiry for SR Safety Division Assessments for fire protection. He also conducts fire protection and safety assessments at several facilities at the Savannah River Site (SRS). Mr. Van Gelder is thoroughly familiar with the National Fire Protection Association (NFPA) Code and their implementation to achieve compliance with Federal, state, or local laws and regulations. He has performed design and NFPA Code compliance reviews. He has served as a member of Design Review Boards and reviewe and developed fire protection procedures. Mr. Van Gelder wrote and obtaine approval of the Reactor Division Fire Protection Plan for the reactor facilities SRS. He has conducted fire hazard analyses and participated in preparing Safe Shutdown analyses.

Mr. Van Gelder was the Lead Auditor of a fire protection audit team which audited the Paducah Gaseous Diffusion Plant in Paducah, Kentucky.

Mr. Van Gelder was a Start-up Test Engineer at Plant Vogtle during the construction phase and was responsible for testing and flushing the fire suppression systems prior to Turnover to the Operations Department.

NAME: Deidra D. Yearwood

EDUCATION: B.S. Chemical Engineering, University of New Mexico
M.S. Nuclear Engineering, University of New Mexico

EXPERTISE: Engineering/Management/Nuclear Criticality Safety

EXPERIENCE: Ms. Yearwood has 16 years professional experience at Los Alamos Nati Laboratory (LANL). Current responsibilities are Facility Management an Operations of the TA-55 Plutonium Facility. These duties include: Depu Group Leader for the Facility Management Group having responsibility f safety envelope, authorization basis, configuration management, maint management, and operations of TA-55.

Other experience at LANL includes providing nuclear criticality safety o and guidance for TA-55 as well as other nuclear facilities at LANL; pro supervisor for plutonium processing operations; and supervision of res and development projects at TA-55.

APPENDIX B

Site Assessment Team Report

(Site Assessment Team Report is Part B)

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APPENDIX C

Working Group Assessment Team
Vulnerability Assessment Forms

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ES&H Vulnerability Assessment Form	
Vulnerability #Pantex Site/Magazines-Bays/WGAT/1	
Packaging type and number of packages	The packaging type (pits and Canned Sub-Assemblies) is primarily dependent upon the program specific shipping/staging container. In the case of Canned Sub-Assemblies, the material will be encased in its own case and possibly in an approved shipping container (if going off-site) or an approved container for staging (on-site). The number of packages will be dependent on the footprint of the facility and the size of the containers staged within the facility. This number changes daily at Pantex consistent with the safety basis and operating limits expressed in the DOE approved Basis for Interim Operations.
Facility and other barriers	Facility structure, access denial barriers (Zone 4), blast doors (Zone 12), release path restrictions, staging/shipping containers, encapsulation, and administrative controls.
Condition or weakness	The most recent analysis, with more conservative input assumptions than previous studies, yields a probability o an aircraft crash into Zone 4 or Zone 12 of about 10^{-5} events per year.. This is in contrast to previous studies whic estimated the risk at less than 10^{-6} events per year. This risk is dominated by the small military aircra because it has missile-like physical characteristics and makes a large number of approaches to Runway 22 this places it in the airspace over Pantex Plant frequently.

ES&H Vulnerability Assessment Form

Vulnerability #Pantex Site/Magazines-Bays/WGAT/1

Block 4: *Potential causes and effects of barrier failure that contribute to the vulnerability.*

Cause: An aircraft crash into a magazine in Zone 4, or a building in Zone 12 containing HEU with resulting explosion or fire could release radioactive material.

Effects: A release of radioactive material from the contained area to the environment via explosive dispersal or aerosolization by fire. The consequences include the potential for exposure to workers, the public and contamination of the environment.

Block 5: *Compensatory measures that reduce the severity of the vulnerability.*

A 50,000 lb. block of steel reinforced concrete has been placed in front of each magazine door. This serves to harden the door during the aircarft crash scenario.

Block 6: *Possible consequences of the vulnerability.*

An increased potential for release of radioactive material resulting in exposure (dose) of the workers, collocated workers, the public and contamination of the environment.

Block 7: *Time period in which the consequences of the vulnerability might occur (e.g., 0 to 5 years; 5 years to facility end-of-life; may not occur during facility lifetime).*

The event is considered to be "extremely unlikely," approximately one chance in 10^{-5} per year that an aircraft may crash anywhere in Zone 4 or Zone 12. It is not expected to occur in the lifetime of the facility.

Block 8: *Comments, views, or plans by the site operations office and site contractor relative to mitigating or minimizing any potential vulnerability. Describe the plan and schedule of corrective actions (if any).*

ES&H Vulnerability Assessment Form

Vulnerability #Pantex Site/Magazines-Bays/WGAT/1

Block 9: *Database information.*

Radionuclide Source Parameters

Isotope	Physical Form	Chemical Form	MAR_i (g)

Collocated Chemicals and Release Products

Chemical		Release Product	
Name	Mass (g)	Name	Mass (g)

Release Path Parameters[1]

Chemical Form and Release Products	DR_i	ARF_i	RF_i	LPF_i

Exposure Parameters[1]

Chemical Form and Release Products	V (meter^3)	t (minutes)	ΔT (minutes)	X/Q	
				Ex-facility	Public

Block 10: *Comments and references for parameter selection.*

The various parameters for Block 9 cannot be completed due to unavailability of the required information. Risk Analysts are currently researching methods to analytically determine the consequences for this accident scenario using a Pu source term. This information, when it becomes available, would be directly applicable to this vulnerability.

ES&H Vulnerability Assessment Form

Vulnerability #Pantex Site/Cells/WGAT/2

Block 1: *Title of the Vulnerability. (<20 words)*

Potential for Higher Release Consequences Due to Increased Leakage Paths and a Greater Understanding of Dispersal Mechanics From an Explosion.

Block 2: *Executive Summary. (<50 words) Concise description of the sequence of events leading to the vulnerability.*

Detonation of bare (uncased) high explosives in the presence of one or more Canned Sub-assemblies containing highly enriched uranium. When in a cell, the amount of high explosive (HE) is insufficient to exercise the "Gravel Gertie" roof, potential leakage paths through the cell blast and personnel door gaps or through a blast valve that fails to latch, could result in a greater dose to the workers, the public and the contamination of the environment.

Block 3: *Describe the condition or weakness, including the material, material form, quantity (if unclassified), packaging type and number of packages, and facility and other barriers that contribute to the vulnerability.*

Vulnerability Description/Information	
Material and material form	Encapsulated HEU
Material at risk (approximate mass [kg] and composition of material which may participate in the release—not necessarily the inventory of material at a given location)	The amount allowed in an individual cell is contingent upon the weapon system being worked in the cell. The mass in kg. cannot be stated in an unclassified manner.

ES&H Vulnerability Assessment Form

Vulnerability #Pantex Site/Cells/WGAT/2

Packaging type and number of packages	The packaging type (pits and Canned Sub-Assemblies) is primarily dependent upon the program's specific shipping/staging container. In addition, the Canned Sub-assembly consisting of one or more parts is hermetically sealed (canned) by welding a thin metal container, usually made of stainless steel or aluminum alloy. The number of containers would depend on operations because staging is not conducted in a cell that has operations ongoing. This number of packages would always be less than 10 in a cell due to physical space limitations.
Facility and other barriers	Release path gaps due to the leakage areas surrounding the equipment and personnel doors. Release path increase from failure of a blast valve to latch.
Condition or weakness	Recent analyses for plutonium dispersal events from a cell indicate that the closer the HE/Pu ratio is to unity, the greater the HEU dispersal

Block 4: *Potential causes and effects of barrier failure that contribute to the vulnerability.*

Cause: The primary cause of the failure is accidental HE detonation.

Effects: As the quantity of HE in a cell gets so low that the cell "Gravel Gertie" ro is not exercised; it does not perform its intended filtering of dispersed material. Different "leakage paths" for the radioactive material to reach environment result. The consequence is the potential for a greater dose the workers, the public and the contamination of environment (less filtra of the material).

ES&H Vulnerability Assessment Form

Vulnerability #Pantex Site/Cells/WGAT/2

Block 5: *Compensatory measures that reduce the severity of the vulnerability.*

Cell source term (Pu inventory) during operations have been reduced.

Leakage paths around the cell blast and personnel doors have been reduced. Photographs of the blast and personnel doors are provided as Attachments "VAF/002 - 1" and "VAF/002 - 2" respectively.

The blast valves have been cleaned and rebuilt with new components. Surveillance has been increased to monthly for some cells with preventive maintenance results being trended to reduce the likelihood of "blast valve" failure to latch. Modifications to the ventilation ducting to eliminate debris accumulating at the blast valves are ready to be installed.

A better understanding of the explosion physics is being developed to better characterize the release and consequences.

Block 6: *Possible consequences of the vulnerability.*

A higher release of radioactive material resulting in greater exposure (higher dose) to the workers, co-located workers, the public and the contamination of the environment.

Block 7: *Time period in which the consequences of the vulnerability might occur (e.g., 0 to 5 years; 5 years to facility end-of-life; may not occur during facility lifetime).*

The event is considered to be "extremely unlikely," approximately one chance in a million per year (1×10^{-6}) and is not expected to occur in the lifetime of the facility.

Block 8: *Comments, views, or plans by the site operations office and site contractor relative to mitigating or minimizing any potential vulnerability. Describe the plan and schedule of corrective actions (if any).*

AR (2)

ES&H Vulnerability Assessment Form

Vulnerability #Pantex Site/Plant/WGAT/3

Block 1: *Title of the Vulnerability. (<20 words)*

Need to Analyze the Potential for Accidental HEU Releases.

Block 2: *Executive Summary. (<50 words) Concise description of the sequence of events leading to the vulnerability.*

Authorization basis documentation and related hazard analyses do not currently evaluate the potential likelihood and consequences of exposing CSAs to drops, fires, and transportation accidents.

Block 3: *Describe the condition or weakness, including the material, material form, quantity (if unclassified), packaging type and number of packages, and facility and other barriers that contribute to the vulnerability.*

Vulnerability Description/Information	
Material and material form	Encapsulated HEU
Material at risk (approximate mass [kg] and composition of material which may participate in the release—not necessarily the inventory of material at a given location)	The amount allowed for individual operations involving CSAs. The mass in kilograms cannot be stated in an unclassified manner.
Packaging type and number of packages	Packaging type is dependent on the program being evaluated. The CSA consists of one or more parts hermetically sealed in a thin metal container, usually made of stainless steel or aluminum alloy. Due to physical constraints, the number of CSAs would always be less than 10 at risk.
Facility and other barriers	Shutdown of the ventilation systems via the RAMS and fire protection interlocks isolates potential HEU releases to the cell or bay where the CSAs reside. Intake HEPA filters provide protection for workers in adjacent cells or bays.

ES&H Vulnerability Assessment Form

Vulnerability #Pantex Site/Plant/WGAT/3

Block 9: *Database information.*

Radionuclide Source Parameters

Isotope	Physical Form	Chemical Form	MAR_i (g)
U-235	Solid	Metal	Unknown

Collocated Chemicals and Release Products

Chemical		Release Product	
Name	Mass (g)	Name	Mass (g)
See Block 10.			

Release Path Parameters[1]

Chemical Form and Release Products	DR_i	ARF_i	RF_i	LPF_i
See Block 10.				

Exposure Parameters[1]

Chemical Form and Release Products	V (meter^3)	t (minutes)	ΔT (minutes)	X/Q	
				Ex-facility	Public
See Block 10.					

Block 10: *Comments and references for parameter selection.*

The various parameters for Block 9 cannot be completed due to unavailability or classification of the required information.

ES&H Vulnerability Assessment Form

Vulnerability #Pantex Site/Plant/WGAT/4

Block 1: *Title of the Vulnerability. (<20 words)*

Need for improvement in functional testing of Alpha Continuous Air Monitors (CAMs).

Block 2: *Executive Summary. (<50 words) Concise description of the sequence of events leading to the vulnerability.*

Four performance issues have been identified with the alpha CAM instrument test, maintenance and calibration program:

- Lack of performance testing;
- No functional test required when a CAM is replaced; functional test source is inadequate;
- No written basis for alpha calibration for measuring U-235 response; and
- Questionable placement of CAM air intake for earliest detection of a release.

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Assessment Repor
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of the above issue

Material and m

Material at risk
composition of material which may
the release not necessarily the in
material at a given location)

ES&H Vulnerability Assessment Form	
Vulnerability #Pantex Site/Plant/WGAT/4	
Packaging type and number of packages	N/A
Facility and other barriers	Cells and Bays
Condition or weakness	Operational Weakness

Block 4: *Potential causes and effects of barrier failure that contribute to the vulnerability.*

The CAMs are part of the Critical Safety System (CSS); there is a potential that the current CAMs will not provide an alarm thus evacuation will not be initiated and other procedures or actions connected with the CSS will not take effect.

Undetected release of airborne alpha contamination.

Block 5: *Compensatory measures that reduce the severity of the vulnerability.*

Photographs of the correct installation, connections and switch settings of the CAMs are placed at each instrument location to help the manufacturing staff verify a correct CAM replacement.

A RAMS/CAM steering committee has been formed 18 months ago as a result of the ES&H Plutonium Vulnerability Assessment to study these and other issues associated with the RAMS program. This committee has discussed some of these issues; however, no resolution has been reached at this time.

Block 6: *Possible consequences of the vulnerability.*

Radioactive contamination of the worker and co-located workers.

Block 7: *Time period in which the consequences of the vulnerability might occur (e.g., 0 to 5 years; 5 years to facility end-of-life; may not occur during facility lifetime).*

$> 1x10^{-6}$, beyond extremely unlikely.

Weaknesses in administrative or management controls.

ES&H Vulnerability Assessment Form
Vulnerability #Pantex Site/Plant/WGAT/4
Block 8: *Comments, views, or plans by the site operations office and site contractor relative to mitigating or minimizing any potential vulnerability. Describe the plan and schedule of corrective actions (if any).*

ES&H Vulnerability Assessment Form

Vulnerability #Pantex Site/Staging Bays/WGAT/5

Block 5: *Compensatory measures that reduce the severity of the vulnerability.*

Pantex has applied for exemption to certain container regulations for one time shipments which have been denied by regulatory agencies.

Block 6: *Possible consequences of the vulnerability.*

Increased worker dose and risk of industrial accident.

Block 7: *Time period in which the consequences of the vulnerability might occur (e.g., 0 to 5 years; 5 years to facility end-of-life; may not occur during facility lifetime).*

0-5 yrs. - Small dose is received upon each repackage, estimated at 5 mrem/yr/worker.

Block 8: *Comments, views, or plans by the site operations office and site contractor relative to mitigating or minimizing any potential vulnerability. Describe the plan and schedule of corrective actions (if any).*

ES&H Vulnerability Assessment Form

Vulnerability #Pantex Site/Staging Bays/WGAT/5

Block 9: *Database information.*

Radionuclide Source Parameters

Isotope	Physical Form	Chemical Form	MAR_i (g)

Collocated Chemicals and Release Products

Chemical		Release Product	
Name	Mass (g)	Name	Mass (g)

Release Path Parameters[1]

Chemical Form and Release Products	DR_i	ARF_i	RF_i	LPF_i

Exposure Parameters[1]

Chemical Form and Release Products	V (meter^3)	t (minutes)	ΔT (minutes)	X/Q	
				Ex-facility	Public

Block 10: *Comments and references for parameter selection.*

ES&H Vulnerability Assessment Form

Vulnerability #Pantex Site/Staging Bays/WGAT/5

Signature, Team Member — Date: 6/25/96

Signature, Team Leader — Date: 6/27/96

1. Described in the Assessment Plan.

APPENDIX D

Classification of Vulnerabilities by Likelihood and Consequence

Vulnerability 3:

- Extremely unlikely to happen
- One chance per 100,000 operations that a CSA might be breached

Vulnerability 4:

- The likelihood of radioactive airborne HEU releases that could be detected by CAMs is less than one in a million (beyond extremely unlikely)

Vulnerability 5:

- Less than 5 mrem/yr/worker dose due to CSA repackaging
- Industrial accidents are more likely

Jnited States Government

Department of Energy

memorandum

DATE: September 24, 1996

EPLY TO
ATTN OF: Michael Hooper, Working Group Assessment Team Leader, Pantex Plant

BJECT: Addendum to Highly Enriched Uranium Working Group Assessment Team Report - Vulnerability Classifications

TO: Sarbes Acharya, Project Leader, HEU Vulnerability Assessment

The Project Support Group performed initial vulnerability classifications (likelihoods and consequences) based on information contained in the vulnerability assessment forms (VAFs) completed as a part of the site assessments. During the Vulnerability Prioritization Meeting held on July 16-19, 1996 at the Washingtonian Marriott, as well as the Second Working Group Meeting, held on August 13 and 14 at the Gaithersburg Hilton, the classification results were reviewed and finalized by the Working Group and Site Assessment Team Leaders and the Project Support Group. The final results of the vulnerability classifications supersede those contained in prior versions of the Working Group Assessment Team (WGAT) report.

This memo, together with the attached final vulnerability classifications for the Pantex Plant, is recognized as an addendum to this WGAT report.

Michael K. Hooper

Michael Hooper, Working Group Assessment Team Leader
Pantex Plant

Enclosure: Table of final vulnerability classifications

HEU Assessment VAF Summary

Site	Facility	VAF Number	Description	Volume II Reference No./Part A Sect.	Like -li- hood	Conse- quences W	P	E	VAF Cate gory
Site:	**PANTEX**								
PANTEX	Gravel Gertie	WGAT-002	Higher HEU releases from high-explosives detonations. (SAT-002)	9/3.4	VL	L	*	L	FC
PANTEX	MAGAZINES	WGAT-001	Aircraft crash into Zone 4 or Zone 12. (SAT-001)	9/3.1.4	-	-	-	-	IV
PANTEX	MULTIPLE	WGAT-003	Consequences of/exposing canned subassemblies to drops, fires, and transportation accidents.	9/3.8.5	-	-	-	-	IV
PANTEX	MULTIPLE	WGAT-004	Lack of functional testing of alpha continuous air monitors.	9/3.8.1,3.8.4	-	-	-	-	IV
PANTEX	MULTIPLE	WGAT-005	Increased exposures due to lack of certified shipping containers for CSA storage.	9/3.1.1	-	-	-	-	IV

* Consequence Below Threshold for Characterization.
** VAF not accepted as vulnerability by WGAT.
\- IV VAFs not characterized.
\+ VAF contains U-233 or Plutonium.

APPENDIX E

References

References

B61-0/2/5, Dismantlement Nuclear Explosive Safety Study, April 1995

Basis for Interim Operation (BIO) for Pantex Plant, Amarillo, Texas. Rev. 3, Errata B, March 1

Calibration Procedure, NWP 0003-4, Radeco 442A-MH(2)

Calibration Procedure, NWP 0004-4, Radeco 441

Conceptual Approaches for Replacement of the 12-60 Ramp at the Pantex Plant, Contract TOAO29037, Task 37, prepared by Jacobs Engineering Group Inc., Albuquerque, NM, Nov 1993

Critical Safety Systems Manual (CSSM), MNL 1101, Rev. 3C, 1995

Design Manual for Tornado Resistant Structures at the Pantex Plant, November 1974

DOE N5400.13 (Sealed Radioactive Sources Accountability)

DOE Orders 5480.22 and 5480.23, Implementatio Plant, June 1995

DOE Plutonium ES&H Vulnerability Assessment, Pantex Site Assessment Team Report,

DOE-STD-1020-94, Natural Phenomena Hazards Design and Evaluation Criteria for DOE 1994

Facility Procedure, F7-5084, Specific Safety Requirements for Building 12-84

Facility Procedure, F7-5099, Specific Safety Requirements for Building 12-99, Bays 1,

Final Environmental Impact Statement, Pantex Plant Site DOE/EIS-0098, October 19

Final Safety Analysis Report for Building 12-44, 3/26/81

Final Safety Analysis Report for Building 12-58 (Bays 4 and 5), 9/2/87

Final Safety Analysis Report, Pantex Plant Building 12-58, Bays 4 and 5, (ORO C Facility), Rev. 0, Draft, February 18, 1994

Final Safety Analysis Report for Building 12-64, Draft, March 1996

Final Safety Analysis Report for Building 12-84, March 1984

Final Safety Analysis Report, Two Assembly Cells Associated with HE Service Ma 12-85 and 12-96, 3/28/84.

Final Safety Analysis Report for Building 12-98, 9/22/87

Final Safety Analysis Report for Building 12-99, February 1988

Final Safety Analysis Report for Building 12-104, January 1989

Final Safety Anaylsis Report Zone 4 Magazines, December 1992

Final Safety Analysis Report, Nuclear Explosive Special Purpose Facilities, Dra

Pantex Plant Standard No. STD-3140, Notification, Investigation and Reporting of Occurrence

Pantex Plant Standard No. STD-3160, Tornado Evacuation Procedures

Pantex Plant Standard No. STD-3161, Electrical Storm and Severe Weather Precautionary Procedur

Pantex Plant Standard No. STD-3211 (Control of Non-Weapon Radioactive Material Sour s)

Pantex Plant Standards 6075 and 6241 regarding suspect parts

Pantex Plant Standard 7-5080, Onsite Transportation of Chemical Explosives, Nuclear E osives, Weapon Components

Pantex Plant Standard 7-5626, Specific Safety Requirements for Building 4-26

Pantex Plant Standard 7-5638.1, General Safety Requirements for Handling and Transporting Nu Explosives and NELAs

Pantex Plant Standard 7-5644, Decontamination of Transport Vehicles

Pantex Plant Standard 7-5650, General Safety Requirements for Zone 4

Pantex Plant Standard No. STD-9035, Facility Configuration Control Board

Pantex Plant Standard No. STD-9045, Configuration and Change Control for Facility Critical Safety Class/Safety Significant Systems

Pantex Plant Technical Procedure No. TP-MN-00845, Annual DOP Functional Testing of HEP/

Plant Standard, STD-4224, Housekeeping Practices to Minimize Fire Loss

Plant Standard, STD-4253, Hazardous, Flammable, and Combustible Materials

Plant Standard, STD-6075, Suspect/Counterfeit Parts

Plant Standard, STD-6241, Suspect/Counterfeit Fasteners

Policy Directive, DIR-4005, Fire Protection Program

PX-JCO-95-003, Justification for Continued Operation (JCO) of Building 12-44, Cell 2-6; 12 and 12-98, cells 1-4, With Potential for Higher Off-site Release Consequences Due to Increas Paths

PX-USQ-94-10, Blast Valve Requirement for Operation of the Assembly Cells

PX-USQD-95-18, Building 12-60, Interim Staging of Oak Ridge Ordinance (ORO) Componen 12-60, 4/21/95

PX-USQD-96-004-A, Weapons Staging Compatibility, 7/26/95

Safety Analysis Report for Packaging, Y-12 Document

Safety Information Document, October 1995

Supplemental Directive AL5TxB, Suspect Parts Plan, Rev. 1, Change 3

Technical Manual Nuclear Safety Criteria (Title U, Report SRD), DOE-DNA-TP20-7, September 1986 (as amended)

Technical Procedure, TP-MN-03190, Functional Test of Radiation Alarm Monitor Systems

Technical Procedure, TP-MN-03192, Functional Test of Radeco Models 442-MH and 442-MH2

Technical Procedure, TP-MN-03193, Functional Test of Radeco Model 441-MH, Radiation Monitor

Technical Procedure, TP-MN-03194, Functional Test of Radeco Model 452, Radiation Monitor

Test/Calibration Procedure, NWP 0045-1-F, Radeco, Model 452

Transportation Safety Analysis Report, Draft B

UCLO-53526, Natural Phenomena Hazards Modeling Project: Extreme Wind/Tornado Hazard Models for DOE Sites, February 1984

APPENDIX F

Stakeholder Involvement

DOE experts to hold public briefing

A team of Energy Department experts will have a public briefing Wednesday on an upcoming vulnerability assessment of the Pantex Plant's highly enriched uranium operations.

The site team will check operations at Pantex in June as part of a nationwide examination of sites that house or use highly enriched uranium, a key component of a nuclear weapon.

The Pantex Plant does not process highly enriched uranium, but the plant does some weapons work using parts manufactured elsewhere that contain the material.

Team members visiting Amarillo will brief members of the public and media representatives on their work at 10 a.m. Wednesday in the plant's Services Facility Building, 16-12.

Cracker Barre

Published by Mason & Hanger-Silas Mason Co. for the employees at Pantex Plant. June 10,

DOE team to assess Pantex handling of uran

A team of experts from other U.S. Department of Energy sites and national laboratories will visit Pantex Plant and review information about the highly enriched uranium operations.

Secretary of Energy Hazel O'Leary directed this Highly Enriched Uranium (HEU) Environment, Safety and Health Vulnerability assessment to determine if the DOE's storage and handling of its HEU holdings is safe.

The teams will be looking for conditions or weaknesses that could lead to unnecessary or increased exposure of workers or the public to radiation or to HEU-associated chemical hazards, or to the release of radioactive materials to the environment.

Pantex does not process HEU materials, but some weapons parts manufactured elsewhere do contain HEU. Therefore, the assessment will center on the site's required security functions as well as procedures for handling, packaging, staging and shipping of those parts.

The team will conduct an in-briefing for members of the Pantex Plant Citizens Advisory Board (PPCAB), media representatives and the public at Pantex on Wednesday, June 12. Team members will discuss the scope of their visit. A similar public briefing will be conducted on June 27 to discuss the findings of the assessment.

The original assessment was perf Pantex Plant Site assessment Team (SAT May and June. Co-leaders of the SAT ar deputy division manager, FO, as the representative and DOE/AAO's Harry DOE representative.

About 15 other Pantexans from provided a full cross-functional a operational aspects dealing with uraniu activities included building walk-do systems and records reviews.

Members of the visiting Workin Team (WGAT) will review the H "cradle to grave," according DOE/Lawrence Livermore Nation members also will interview Manufacturing, Engineering & Facility Operations.

This assessment provides DO complete picture of how HEU ope carried out and how well site intricacies and risks of their oper

Call ext. 6788 for more inf SAT or WGAT.

WGAT In-Briefing

- Background
- Project Purpose and Authorization
- Project Organization
- Project Scope and Schedule
- WGAT Site Activities
- Concluding Activities of the Working Group

Background: Non-proliferation

- Post cold-war era arms reduction
- HEU operations stopped
- HEU in temporary storage
- Secretary initiated DOE's Nuclear Material Disposition Project reporting directly to the Under Secretary (January 24, 1994)
- DOE seeks interim safe management and ultimate disposition options for surplus fissile materials
- Information on current status of HEU holdings needed to establish foundation for decision making for HEU management
- S-1 directive on March 15, 1994 for Pu/HEU vulnerability study

Project Purpose

- Conduct ES&H vulnerability assessment of HEU storage and operations
- Assessment report will provide foundation for decision making on:
  - Interim safe management, and
  - Ultimate disposition of fissile materials
- Fact finding effort only
  - NOT an oversight, audit or compliance assessment

Authorization

- Secretary of Energy initiated the Nuclear Materials Disposition Project (1/24/94)
- Secretary of Energy initiated the Plutonium Vulnerability Assessment (3/15/94) and HEU to follow
- Secretary of Energy directed the Office of EH to coordinate with PSO's, Operations Office managers, and M&O contractors to fully participate in the project
- Secretary of Energy directed that external stakeholders be involved in the assessment
- Assistant Secretary of EH established the HEU ES&H Vulnerability Assessment Project

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Assessn ent p ss
(SAT) ar
Pantex

- "Working Grou p

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- WG consists o expe
  highly experier
  consultants fro

Pantex Plant
Working Group Assessment Team

- Team Lead
- Deputy Team Lead
- Administrator
- Technical Disciplines
  - Highly Enriched Uranium
  - Criticality Safety
  - Operations & Maintenance
  - Safety Analysis
  - HVAC
  - Fire Protection
  - Industrial Hygiene
  - Seismic
- Team Size: 14

Definition of ES&H Vulnerability

- Conditions or weaknesses that could lead to unnecessary or increased exposure of workers or the public to radiation or associated chemical hazards from HEU, or the release of radioactive materials to the environment

Project Scope (WGAT Independent Validation Assessment)

- All isotopes of HEU (>20 percent 235U enrichment)
- In-scope categories
  - Weapons components, pits
  - Sealed sources in DOE custody
- All other categories out of scope, including high level and TRU waste
- HEU amounts
  - 174.3 Metric Tons DOE wide
  - 16.7 Metric Tons at Pantex (9.6%)

Concluding Activities of the Working Group (HQ)

- Receive reports from each SAT and WGAT
- Review responses from sites not visited
- Normalize, characterize, and prioritize vulnerabilities across all sites and facilities assessed
- Prepare summary report for submittal by Assistant Secretary for EH the Secretary of Energy and FD
  - Due August 30, 1996

DOE team to assess plant's operations

By E. KYLE STEINHAUSER
Globe-News Staff Writer

A 14-member team from the Department of Energy began an environmental safety and health assessment at the Pantex Plant on Wednesday concerning highly enriched uranium.

The team will observe HEU storage and operations to determine impacts on environmental safety and health, said team leader Michael Hooper, associate manager for national security, DOE Oakland Operations Office.

Post-Cold War arms reductions ceased HEU operations, and DOE wanted to ensure the safety of HEU storage and find possible future uses, he said.

A Pantex team completed a draft of a similar study in May, Hooper said, and the DOE assessment is designed to validate those findings and offer a "fresh look" into plant operations.

According to Hooper's presentation, the team will discuss current and potential problems at the plant, conduct an examination of the facilities, interview personnel and reconcile differences between Hooper's team and the Pantex team's findings.

"The assessment report will provide foundation for decision making on interim safe management and ultimate disposition of fissile materials," Hooper said.

Hooper said safety risks to be prevented include conditions that lead to exposure of employees or the public to radiation or hazards from HEU, or the release of radioactive materials to the environment.

Hooper said his team will examine storage areas, cells where bombs are assembled and disassembled, and transportation of HEU within the plant. They also will examine HEU sources, which include weapons components and sealed sources in DOE custody, he said.

Pantex houses 16.7 metric tons of HEU, he said, almost 10 percent of the DOE's 174.3 metric tons. HEU is very dense and amounts to about 16 bushel baskets, Hooper said.

Five other sites will undergo similar assessments at the same time, he said, but Pantex is unique because it is the only dismantling facility, he said. Twelve other sites with smaller amounts of HEU will also undergo some assessment.

The Pantex Plant does not process HEU materials, but on-site weapons work involves parts manufactured at other plants that contain HEU, according to a DOE press release.

Pantex is only concerned with interim storage of HEU. It is eventually shipped to a plant in Tennessee for use or permanent storage, Hooper said. He said the DOE is studying the feasibility of using HEU as reactor fuel.

Hooper said the assessment is the final stage of a program initiated by the undersecretary of the DOE in 1994. This study is similar to the plutonium vulnerabilities assessment that was carried out in 1994, accounting the release

APPENDIX G

SAT VULNERABILITY #PANTEX/SITE/SAT/001

The SAT Vulnerability finding regarding aircraft crash frequency and subsequent plutonium release fro pit storage is similar to analysis conducted for the Draft EIS (DOE/EIS-0225D, March 1996), Appen E.

The EIS study was examined in detail. It was found that conservative assumptions are used in sei For example from page E15:

> "For all runways the pattern side for military operations was conservatively assumed to be towa Pantex Plant..." however, "per discussion with FAA staff, all military aircraft takeoff operations Runway 04 are instructed by the air traffic control tower to avoid overflight of Pantex Plant."

So here we have a conservative bias of assuming that the traffic pattern is towards Pantex wherea actual case the control tower directs military traffic to avoid Pantex when they have any say in the ma

This is an important bias because the dominant hazard to Pu (or HEU) release from aircraft cra shown in the EIS to be from small military aircraft (see Tables E.3.1.4-6 and E.3.1.4-12). This exa can easily change the conclusions by a factor of 10^{-2} and place the aircraft hazard in the incre category ($<10^{-6}$) where the commercial and large military aircraft already are.

The EIS uses the "Solomon" model (page E-18) for commercial and military take offs from Runw whereas if the DOE standard model were used it would not be considered a takeoff but an en situation, because the take off start is more than 10 miles from Pantex. (The en route crash rate pe is much lower than the near airport model). The final DOE Standard (3014-96) uses the runway m for the coordinate origin, but this is not appropriate for this extraordinary three mile runway length is another conservative assumption.

In paragraph E.3.1, page E-8 of the EIS it is stated that the main approach uses the back course l signal and that any aircraft using full instrument approach to the main runway (runway 22 implie follows a path over the Pantex Plant at 4800 feet above mean sea level (MSL). This statement is i The main approach using full instruments is to ILS Runway 04 which does not pass over Par approaches the airport from the southwest as shown in the attached approach plate labeled ILS 4. This approach allows a glide slope aided descent to the runway with minimums of 200 feet cei 1/2 mile visibility. This landing approach can be auto pilot coupled and as such is most pre instrument conditions by all pilots.

The approach described in the EIS as the main full instrument approach is in fact the back-up, a as the name "Back Course (BC)" implies. In the attachment herein it is labeled LOC BC RWY 2 no electronic glide slope descent guidance and allows landing with a minimum ceiling of 337 fee mile visibility; minimums which are above the ILS front course to Runway 04.

The approach GPS RWY 22, attached herein shows the current, non-precision (satellite naviga Runway 22 approach which avoids the Pantex Plant and can be assigned by FAA when the appropriately equipped. This approach allows descent under a ceiling of 297 feet and 3/4 mil In the future this will probably become the preferred back-up in place of the back course Run it allows an approach under a lower ceiling.

The VOR Runway 22 approach plate is still further down the list of preferred approaches to (See the attachment) it allows a descent to 357 feet above the ground and a landing w visibility. It does go over Pantex (P-47 on the plate) at a minimum altitude of 5000 ft. MSL.

Approach plate NDB or GPS RWY 4 is also attached. This approach does not overfly Pante attached approach plates are published by the Federal government; they are displayed to sca the relative size of the Pantex prohibited area, P-47. They do not show the smaller areas of

12. The EIS charts are not to scale and may tend to convey a different probability overview than is actually the case (Pages E-9, E-10 and SAT/001/VAF/001-1).

Before one gets too exact about calculating crash probability to two significant figures, one should understand that the instrument approaches discussed are only flown when the weather requires it. About 90 percent of the time at Amarillo, visual approaches are flown by everyone including airlines and military even when on instrument flight plans (contrary to what the DOE standard states). In a visual approach, when the pilot sees the airport he may fly directly toward it for landing but only as directed by the tower in order to avoid other traffic.

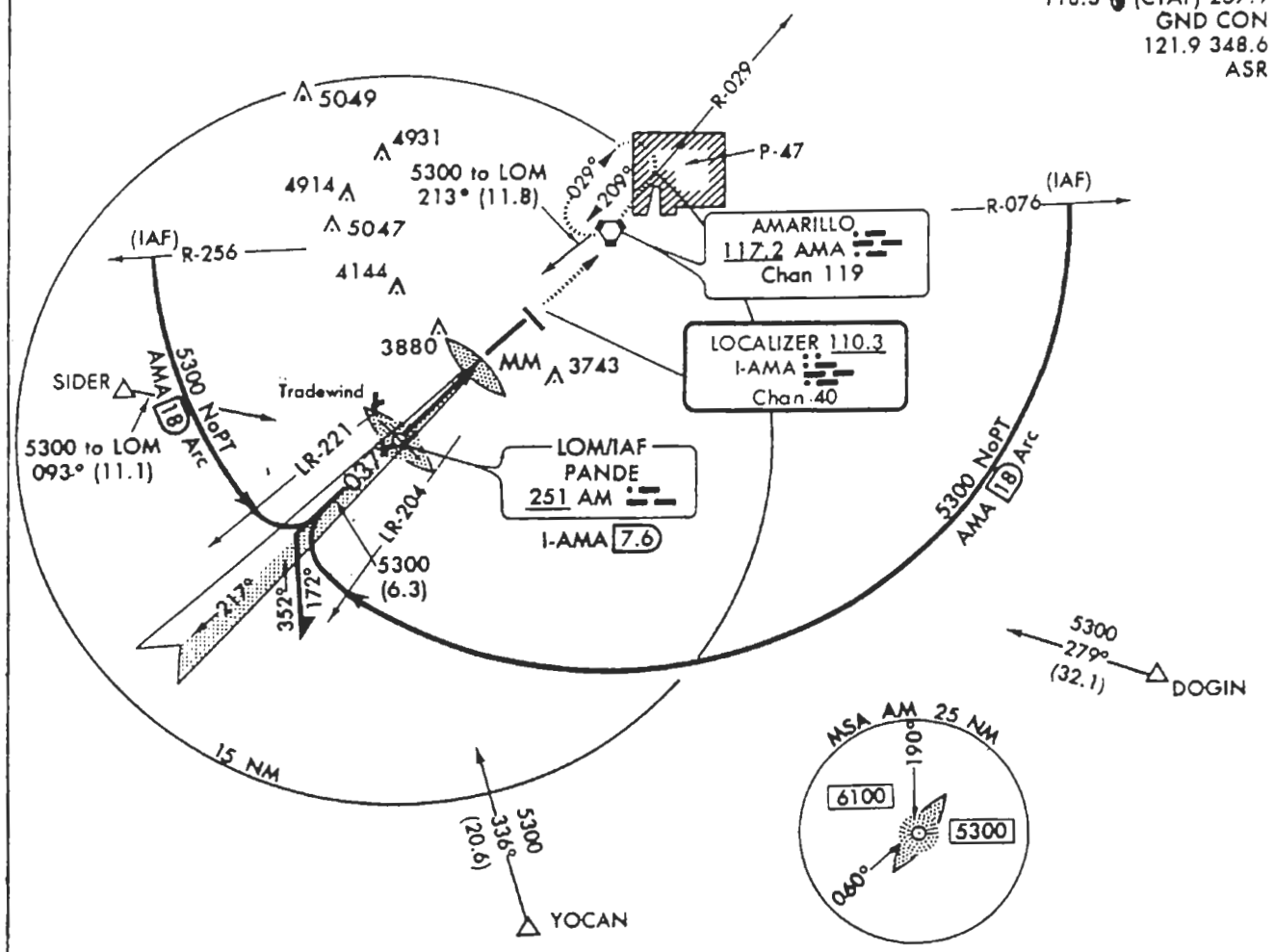
Practice instrument approaches are used for training military and general aviation pilots frequently in the AMA vicinity. These are conducted in good weather conditions and do not necessarily include landings and takeoffs but perhaps only low approaches to the runway. These could be modified by the local FAA air controllers to "request" that small military aircraft not directly overfly Pantex in good weather conditions when unnecessary to the safety of the flight. The crash probability per year in the EIS is dominated by the category of the small military aircraft (see Tables E.3.1.4-12 and E.3.1.5-12). This category of aircraft is also most likely to penetrate the Zone 4 and Zone 12 magazines.

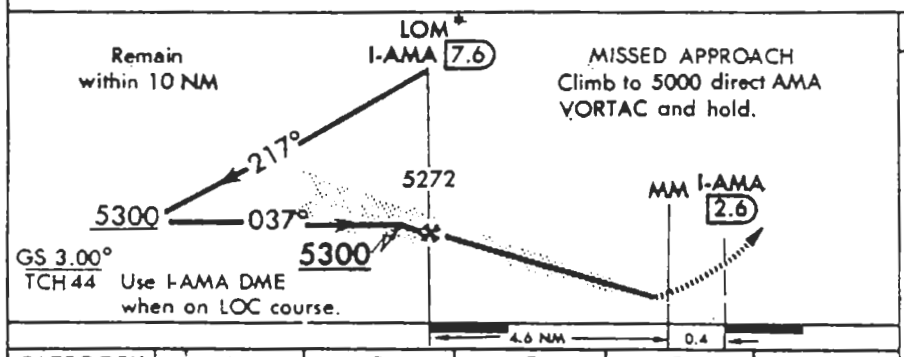
It was noted that the Pantex EIS Draft uses a crash rate for military aircraft of $5.1X10^{-7}$, and $1.9X10^{-9}$ per mile for large and small aircraft, respectively. The DOE Standard in Table B-1 uses $1.9X10^{-9}$ and $1.8X10^{-8}$ per mile. These are rather inconsistent (one would suspect a typo error perhaps?).

It should be noted that technology in the form of satellite navigation now allows point to point enroute navigation without the use of designated airways. Thus the FAA wants to move away form using airways and VOR navigation aids because it allows for greater enroute traffic volume.

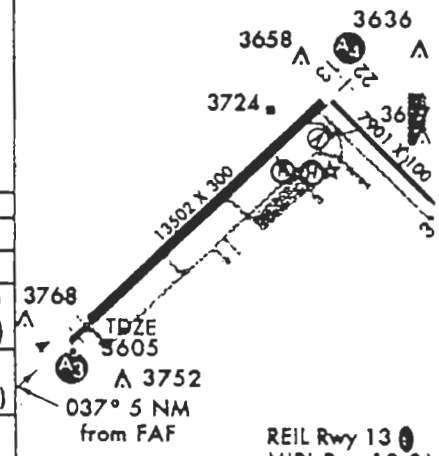
ILS RWY 4

ATIS* 118.85 350.3
AMARILLO APP CON
119.5 307.0
AMARILLO TOWER*
118.3 (CTAF) 257.9
GND CON
121.9 348.6
ASR





ELEV 3605



REIL Rwy 13
MIRL Rwy 13-31
HIRL Rwy 4-22

CATEGORY	A	B	C	D	E
S-ILS 4	3805/24 200 (200-½)				
S-LOC 4	4000/24 395 (400-½)			4000/40 395 (400-¾)	4000/50 395 (400-1)
CIRCLING	4100-1 495 (500-1)		4100-1½ 495 (500-1½)	4240-2 635 (700-2)	4500-3 895 (900-3)

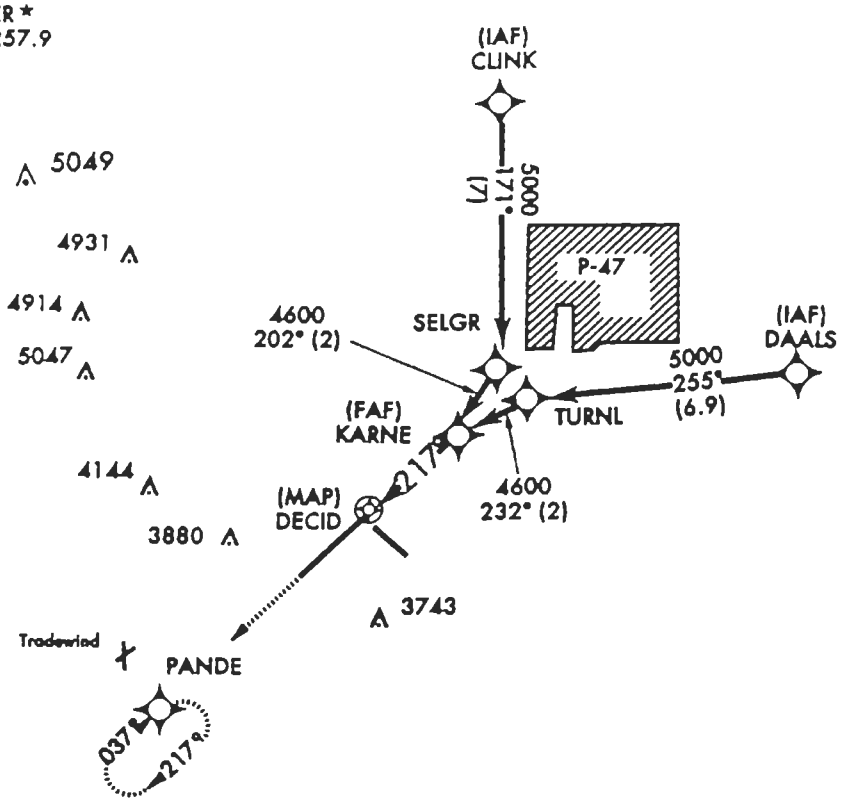
* Procedure turn not authorized for Cat. E.

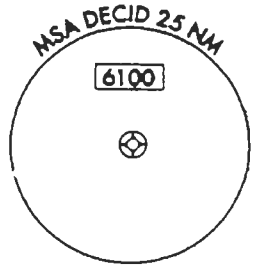
FAF to MAP 5 NM					
Knots	60	90	120	150	180
Min:Sec	5:00	3:20	2:30	2:00	1:4

GPS RWY 22

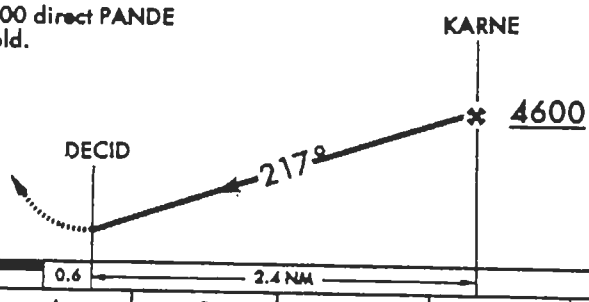
AL-19 (FAA)

ATIS *118.85 350.3
AMARILLO APP CON
119.5 307.0
AMARILLO TOWER *
118.3 (CTAF) 257.9
GND CON
121.9 348.6
ASR





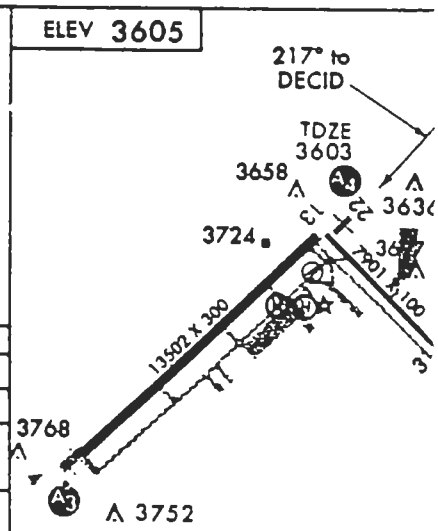
MISSED APPROACH
Climb to 5100 direct PANDE WPT and hold.



CATEGORY	A	B	C	D	E
S-22	3900-¾ 297 (300-¾)			3900-1 297 (300-1)	
CIRCLING	4080-1 475 (500-1)		4080-1½ 475 (500-1½)	4240-2 635 (700-2)	4500-3 895 (900-3)

▽
△ NA

ELEV 3605



REIL Rwy 13
MIRL Rwy 13-31
HIRL Rwy 4-22

35°13'N-101°42'W

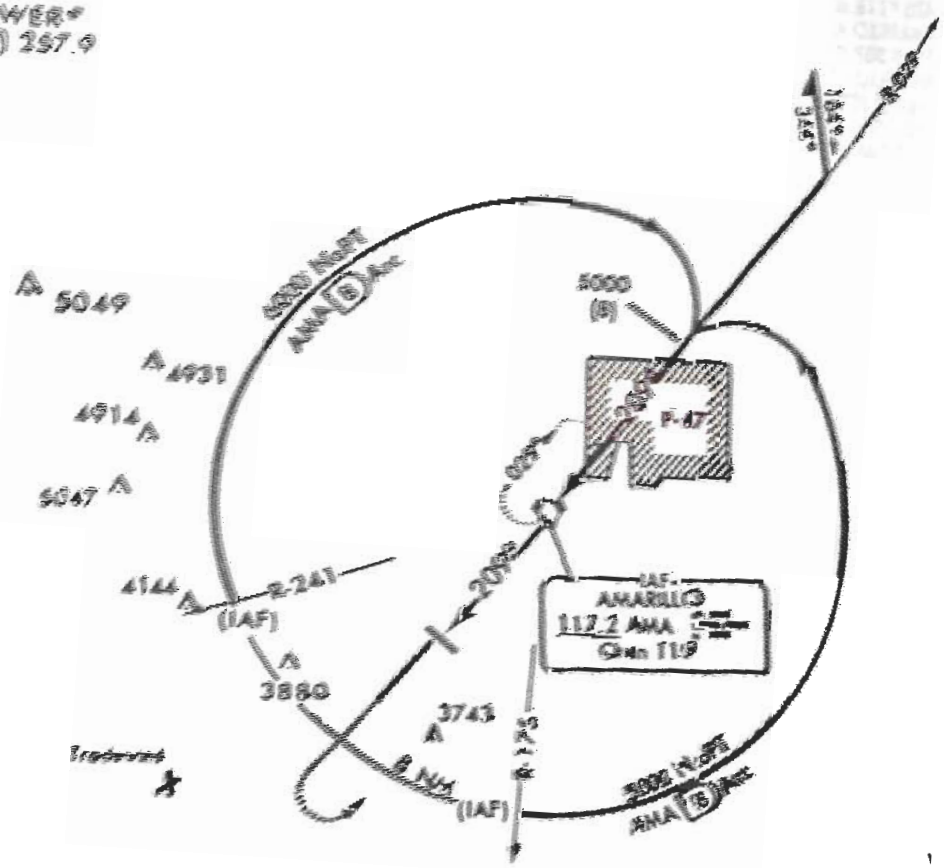
Orig 9606

VOR RWY 22

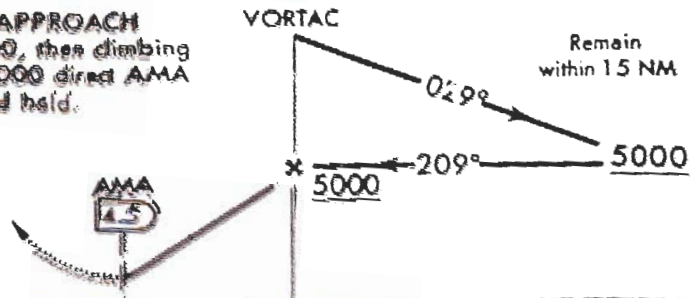
AL-119 (FAA)

AMARILLO

ATIS* 118.85 350.3
AMARILLO APP CON
119.5 307.0
AMARILLO TOWER*
118.3 (CTAF) 257.9
GND CON
121.9 348.6
ASR



MISSED APPROACH
Climb to 4200, then climbing left turn to 5000 direct AMA VORTAC and hold.



ELEV 360

CATEGORY	A	B	C	D	E
S-22	3960-¾ 357 (400-¾)			3960-1¼ 357 (400-1¼)	
CIRCLING	[redacted]		4100-1½	4240-2 435 (700-2)	4500-3 595 (900-3)

3768

REIL
MIRL
HIRL

Knot
Minus

VOR RWY 22

35°13'N-101°42'W

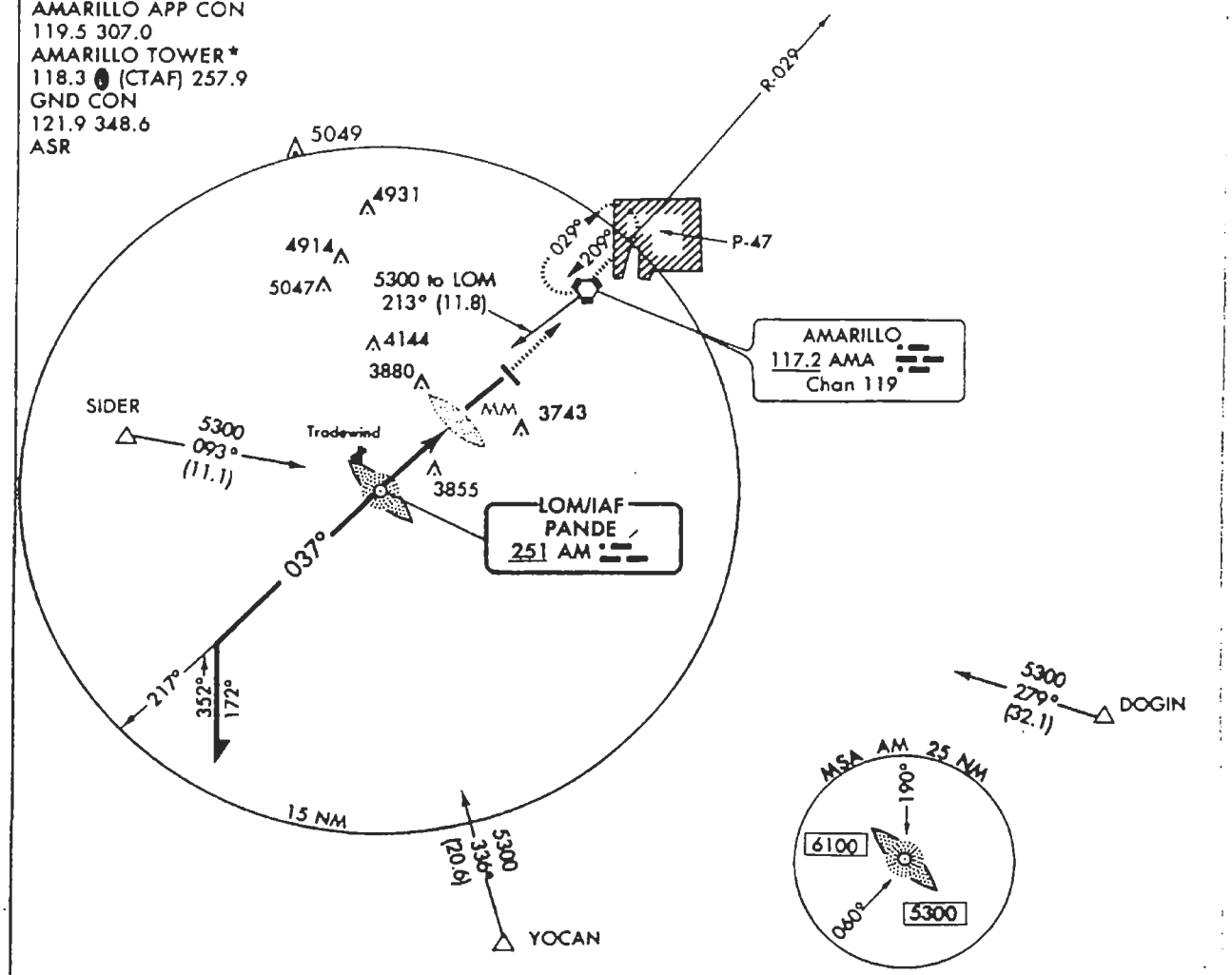
Amdt 16 96060

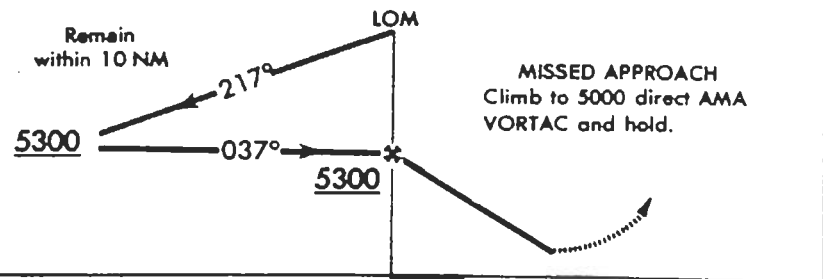
NDB or GPS RWY 4

AL-19 (FAA)

AMARILLO INTL (AMA)
AMARILLO, TEXAS

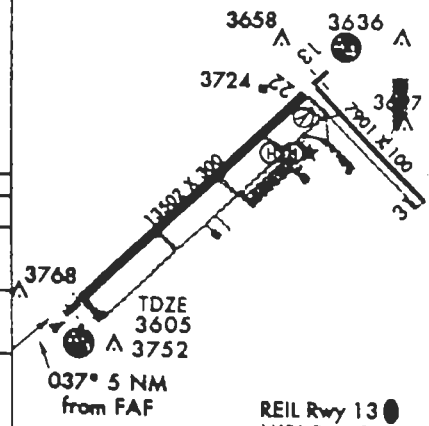
ATIS* 118.85 350.3
AMARILLO APP CON
119.5 307.0
AMARILLO TOWER*
118.3 (CTAF) 257.9
GND CON
121.9 348.6
ASR





ELEV 3605

CATEGORY	A	B	C	D
S-4	4220/40 615 (700-¾)		4220/60 615 (700-1¼)	4220-1¾ 615 (700-1¾)
CIRCLING	4220-1 615 (700-1)		4220-1¾ 615 (700-1¾)	4240-2 635 (700-2)



REIL Rwy 13
MIRL Rwy 13-31
HIRL Rwy 4-22

FAF to MAP 5 NM					
Knots	60	90	120	150	180
Min:Sec	5:00	3:20	2:30	2:00	1:40

TABLE E.3.1.4–5.—*Zone 4 Aircraft Crash Location Probability: Runway 31*

AIRCRAFT	CRASH LOCATION PROBABILITY		
	TAKEOFF (PER MILE^2)	LANDING (PER MILE^2)	IN-FLIGHT (PER MILE)
Air Carrier	5.71×10^{-10}	0.00	NA
Air Taxi	5.71×10^{-10}	0.00	NA
Military: Large	7.16×10^{-15}	9.22×10^{-4}	NA
Military: Small	1.63×10^{-3}	2.49×10^{-6}	NA
General: Single engine piston	NA	NA	8.76×10^{-6}
General: Multi-engine piston	NA	NA	8.76×10^{-6}
General: Turboprop	NA	NA	8.76×10^{-6}
General: Turbojet	NA	NA	8.76×10^{-6}

Source: DOE 1995:Tables B-3, B-5, B-6, and B-9

TABLE E.3.1.4–6.—*Zone 4 Aircraft Total Crash Probability per Year*

AIRCRAFT	RW 22 LANDING	RW 04 TAKEOFF	RW 31 LANDING	RW 31 TAKEOFF	JETWAY 1: 42°	JETWAY 2: 77°	JETWAY 3: 105°	JETWAY 4: 141°	JETWAY 5: BORGER	TOTAL ZONE 4
Air Carrier	3.35×10^{-7}	1.79×10^{-9}	0	0	3.84×10^{-7}	1.45×10^{-7}	5.85×10^{-9}	1.28×10^{-9}	1.15×10^{-28}	1.07×10^{-6}
Air Taxi	[illegible]	[illegible]	0	1.27×10^{-13}	0	0	0	0	0	1.57×10^{-6}
Military: Large	[illegible]	[illegible]	0	0	3.96×10^{-8}	3.02×10^{-8}	3.89×10^{-9}	[illegible]	[illegible]	3.39×10^{-7}
Military: Small	[illegible]	[illegible]	[illegible]	3.58×10^{-7}	2.90×10^{-7}	2.21×10^{-7}	2.71×10^{-8}	[illegible]	[illegible]	[illegible]
General: Single-eng.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
General: Multi-eng.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
General: Turboprop	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
General: Turbojet	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE E.3.1.4–7.—*Aircraft Characteristics*

AIRCRAFT	IMPACT VELOCITY (ft/sec)	WEIGHT (lb)	DIAMETER (in)
Air Carrier	422	3,164	46
Air Taxi	422	677	25
Military: Large	338	4,717	59
Military: Small	422	854	27
General: Single-eng.	152	480	26
General: Multi-eng.	152	488	20
General: Turboprop	152	358	21
General: Turbojet	152	651	40

Source: LLNL 1995; Jones 1994

TABLE E.3.1.5–11.—*Zone 12 Total Aircraft Crash Probability per Year: Perforation and Scab.*

AIRCRAFT	RW 22 LANDING	RW 04 TAKEOFF	RW 31 LANDING	RW 31 TAKEOFF/ IN-FLIGHT	JETWAY 1: 42°	JETWAY 2: 77°	JETWAY 3: 105°	JETWAY 4: 141°	JETWAY 5: BORGER	TOTAL ZONE 1
Air Carrier	1.10×10^{-7}	4.89×10^{-9}	0	0	8.38×10^{-9}	7.90×10^{-7}	1.60×10^{-8}	6.84×10^{-10}	2.31×10^{-30}	$9.29 \times 10^{-}$
Air Taxi	3.25×10^{-7}	9.14×10^{-8}	0	0	0	0	0	0	0	$4.17 \times 10^{-}$
Military: Large	6.47×10^{-9}	5.24×10^{-8}	0	0	2.76×10^{-9}	5.62×10^{-8}	5.27×10^{-9}	7.21×10^{-10}	1.20×10^{-22}	$1.34 \times 10^{-}$
Military: Small	6.85×10^{-6}	6.72×10^{-7}	5.12×10^{-9}	0	2.18×10^{-8}	5.22×10^{-7}	4.16×10^{-8}	5.59×10^{-9}	9.46×10^{-22}	$8.12 \times 10^{-}$
General: Single eng.	1.78×10^{-9}	2.51×10^{-11}	2.74×10^{-10}	2.74×10^{-10}	4.07×10^{-11}	9.55×10^{-9}	7.77×10^{-11}	1.53×10^{-12}	3.84×10^{-38}	$1.20 \times 10^{-}$
General: Multi-eng.	4.61×10^{-10}	2.63×10^{-12}	7.11×10^{-11}	7.11×10^{-11}	6.59×10^{-11}	1.55×10^{-8}	1.26×10^{-10}	2.47×10^{-12}	6.22×10^{-38}	$1.63 \times 10^{-}$
General: Turboprop	4.16×10^{-10}	8.27×10^{-13}	6.43×10^{-11}	6.43×10^{-11}	2.01×10^{-10}	4.72×10^{-8}	3.84×10^{-10}	7.55×10^{-12}	1.90×10^{-37}	$4.83 \times 10^{-}$
General: Turbojet	2.85×10^{-10}	5.67×10^{-14}	4.40×10^{-11}	4.40×10^{-11}	4.52×10^{-11}	1.06×10^{-8}	8.62×10^{-11}	1.70×10^{-12}	4.27×10^{-38}	$1.10 \times 10^{-}$
Total	7.29×10^{-6}	8.21×10^{-7}	5.58×10^{-9}	4.54×10^{-10}	3.33×10^{-8}	1.46×10^{-6}	6.35×10^{-8}	7.11×10^{-9}	1.07×10^{-21}	9.68×1

TABLE E.3.1.5–12.—*Zone 12 Total Aircraft Crash Probability per Year: Perforation*

AIRCRAFT	RW 22 LANDING	RW 04 TAKEOFF	RW 31 LANDING	RW 31 TAKEOFF/ IN-FLIGHT	JETWAY 1: 42°	JETWAY 2: 77°	JETWAY 3: 105°	JETWAY 4: 141°	JETWAY 5: BORGER	TOT/ ZONE
Air Carrier	1.08×10^{-7}	4.78×10^{-9}	0	0	8.20×10^{-9}	7.73×10^{-7}	1.57×10^{-8}	6.69×10^{-10}	2.26×10^{-30}	$9.10 \times$
Air Taxi	2.86×10^{-7}	8.01×10^{-8}	0	0	0	0	0	0	0	$3.66 \times$
Military: Large	5.56×10^{-9}	4.50×10^{-8}	0	0	2.37×10^{-9}	5.68×10^{-8}	4.52×10^{-9}	6.18×10^{-10}	1.03×10^{-22}	$1.15 \times$
Military: Small	5.71×10^{-6}	5.50×10^{-7}	4.27×10^{-9}	0	1.78×10^{-8}	4.27×10^{-7}	3.40×10^{-8}	4.65×10^{-9}	7.74×10^{-22}	$6.75 \times$
General: Single eng.	0	0	0	0	3.22×10^{-11}	7.55×10^{-9}	6.14×10^{-11}	1.21×10^{-12}	3.04×10^{-38}	$7.64 \times$
General: Multi-eng.	0	0	0	0	5.21×10^{-11}	1.22×10^{-8}	9.94×10^{-11}	1.96×10^{-12}	4.92×10^{-38}	1.24
General: Turboprop	0	0	0	0	1.51×10^{-10}	3.55×10^{-8}	2.89×10^{-10}	5.69×10^{-12}	1.43×10^{-37}	3.59
General: Turbojet	0	0	0	0	3.55×10^{-11}	8.32×10^{-9}	6.77×10^{-11}	1.33×10^{-12}	3.35×10^{-38}	8.42
Total	7.29×10^{-6}	8.21×10^{-7}	5.58×10^{-9}	$4.54 \times 10^{-}$	3.33×10^{-8}	1.46×10^{-6}	6.35×10^{-8}	5.69×10^{-9}	1.07×10^{-21}	8.24

TABLE E.3.2.1–1.—*1994 Albuquerque International Airport Traffic Activity*

AIRCRAFT CATEGORY	NUMBER OF FLIGHTS
Air Carrier	79,008
Air Taxi	40,685
Military	31,114
General	68,316
Total	219,123

Source: City 1994

PART B

SITE ASSESSMENT TEAM REPORT

DEPARTMENT OF ENERGY
HIGHLY ENRICHED URANIUM
ES&H VULNERABILITY ASSESSMENT

PANTEX SITE ASSESSMENT TEAM REPORT

JUNE 1996

PANTEX
PURSUIT OF EXCELLENCE

MEMO

Date: June 25, 1996

From: L. C. Phillips **Location:** Pantex Classification Office

To: E. H. Mann **Location:** SAT HEU Co-Leader

Subject: Review of the Highly Enriched Uranium Vulnerability Assessment of the Pantex Plant

A review of the Highly Enriched Uranium Vulnerability Assessment of the Pantex Plant, performed by the Site Assessment Team and dated June 25, 1996, has been reviewed and is unclassified and does not contain UCNI.

The same determination applies to associated photographs and attachments.

L. C. Phillips

L. C. Phillips
Classification
Program Coordinator

LCP:lcj

HIGHLY ENRICHED URANIUM
ES&H VULNERABILITY
ASSESSMENT

PANTEX PLANT
SITE ASSESSMENT
APPROVAL SIGNATURES

W.A. Weinreich
General Manager

G.W. Johnson, DOE/AAO
Area Manager

R.S. Watkins, ES&H
Division Manager

J.W. Angelo, Manufacturing
Division Manager

H.S. Berman, Engineering & Design
Division Manager

E.H. Mann, Facility Operations
Dupty Division Manager

H.R. Griffith, DOE/AAO
Safety & Health Staff, Health Physicist

Concurrence By:

D.C. Brunell, DOE/AAO
Assistant Area Manager for
Facilities

W.S. Goodrum, DOE/AAO
Assistant Area Manager for Weapon
Programs

Reviewed for Classification

Pantex Classification Office
C.R.# 96-066-PCS RPT

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E Classified Information Relative to Vulnerability Assessment E-1
(This document provides relevant information, but is not attached to this report.)

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DT 18 ..... Attachment "Staging - 7"
DT 20 ..... Attachment "Staging - 8"
DT 22 ..... Attachment "Staging - 9"
DT 23 ..... Attachment "Staging - 10"
MH 2800 ..... Attachment "Staging - 11"

Appendix B - Cells

Location of Cell Facilities in Zone 12 ..... Attachment "Cells - 1"
Pantex Plant HEU Facility Location Sketch ..... Attachment "Cells - 2"
Assembly/Disassembly Cell (Gravel Gertie) - Photograph ..... Attachment "Cells - 3"
Cells - Round Room - Photograph ..... Attachment "Cells - 4"

Cells . . . . . Attachment "Cells - 5
Floor Plan for Building 12-44 . . . . . Attachment "Cells - 6
Elevations and Sections for Building 12-44 . . . . . Attachment "Cells - 7
Floor Plans for Buildings 12-85 and 12-96 . . . . . Attachment "Cells - 8
Elevations and Sections for Buildings 12-85 and 12-96 . . . . . Attachment "Cells - 9
Floor Plan for Building 12-98 . . . . . Attachment "Cells - 10
Assembly Cell Floor Plan in Building 12-98 . . . . . Attachment "Cells - 11
Elevations and Sections for Building 12-98 Assembly Cell . . . . . Attachment "Cells - 12
Pantex Plant HEU Movements . . . . . Attachment "Cells - 1
Assembly Cells HEU Barriers . . . . . Attachment "Cells - 1
DT 18 . . . . . Attachment "Cells - 1
DT 20 . . . . . Attachment "Cells - 1
DT 22 . . . . . Attachment "Cells -
DT 23 . . . . . Attachment "Cells -
MH 2800 . . . . . Attachment "Cells -

Appendix B - Bays

Buildings 12-64, 12-84, 12-99, and 12-104 and Neighboring Facilities . . Attachment "Bays
Pantex Plant HEU Facility Location Sketch . . . . . Attachment "Bay
Bays - Photograph . . . . . Attachment "Bay
Building 12-64 Floor Plan . . . . . Attachment "Bay
Building 12-64 Assembly Bay Floor Plan . . . . . Attachment "Bay
Building 12-64 Vertical Section . . . . . Attachment "Ba
Building 12-84 (West) Floor Plan . . . . . Attachment "Ba
Building 12-84 (East) Floor Plan . . . . . Attachment "Ba
Building 12-84 (West) Assembly Bay Floor Plan . . . . . Attachment "B
Building 12-84 (East) Assembly Bay Floor Plan . . . . . Attachment "Ba
Building 12-84 (West) Vertical Section . . . . . Attachment "Ba
Building 12-99 Floor Plan . . . . . Attachment "Ba
Building 12-99 Assembly Bay Floor Plan . . . . . Attachment "B
Building 12-99 Vertical Section . . . . . Attachment "B
Building 12-104 Floor Plan . . . . . Attachment "B
Building 12-104 Assembly Bay Floor Plan . . . . . Attachment "E
Building 12-104 Vertical Section . . . . . Attachment "I
Pantex Plant HEU Movements . . . . . Attachment "
Assembly Bays HEU Barriers . . . . . Attachment "
DT 18 . . . . . Attachment "
DT 20 . . . . . Attachment
DT 22 . . . . . Attachment
DT 23 . . . . . Attachment
MH 2800 . . . . . Attachment

Appendix B - Transportation

Interzone Transfer Routes . . . . . Attachment "Trans - 1"
Zone 12 Loading Dock Locations . . . . . Attachment "Trans - 2"
Pantex Plant HEU Facility Location Sketch . . . . . Attachment "Trans - 3"
Pantex Plant HEU Movements . . . . . Attachment "Trans - 4"
Transporting a DT 23 - Photograph . . . . . Attachment "Trans - 5"
Transportation HEU Barriers . . . . . Attachment "Trans - 6"
DT 9, Drum 17-H 55 Gal. . . . . Attachment "Trans - 7"
Attachment "Trans - 8" . . . . . See Appendix E
DT 18 . . . . . Attachment "Trans - 9"
DT 20 . . . . . Attachment "Trans - 10"
DT 22 . . . . . Attachment "Trans - 11"
DT 23 . . . . . Attachment "Trans - 12"
Transportation - DT 23 - Photograph . . . . . Attachment "Trans - 13"
Transportation - Horizontal Shipping Container - Photograph . . . . . Attachment "Trans - 14"
MH 2800 . . . . . Attachment "Trans - 15"

Appendix B - Sources

Pantex Plant HEU Facility Location Sketch . . . . . Attachment "Sources - 1"
Sources Room Door - Controlled Area Access - Photograph . . . . . Attachment "Sources - 2"
Sources - 5-Drawer Source Filing Cabinet - Photograph . . . . . Attachment "Sources - 3"
Source HEU Barriers . . . . . Attachment "Sources - 4"
HEU Sources - Photograph . . . . . Attachment "Sources - 5"

Appendix C - Vulnerability Assessment Form

Proposed VOR Approach Change . . . . . Attachment "VAF/001 - 1"
Vulnerability Assessment Form - Cell Blast Door - Photograph . . . . Attachment "VAF/002 - 1"
Vulnerability Assessment Form - Cell Revolving Door - Photograph Attachment "VAF/002 - 2"

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ACRONYMS

ALARA	As Low As Reasonably Achievable
BDI	Blast Door Interlock
BIO	Basis for Interim Operation
CAM	Continuous Air Monitor
CAMP	Capital Asset Management Process
CEDE	Cumulative Effective Dose Equivalent
CSA	Canned Sub-assembly
CSSM	Critical Safety Systems Manual
DBA	Design Basis Analysis
DBE	Design Basis Earthquake
DBT	Design Basis Tornado
DNFSB	Defense Nuclear Facilities Safety Board
DOE	Department of Energy
DP	Defense Programs
EA	Environmental Assessment
EIS	Environmental Impact Statement
ES&H	Environment Safety & Health
FSAR	Final Safety Analysis Report
HE	High Explosive
HEPA	High Efficiency Particulate Air (Filter)
HEU	Highly Enriched Uranium
HVAC	Heating, Ventilation and Air Conditioning
IHE	Insensitive High Explosives
IOP	Internal Operating Procedure
LINAC	Linear Accelerator
MAA	Material Access Area
MCE	Maximum Credible Earthquake
MIP	Maintenance Implementation Plan
MNL	Manual
NEA	Nuclear Explosive Area
NELA	Nuclear Explosive Like Assembly
O&I	Operation and Inspection
OR	Occurrence Reports
ORO	Oak Ridge Operations
PA	Partitioned Area

PSMP	Pantex Site Maintenance Plan
Pu	Plutonium
RAMS	Radiation Alarm Monitoring System
REM	Roentgen Equivalent Man
RPP	Radiation Protection Program
RSD	Radiation Safety Department
RTG	Radioisotopic Thermoelectric Generator
SAC	Steel Arch Construction
SAR	Safety Analysis Report
SARP	Safety Analysis Report for Packaging
SAT	Site Assessment Team
SEN	Secretary of Energy Notice
SMAP	Site Maintenance Action Plan
SNM	Special Nuclear Material
S\RIDS	Standards\Requirements Identification Documents
SS	Stainless Steel
SSC	Structures, Systems, and Components
SST	Safe Secure Trailers
STD	Standard
TSR	Technical Safety Requirement
UOR	Unusual Occurrence Report
UPS	Uninterruptible Power Supply
USQD	Unreviewed Safety Question Determination
(U)	Unclassified
VAF	Vulnerability Assessment Form
WGAT	Working Group Assessment Team

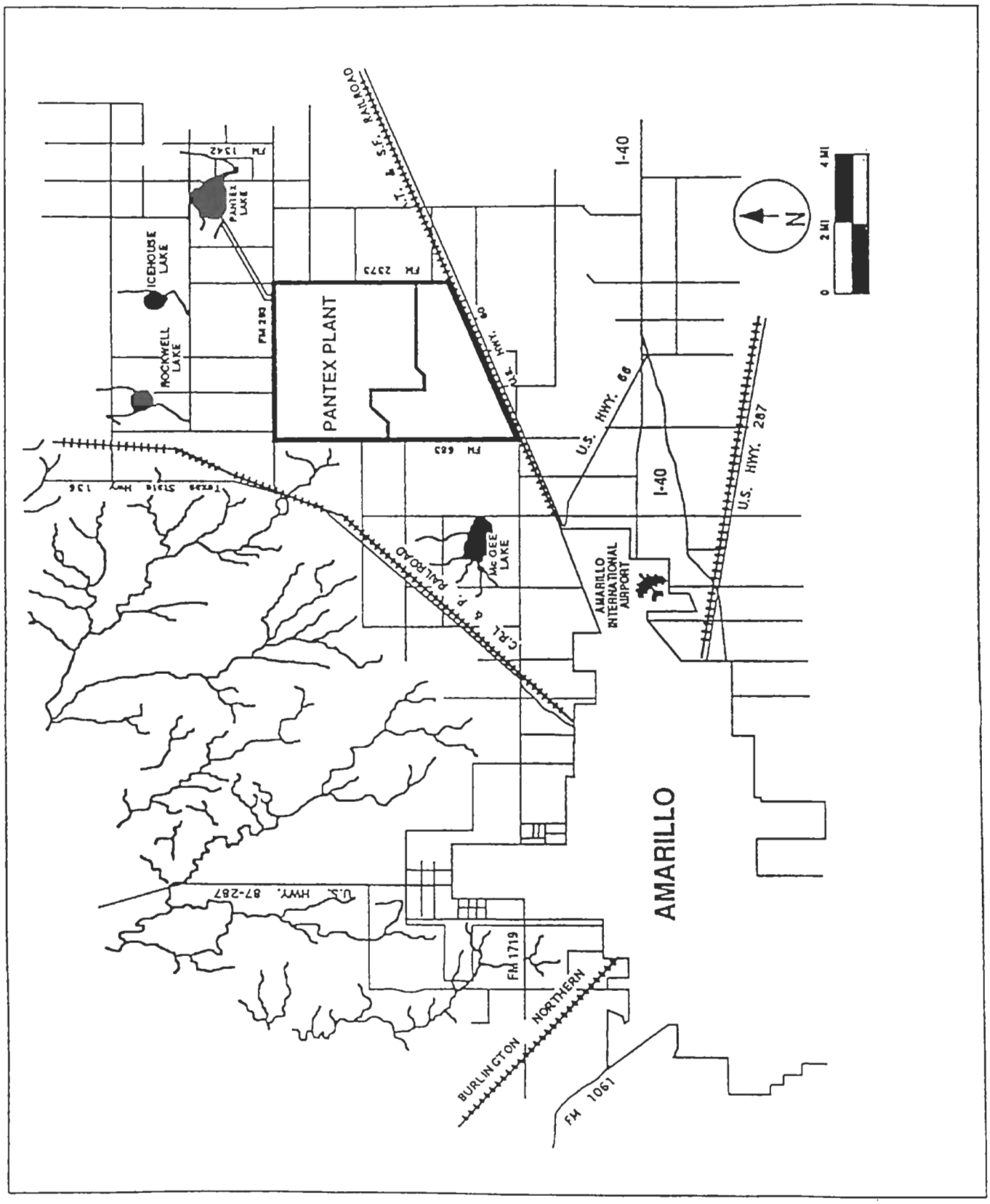
interim storage for plutonium pits from dismantled nuclear weapons; and (6) develop, fabricate, and test chemical explosives and explosive components for nuclear weapons and to support DOE initiatives.

Facilities that have been identified by similar function for inclusion in the HEU Vulnerability Assessment of the Pantex Plant are: (1) Zone 4 magazines; (2) Buildings 12-58 and 12-60 (Bays); (3) Buildings 12-44, 12-85, 12-96 and 12-98 (Cells); (4) Buildings 12-64, 12-84, 12-99, and 12-104 (Bays); (5) Intra-plant HEU transportation activities; and (6) Sources containing HEU. The facilities containing disassembled nuclear explosive components are designed to withstand adverse conditions with minimum damage or release of radioactivity to the environment.

The SAT identified two vulnerabilities associated with HEU at Pantex Plant. They are: (1) "An aircraft crash in Zone 4 or Zone 12;" and (2) "Potential for higher release consequences due to increased leakage paths and greater understanding of dispersal mechanics from an explosion."

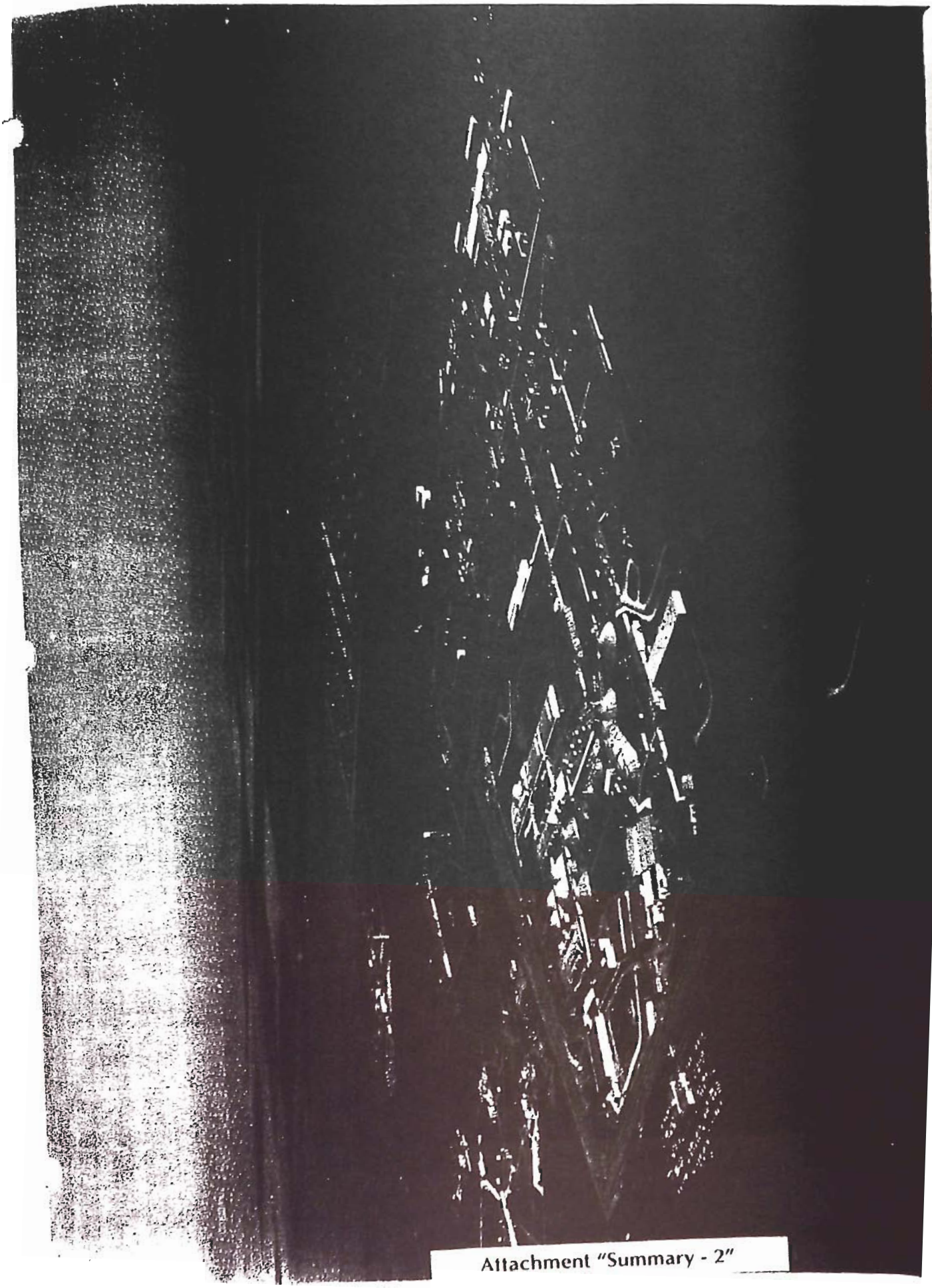
The Pantex Plant Site Assessment Team (SAT) HEU Vulnerability Assessment results contained in this document will be validated by a visiting Working Group Assessment Team (WGAT) during the month of June 1996.

The SAT report consists of an Executive Summary, Identification of Facilities, Discussion by Facility and five appendices. The appendices include a listing of Assessment Team Members and Bibliography; Sketches; Responses to the Question Sets; Partitioned (Grouped) Areas; Expert Vulnerability Assessment Forms; References and Classified Information Relative to Vulnerability Assessment. This classified appendix will not be a permanent part of the report, and will be retained on site.



PANTEX PLANT LOCATION

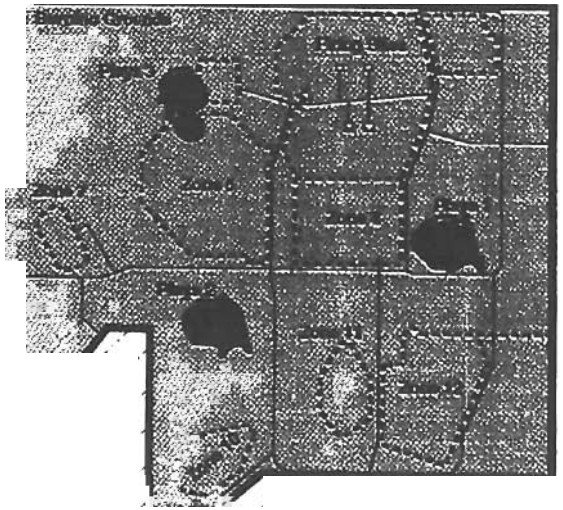
Attachment "Summary - 1"

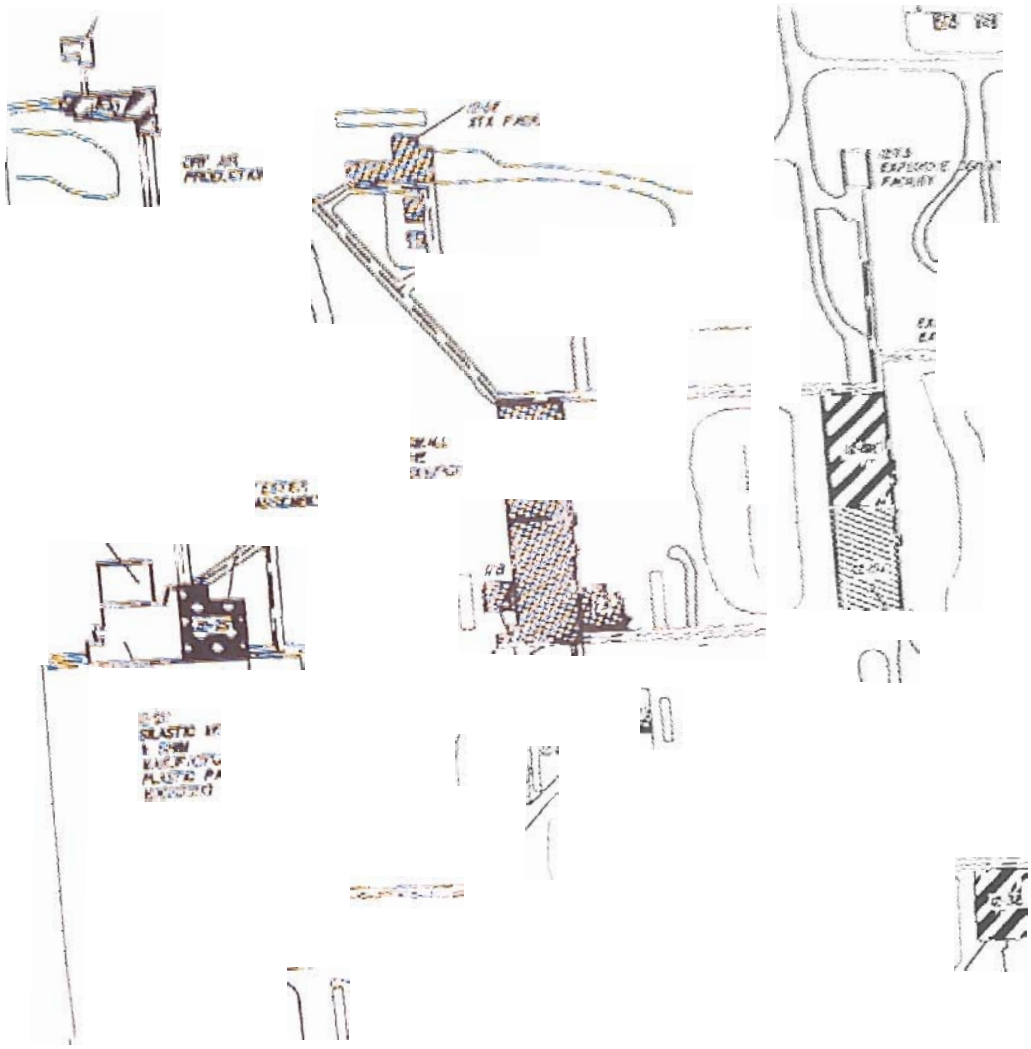


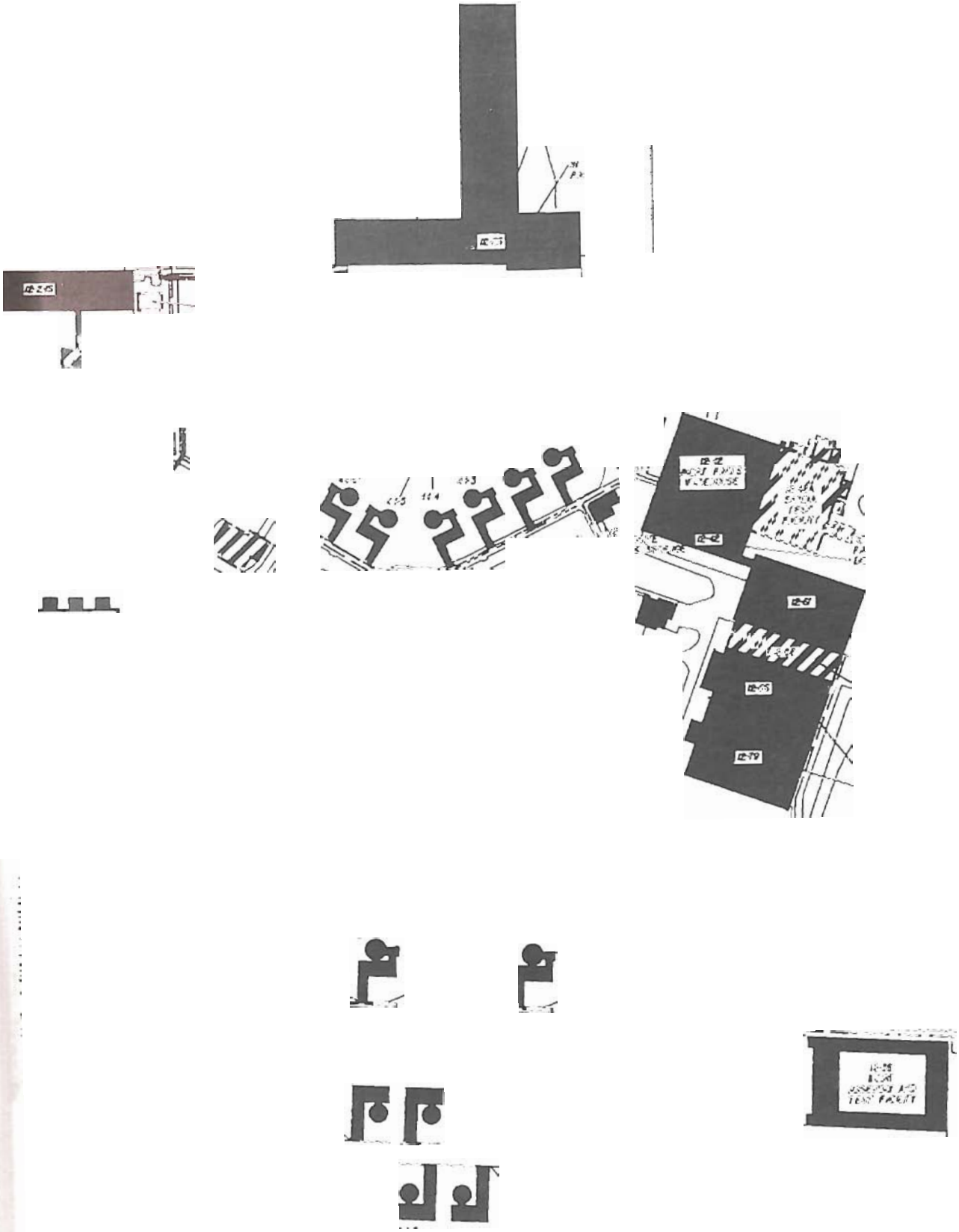
Summary - Aerial view

Attachment "Summary - 2"

cation of Pantex







INTRODUCTION

Summary by Facility

- Zone 4, Staging, Bays, Transportation

The Vulnerability identified for Zone 4 Magazines is entitled "Aircraft Crash into Zone 4 or Zone 12." This vulnerability is of low relative consequence with primarily localized effects as it relates to HEU.

- Cells

The Vulnerabilities identified for Cells are entitled "Aircraft Crash into Zone 4 or Zone 12." and "Potential for Higher Release Consequences Due to Increased Leakage Paths and a Greater Understanding of Dispersal Mechanics from an Explosion." These vulnerabilities are of low relative consequence with primarily localized effects as they relate to HEU.

Site-Wide Conclusions

The Pantex Plant is the first DOE/Albuquerque Operations Office Site to successfully achieve compliance with the Implementation Plan and Basis for Interim Operation (BIO) provision of DOE Orders 5480.22 and 5480.23 under the DOE-STD-3011 guidance.

Changes are not made to the safety basis or operating controls expressed in the BIO without the application of the Pantex Plant Unreviewed Safety Question (USQ) process.

All handling of disassembled nuclear explosive components and sources containing HEU at the Pantex Plant is performed by a trained and qualified work force in accordance with DOE requirements, OSHA national standards, programmatic and approved plant procedures.

The Maintenance Management Program at Pantex is a consolidated comprehensive program which addresses all maintenance functions of all areas of the Plant. With the primary maintenance criteria of DOE Order 4330.4B, "Maintenance Management Program," the program provides the maintenance function based on a graded approach as defined in the Pantex Plant "Maintenance Implementation Plan (MNL-FO-1106)" for both nuclear and non-nuclear facilities.

Pantex Plant operations are accomplished safely through the implementation and use of Formality of Operations and Conduct of Operations concepts.

The SAT has identified two vulnerabilities associated with the HEU holdings of the Pantex Plant. These vulnerabilities exhibit low consequences of violating the barriers established to contain HEU and protect the worker, the public and the environment.

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IDENTIFICATION OF FACILITIES

Brief Description

Zone 4 Magazines

Zone 4 Magazines are located in the Zone 4 Material Access Area (MAA), and consists of modified-Richmond and Steel Arch Construction (SAC) magazines. Five types of items may be housed in these magazines: (1) weapon assemblies, (2) pits, (3) Radioisotopic Thermal Generators (RTGs), (4) Canned Sub-assemblies (CSAs), and (5) nuclear explosive-like assemblies (NELAs). Currently, 38 of 42 SAC magazines are approved for staging HEU items, however, only 11 are currently being used to stage HEU holdings. At the time of this assessment, HEU pits in storage containers and HEU in Canned Sub-assemblies are the only materials contained in the magazines that were within the scope of this assessment.

Staging Bays

Buildings 12-58 and 12-60 are located in close proximity to each other in the Zone 12 Material Access Area (MAA), which is located in the southeast quadrant of the Pantex Plant. There are two bays in Building 12-58 and three bays in Building 12-60 that are used to stage Canned Sub-assemblies containing HEU. A layout drawing of Zone 12 South is provided in Attachment "Summary-4."

Assembly/Disassembly Cells

Buildings 12-44 (Cells 1-6), 12-85, 12-96, and 12-98 (Cells 1-3) are part of the production area of Zone 12 and are located inside the Zone 12 Material Access Area (MAA). These cells are used for nuclear explosives assembly, disassembly, examination and testing. The cells in these buildings were designed as nuclear explosive facilities with the capability to process uncased explosives and weapon components. Highly enriched uranium (HEU) will be in these facilities in the form of a pit alone, or with either cased or uncased high explosive (HE), or insensitive high explosives (IHE), or, as a Canned Sub-assemblies that have been removed from nuclear weapons. Buildings 12-85 and 12-96 each contain one cell, and Building 12-98 contains three that are used for assembly/ disassembly operations. The four buildings also contain decontamination facilities and a number of supporting office, storage, electrical, and mechanical equipment rooms.

Assembly/Disassembly Bays

Buildings 12-64, 12-84, 12-99, and 12-104 are part of the production area of Zone 12 and are located inside the Zone 12 MAA. These buildings include individual bays for nuclear explosives assembly, disassembly, examination, and testing. The

Assessment is provided as Attachment "Summary - 5." These facilities are grouped by similar function as follows (there are no partitioned areas within these groups):

- ***Zone 4:*** Magazines 101, 102, 103, 105, 108 and 110 through 142.

- ***Staging:*** Building 12-58 (Bays 4 and 5), and Building 12-60 (Bays 3, 4, and 5).

- ***Cells:*** Cells in Buildings 12-44 (Cells 2-6); Building 12-85 (Cell); Building 12-96 (Cell) and Building 12-98 (Cells 1, 2 and 3).

- ***Bays:*** Bays in Buildings 12-64 (Bays 1, and 4-16), Building 12-84 (Bays 1-20), Building 12-99 (Bays 1, 3, 5, 7 and 8) and Building 12-104 (Bays 1-16).

- ***Transportation:*** Intra-plant transportation of HEU.

- ***Sources:*** HEU Sources.

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APPENDIX A

Site Assessment Team Membership and Bibliographic Sketches

H.R. Griffith - SAT Co-Leader (DOE/Amarillo Area Office)

Position: HP, Health Protection Team
DOE - Amarillo Area Office
Specialization: Health Physicist

Education: B.S. in Biological Sciences

Certifications: Personnel Assurance Program

Experience: Mr. Griffith has 16 years experience in the health physics arena. This experience includes six years as a health physics technician and two years experience as a supervisory health physics technician in the Radiological Control Program at two Naval Shipyards. In addition, he spent the last seven years with the Radiological Control Technical Division of a Naval Shipyard where he filled the positions of both a health physicist and a nuclear engineer. During this time he was assigned as the Radiological Control Project Engineer for propulsion plant steam generator inspections. Mr. Griffith has expertise in radiological work practices, especially those associated with high levels of radioactive contamination, control of airborne contamination, and the design of containments to support high contamination work.
(Nuclear experience 16 years; at Pantex 2 years)

E.H. Mann - SAT Co-Leader (Facility Operations Division, Pantex Plant)

Position: Facility Operations Deputy Division Manager
Specialization: Operations and Maintenance

Education: M.S. Public Administration
B.S. Industrial Education
U.S. Navy Nuclear Power
U.S. Navy Nuclear Power Prototype

Certifications: Personnel Assurance Program

Experience: Mr. Mann has more than 30 years experience in the U.S. Navy's nuclear power submarine program. He served in numerous high level positions that involved the operation, maintenance and repair of nuclear reactor plants and related propulsion systems. These positions included Commanding Officer of the Navy's largest and most heavily taxed nuclear submarine repair activity. He has had more than 1-1/2 years experience as a Senior Mentor and Facility

Operations Deputy Division Manager at the Pantex Plant. His responsibilities include repairs, preventive maintenance, and modifications to critical, important, and balance of plant buildings and systems, and associated plannir and scheduling; site utilities; and associated logistics, training, administratic and budgeting, in support of the plant's primary mission of nuclear weapons fabrication and dismantlement processes. He has managed numerous progra required by DOE Orders, such as Conduct of Operations, Conduct of Maintenance, and Occurrence Reporting.
(Nuclear experience 32 years; at Pantex 1 1/2 years)

P.S. Allison - Environment, Safety, and Health Division, Explosives Safety Department

Position: Senior Project Scientist
Specialization: Explosives Safety

Education: B.S., M.S. Biology, West Texas A&M University, Canyon, Texas
Post Graduate Studies, Biology, Texas Tech University, Lubbock, Texas

Certifications: Personnel Assurance Program
Certified Professional Wetlands Scientist

Experience: Ms. Allison is a scientist in the Explosives Safety Department. She also h been in biological and environmental work for 9 years. She serves on a national committee for wetland scientists and is active on the Pantex Plant Citizens' Advisory Board.
(Nuclear experience 5 years; at Pantex 5 years)

R.L. Benson - Manufacturing Division, Packaging and Shipping

Position: Section Manager, Packaging Engineers.
Specialization: Configuration Management (HEU)

Education: B.S., Engineering, Texas Tech University, Lubbock, Texas
Site Assessment Training at Pantex

Certifications: Personnel Assurance Program
Lead investigator on W68 HE incident.
Member of 48 Cracker Assessment and Work Team
Lead Engineer for developing H1616 Packaging and Testing Requiren
Lead Engineer for developing and establishing DT Container Refurbis Process at Pantex.

Experience: Mr. Benson has been an Assembly Engineer for 13 years. He worked B28, B53, W50 and W56 Assembly and Dismantlement Programs. H been responsible for packaging of all components for shipping and ev

purposes and served as a packaging engineer for 3 years. He was the Section Manager of the packaging group and recently completed the Pantex Refurbishment Process presentation to DOE NESD Albuquerque and Oak Ridge Packaging Group. The Packaging Section is currently involved with the CSA packaging, pit packaging, DT container refurbishment efforts, Tritium Reservoir packaging, Interim Hazard Classifications, Hazardous and Non Hazardous material packaging requirements, and establishment of the AT-400 packaging process at Pantex.
(Nuclear experience 16 years; at Pantex 16 years)

N.F. Foster - Facility Operations Division, Operations

Position: Project Leader, Facility Operations
Specialization: Operations, Facilities

Education: A.A., A.S. in Applied Science

Certifications: Personnel Assurance Program

Experience: Mr. Foster has had 31 years experience in production. He has served as a Production Operator, Inspector, Inspection Supervisor, General Inspection Supervisor, Production Supervisor, Operations Manager of Buildings 12-116 and 12-117, and Project Leader, Pantex Plant.
(Nuclear experience 31 years; at Pantex 31 years)

W.J. Harris - Engineering and Design Division, Risk Management Department

Position: Program Manager, Authorization Basis Documentation, Risk Management
Specialization: Authorization, Safety, Operational; Hazard Accident, Risk Analysis; Administrative Controls; Design Basis (including natural phenomena)

Education: Naval Nuclear Power
Naval Electronics
Northern Virginia Community College, San Diego College

Certifications: Personnel Assurance Program
Accident Investigator
Reactor Operator
Reactor Engineering Duty Officer
Events Analysis Evaluator

Experience: Mr. Harris has had more than 38 years experience in the military and commercial nuclear power industry. This experience is varied and includes the naval reactors program, the Institute of Nuclear Power, Commercial Nuclear Power, and Defense Department Programs. His activities have included

design, construction, repair, maintenance and operation, licensing, assessment and compliance activities, risks and hazards evaluation.
(Nuclear experience 38 years; at Pantex 2 years)

D.T. Hooten - Engineering and Design Division, Assembly Engineering Department

Position: Project Engineer
Specialization: Nuclear Weapons Production, Limiting Conditions Operations; Administrative Controls

Education: B.S., Mechanical Engineering

Certifications: Personnel Assurance Program

Experience: Mr. Hooten performs weapons assembly/disassembly and joint te engineering at Pantex Plant. He also designed process equipment nuclear materials, reviewed process procedures, and reviewed fa operations for safe conduct of operations.
(Nuclear experience 7 years; at Pantex 1 1/2 years)

S.G. Keadle - Maintenance Support Department, Facility Operations Division

Position: Staff Manager for Special Projects
Specialization: Maintenance

Education: [illegible]

Certifications: [illegible]

Experience: [illegible]

Development for Facility Operations; Manager for Preventive Maintenance and Scheduling. Mr. Keadle has 27 years of experience in nuclear and industrial maintenance, operations and design, including emergency response (i.e., fire service, emergency medicine, nuclear weapons incident response, radiological and hazardous material), maintenance program implementation, maintenance management, facility/equipment design, performance based assessment, certified training instructor, and accident investigation. Mr. Keadle has served or is currently serving on numerous DOE complex work teams for maintenance issues, e.g., development of DOE Standards for maintenance and is a member of the Steering Committee for the DOE complex-wide Maintenance Working Group of the Energy Facilities Contractor Group.
(Nuclear experience 27 years; at Pantex 24 years)

M.G. Knight - Environment, Safety, and Health Division, Radiation Safety Department

Position: Department Scientist
Specialization: Radiological Protection

Education: B.S., East Texas State University, Commerce, Texas, Chemistry
M.S.(Hyg), University of Pittsburgh, Pittsburgh, Pennsylvania, Radiation Health

Certifications: Comprehensively certified by the American Board of Health Physics (1995)
Personnel Assurance Program

Experience: Mr. Knight has been with Battelle Pantex for 2 1/2 years as a Department Scientist, Radiation Safety Department. He is responsible for oversight of Radiological Worker Training, budget, dosimetry and compliance assessment. 21 years experience as U.S. Navy Radiation Health Officer. He was responsible for ionizing and non-ionizing radiation safety programs for a wide variety of Naval activities, including medical, research, training, weapons, and industrial facilities, as well as support of the Navy nuclear propulsion program.
(Nuclear experience 24 years; at Pantex 2 1/2 years)

L.F. Kuga - Operations Support Division, Occurrence Management Department

Position: Project Leader
Specialization: Occurrences

Education: B.S. in Nuclear Engineering, University of Florida
Graduate of Naval Nuclear Power School

Certifications: OSHA 40 Hour HAZWOPER (1994)
Personnel Assurance Program
Authorized Derivative Classifier

rebuild program. She participated in a Manufacturing Resource Planning II rewrite for disassembly functions and in creating and implementing procedures for a radioactive materials movement procedure. She is a former Supervisor-Adult Sheltered Workshop and Juvenile Learning Program, Texas Department of Mental Health/Mental Retardation.
(Nuclear experience 15 years; at Pantex 15 years)

R.C. Stone - Environment, Safety, and Health Division, Industrial Hygiene Department

Position: Project Scientist/Industrial Hygiene Surveillance Team Leader
Specialization: Occupational Safety and Health

Education: B.S., Utah State University, Public Health-Industrial Hygiene/Chemistry
A.S., Ricks College, General Education

Certification: Personnel Assurance Program
Industrial Hygiene IT (initial certification)

Experience: Mr. Stone has been a Industrial Hygiene Surveillance Team Leader in the Industrial Hygiene Department, where he supervises day-to-day activities of a monitoring/ surveillance team. He also conducts surveillance of employee exposures to chemical and physical hazards and has developed and administered various ES&H programs. He has served on the Pantex Hazardous Material Spill Response Team for 3 1/2 years. In addition, he has taught in the Industrial Technology Department at Amarillo College. He was previously an
Industrial Hygiene Technician, ES&H Office, and a research assistant, Utah Water Research Lab, Utah State University.
(Nuclear experience 3 1/2 years; at Pantex 3 1/2 years)

P.J. Thompson - Environment, Safety and Health Division, Project Oversight\Technical Support

Position: Sr. Administrative Specialist, Division Records Manager
Specialization: Technical writing

Education: M.B.A.- Indiana Central University, Indianapolis, Indiana, Management
M.L.S. - Indiana University, Bloomington, Indiana, Library Science
B.A. - University of Iowa, Iowa City, Iowa, Education/English

Certifications: Authorized Derivative Classifier

Experience: Ms. Thompson has experience as a technical writer and editor, and also with records and management procedures (plant standards and directives) at Pantex Plant. She has served on CITs for Conduct of Operations and Communications. Previously she supervised systems' documentation preparation and was technical writer at computer services company, where she

prepared materials and taught writing seminars. She has been a newspaper reporter and copy editor; responsible for the preparation of research reports and brochures for a large metropolitan bank; and employed as a research librarian in a university library.
(Writing experience 19 years; at Pantex 3 years)

OD-Zone 4-006	[illegible]
-007	Stage Right in SAC Magazine, 12/29/93
-008	Improperly Packaged Pit Container, 2/3/94
-009	Stage Right in SAC Magazines (Vertical Configuration), 1/21/94
	Zone 4, 34B Magazine, Temperature, 3/31/94
	Zone 4, Modified Richmonds, Refrigerated Air Into Magazines/94
OD-94-21	Pantex Plant, Aerial Radiological Survey, 5/24/94
	Pantex Plant, Aerial Radiological Survey, 6/08/94
	Zone 4, Potentially Inadequate Safety Analysis (ORR), 7/14/94
	Zone 4, West Material Access Area (Aircraft Crash Analysis), 1/05/9
OD-94-62	Zone 4, Stage Right Pallet Trailers, Acceptability for Pit Transport, 9/15/

SITE: Pantex Plant

FACILITY (Building Location): Zone 4 Magazines (101, 102, 103, 105, 108 and 110 through 142)

FUNCTION: Staging

Historical Information, Continued

PX-USQD-94-65	Zone 4, Stage Right Pit Trailer (Pallet Trailer), 9/30/94
PX-USQD-94-66	Pantex Plant, Aerial Radiological Survey, 9/23/94
PX-USQD-94-70	Zone 4, Staging of Pits and OROs in Containers, 10/17/94
PX-USQD-94-73	Zone 4, Hot Wire Probe, 5/15/95
PX-USQD-94-76	Pantex Plant, CSSM Buildings, CSSM Change-Firewatch, 11/22/94
PX-USQD-95-01	Pantex Plant, CSSM Change - 5480.31 Requirements for Shutdown Mode, 3/02/94
PX-USQD-95-06	Zone 4, Thermal Studies in Zone 4 Magazines, Install & Use of Fast Track/Radio Telemetry/Hot Wire Probe, 5/15/95
PX-USQD-95-22	Pantex Plant (MAA), Fire Alarm Upgrades, 11/06/95
PX-USQD-95-25	Pantex Plant (MAA), Electronics Enhancements Security Upgrade Project, 2/21/96
PX-USQD-95-26	Zone 4, Install Permanent Air Conditioning in the Modified Richmond Magazines in Zone 4, 6/28/95
PX-USQD-95-34	Zone 4, Introduction of Dry Ice For Passive Cooling in Zone 4 Magazines, 8/28/95
PX-USQD-96-06	Pantex Plant (MAA), Implementation of Criticality Controls Recommendations in BIO, 3/07/96

Pending Unreviewed Safety Question Determinations:

PX-USQD-94-54	Zone 4, Pit Storage Temperature Constraints
PX-USQD-95-37	Zone 4, Compartmentalization of SAC Magazines

DNFSB Concerns:

DNFSB Recommendation 95-2 (10/11/95): Standards/Requirements Implementation Documents (S/RIDS).

NOTE: This DNFSB recommendation concerns the entire DOE complex. S/RIDS are currently under development at the Pantex Plant

SITE: Pantex Plant	FACILITY (Building or Location): Zone 4 Magazines (101, 102, 103, 105, 108 and 110 through 142)
	FUNCTION Staging

- The authorization basis.
  - Final Safety Analysis Report Zone 4 Magazines, December 1992
  - Final Environmental Impact Statement, Pantex Plant Site, DOE/EIS-0098, October 1983
  - Basis for Interim Operation (BIO) for the Pantex Plant, Amarillo, Texas, Rev. 3, Errata B, March 1996
  - Critical Safety Systems Manual (CSSM), MNL 1101, Rev. 3C, December 1995
  - Nuclear Explosive Safety Master Studies, 1993
  - Input Documents for the Nuclear Explosives Safety Master Studies, 1993

Other Pertinent ES&H Documentation

- Pantex Plant FY1996 CAMP Report, Capital Asset Management Process, April 1994
- Technical Manual Nuclear Safety Criteria (Title U, Report SRD), DOE-DNA TP 20-7, September 1986 (as amended)
- DOE Order 5480.22 and 5480.23 Implementation Plan, June 1995

SITE Pantex Plant	FACILITY (Building or Location): Zone 4 Magazines (101, 102, 103, 105, 108 and 110 through 142)
	FUNCTION: Staging

- Important or unique facility design features.

Design Features:

The SAC magazines were originally constructed in 1965, according to military drawings and specifications for "Igloo Storage Steel Arch-Earth Mounded (SAC Type)," Department of the Air Force, Office of Chief Engineers, Drawings AD 33-15-70, AW 33-15-64, and AD 33-15-70RI, dated May 1963 to May 1964.

The main feature of a SAC magazine is a metal arch constructed of corrugated, galvanized steel panels fitted together and sealed (see Attachment "Zone 4 - 4"). The steel arch is embedded into the front, back, and side walls using anchor bolts and strap anchors that extend into the concrete. The 13-foot radius steel arch rests on concrete stem walls that extend from below grade to slightly above ground level (see Attachment "Zone 4 - 5"). The end retaining walls were designed to resist loads due to the earth fill and a uniform live load of 40 pounds per square foot. The approximate internal dimensions of a magazine are 25 feet wide (at the base), 41 feet deep, and a maximum of 14 feet 4 inches high (at the top of the steel arch).

The single entry to the magazine is an insulated, steel double door. Each door consists of a front steel plate, insulation, an air gap, and a back steel plate. These doors have no established fire rating. The double doors are secured to each other with two locking hasps, and the entire door assembly is secured to the magazine structure with locking bars at the top and bottom of the door opening. Separate key locks are used in each locking hasp.

Located in front of and covering the magazine door is a two-piece, steel-reinforced concrete barrier. The total weight of the removable barrier is approximately 50,000 pounds. There are also headwall barriers placed on either side of the door barriers to protect the front wall of some magazines. They are also constructed of concrete reinforced with steel bars. The headwall barriers remain in place under all normal operating conditions.

Structural Design:

Earth-covered

Weaknesses:

None identified

Description of Partitioned areas:

These facilities are not partitioned. Each SAC magazine is one entire area that is used for the staging of HEU components in approved containers.

	FACILITY (Building or Location): Zone 4 Magazines (101, 102, 103, 105, 108 and 110 through 142)
	FUNCTION: Staging

s of hazardous materials collocated or commingled with HEU.

ıay be located in containers in the SAC magazines numbered 101, 102, 103, 105, 142, however, magazines 101, 108, 118, 127, 130, 131, 133, 135, 137, 141, and 142 ently being used to stage HEU components. The amount of HEU in each magazine is articular nuclear explosive system components that are stored there and the limit is umber of containers that can physically fit within the footprint of the facility. For rently staged in Zone 4, see classified Appendix E of this document.

nany different types of hazardous and radioactive materials that are part of the emblies and nuclear explosive components. Plutonium, thorium, uranium, tritium, ıteride, and high explosives (HE) insensitive high explosives (IHE) material are the rdous materials that could be located in the magazines. Significantly smaller zardous materials associated with nuclear explosive assemblies and components (for es, heavy metals, encapsulant materials) are also present. All materials are contained d assemblies inside steel drums, or wooden and steel boxes. The quantity of esent throughout the magazines can vary significantly depending on the level of ıd the current mix of nuclear explosive assemblies/components.

sfers within the facility.

perations are conducted in Zone 4. As such, there are no waste streams generated as a ıs performed there. All items placed into and retrieved from the magazines are nually or with the aid of electric forklifts.

ı and its interfaces with the facility or partitioned area.

- 6." illustrates the flow of nuclear explosive components containing HEU into and ccess Area (MAA) of Zone 4 (where the SAC magazines are located). Shipments into MAA originate from or are sent to either of two locations: (1) DOD or other DOE (2) the on-site production areas in Zone 12. Each SAC magazine can be used to house l the staging combinations of these items can vary significantly. Details of on-site ovided in the "Transportation Question Set."

SITE: Pantex Plant	FACILITY (Building or Location): Zone 4 Magazines (101, 102, 103, 105, 108 and 110 through 142)
	FUNCTION: Staging

- Staffing levels and staff experience (in years).

	Number of Employees	Average Facility Experience	Experience Range
Transportation			
Supervisory	13	16	1 - 31
Operators	57	14	1 - 37
Crafts			
Craft Supervisors	35	20	1 - 30
Craft Technical	32	19	1 - 30
Craft Maintenance	220	22	1 - 35

NOTE: Maintenance members reflect a pool of personnel available to be assigned to perform maintenance in Zone 4.

References:

- Basis for Interim Operation for the Pantex Plant, Amarillo, Texas, Rev. 3, Errata B, March 1996
- Critical Safety Systems Manual (CSSM), MNL 1101, Rev. 3C, December, 1995
- Department of Energy Plutonium ES&H Vulnerability Assessment, Pantex Site Assessment Team Report, July 29, 1994
- Final Safety Analysis Report for Zone 4, December 1992
- Input Documents for the Nuclear Explosive Safety Master Study, 1993
- Nuclear Explosive Safety Master Studies, 1993

ex Plant	FACILITY: Zone 4 Magazines (101, 102, 103, 105, 108 and 110 through 142)
	FUNCTION: Staging

What barriers are used to protect workers, the public and environment from HEU?

Barrier Types			
·ier ces System 'Canyon g ory on ve Clothing Handling nent System iround ystem ary Barriers sted below)	Public Environmental Barrier ☐ Facility Building Boundary ☐ HVAC Confinement ☐ Liquid Containment Dike ☒ Bays, Cells, Magazines ☐ Canyons ☐ Pads ☒ Site Boundary ☐ Trenches ☐ Storage Vault ☐ Fire Suppression ☐ Alarm System ☒ Other (listed below)	Criticality ☐ Containers ☐ Physical Dividers ☐ Poisons ☐ Concentration Control ☐ Stirrers ☐ Volume Control ☐ Double Contingency ☒ Other (Criticality)	Administrative Barrier ☒ Procedures: Operation, Maintenance ☒ Material Limits ☒ Monitoring ☒ Configuration Contr ☐ Quality Assurance ☒ Conduct of Operations ☒ Authorization Basis ☒ Training ☒ Organization ☒ Lessons Learned ☐ Testing ☐ Trending ☐ Records ☒ Standards ☐ External Regulation ☒ Surveillance ☒ Personnel Reliability Assurance Program ☒ Worker Access Occupancy Limits ☒ Emergency Response ☐ Other (specify)

Other Worker Barriers:

Portable Fire Extinguishers
Lightning Protection
Magazine Structure
Concrete Security Barriers
Zone Access Control

Other Public/Environmental Barriers:

Zone Access Control

Note: Worker, Public, and Environment barriers are shown in Attachment "Zone 4 - 7."

Confinement System:

The HEU component containers provide a confinement barrier that protects the packaged components. These containers are designed to maintain proper criticality spacing and may be placed skin to skin in accordance with the DOE approved Pantex Plant Basis for Interim Operation. Also, the magazines provide a barrier preventing the release of hazardous material to the collocated worker and the environment.

Portable Fire Extinguishers:

The fire extinguishers provide personnel with a fire suppression device to extinguish a fire or to retard the spread of a fire until the Fire Department can respond to the incident.

Lightning Protection:

The lightning protection system meets the requirements of NFPA 78, Plant Design Criteria Manual, and the DOE Explosives Safety Manual. The system will provide adequate lightning protection to prevent any significant system failures or significant damage to structures that affect the safety of a facility due to lightning.

Magazine Structure:

The steel arch construction magazine is a concrete-hardened structure, with earth overburden. It provides a significant barrier that prevents natural phenomena and many types of accidents external to the structure from damaging the facility and its contents.

Concrete Security Barriers:

Access to the magazines requires removal of the steel-reinforced concrete barriers and the dual locks.

Zone Access Control:

Zone access control is maintained by zone security fences, security guards, gate access control and watch towers), and security intrusion systems.

Administrative Barriers:

Procedures: Operation, Maintenance:

Handling and movement of HEU and associated storage containers are performed in accordance with approved procedures.

Material Limits:

The material limits for these facilities are listed in the Basis Interim Operation (BIO) for the Pantex Plant, Table E-2, "Magazines Hazardous Materials." There are no specific limits on the quantity of CSA components that can be placed in the magazines. However, there are inherent limits, due to desired staging configurations and the physical size of the magazines. Certain pits and CSAs can not be staged together in the same magazine.

Monitoring:

The overall performance of operations is monitored relative to the environment, safety, and productivity using performance indicators. These indicators track the trends and progress toward the goals and objectives of the Plant as established by the Plant General Manager, or as negotiated with the DOE for Cost Plus Award Fees (CPAF) performance. These indicators serve as instruments in monitoring compliance with laws, regulations, and orders to ensure that organizations critically examine performance of activities/functions, and identify strengths and weaknesses and develop/implement effective corrective actions. (Reference: Pantex Plant Assessment Program, DIR-0106).

Configuration Control:

Configuration control exists for structures, systems, and components that are critical to safety. The Configuration Management Program is described in Appendix G of the Basis for Interim Operation for the Pantex Plant.

Conduct of Operations:

The program is administered in accordance with the Pantex Plant Conduct of Operations Manual, MNL-00040. The effective coordination of formality in the conduct of operations at the Pantex Plant is based on bench-marking and implementation of best practices into the program.

Authorization Basis:

The authorization basis is defined through existing Final Safety Analysis Reports, the Nuclear Explosive Master Studies, and the Basis for Interim Operation (BIO) for the Pantex Plant, in conjunction with the Critical Safety Systems Manual, until such time that new Facility Safety Analysis Reports (FSARs) are developed in accordance with DOE Order 5480.23.

Training:

The Pantex training program provides personnel with appropriate education, training, and certification programs that promote an increased state of awareness of the responsibilities and operating practices at the Plant.

SITE: Pantex Plant	FACILITY: Zone 4 Magazines (101, 102, 103, 105, 108 and 110 through 142)
	FUNCTION: Staging

Administrative Barriers, Continued:

Organization:

The operating organization is part of a network of management, technical, and support functions that is sufficient to ensure that hazards and safety issues are identified, communicated, evaluated, resolved, and documented.

Lessons Learned:

Pantex Plant Standard STD-6216 establishes a process for reviewing and analyzing operational management experiences and translating these experiences into lessons learned.

Standards:

Pantex Standards are management control documents that outline both specific management objectives and how processes and activities are to be accomplished and controlled. These standards are based on and developed from the Plant policy directives which are those management documents that provide direction, assign responsibilities, and define goals on a Plant-wide basis.

Surveillance:

Formal procedures and processes are in place to ensure that structures, systems, and components (SSCs) that are critical to safety will perform as intended.

Personnel Reliability Assurance Program:

This program establishes the requirements and responsibilities for screening, selecting, and continuously evaluating those employees being assigned to or considered for assignment to critical duties.

Worker Access/Occupancy Limits:

The Material Access Area (MAA) access is controlled by security fences, security guards (gate access control and guard towers), and security intrusion systems. Each bay has specific personnel limits that are administratively controlled.

Emergency Response:

Pantex has an emergency management program that includes the management, planning, preparedness, readiness assurance, response, and mitigation of emergency conditions.

SITE Pantex Plant	FACILITY (Building or Location): Zone 4 Magazines (101, 102, 103, 105, 108 and 110 through 142)
	PARTITIONED AREA: Current Facility

Question 4: What are potential causes for the failure of materials, packages, and barriers?

Potential Causes

Facility	Material	External
☐ Process Material Transfers	☐ Aging	☐ Fire
☐ Inadvertent Transfers	☐ Container Seal Degradation	☐ Explosion
☒ Aging/Degradation	☐ Pressurization	☐ Earthquakes
☐ Equipment Failure	☐ Pyrophoricity	☐ Subsidence
☐ Change in Mission	☐ Radioactivity	☐ Winds
☒ Other Collocated Hazards	☐ Chemical Reactivity	☐ Floods
☐ Corrosion/Embrittlement	☐ Radiolysis	☐ Extreme Temperature
☐ Inadequate Configuration Knowledge	☐ Volumetric Expansion	☐ Snow
☒ Combustible Loading	☐ Oxidation	☐ Ash Loading
☐ Inadequate Seals	☐ Flammability	☒ Aircraft Crash
☐ Water Sources	☐ Toxicity	☒ Vehicle Accident
☐ Inadequate Drains	☐ Hydrolysis	☐ Onsite Transportation
☐ Preventive Maintenance Failure	☐ Crystalization	☐ Adjacent Facility Accident
☐ Administrative Controls	☐ Other (Specify)	☒ Other (listed below)
☐ Human Error		
☐ Chemical Reactions		
☐ Contamination		
☐ Inadequacy of Design Basis		
☐ Design Deficiency		
☐ Flooding		
☒ Fire		
☐ Other SAR Accidents (specify)		
☐ Other (listed below)		

SITE: Pantex Plant	FACILITY (Building or Location). Zone 4 Magazines (101, 102, 103, 105, 108 and 110 through 142)
	PARTITIONED AREA. Current Facility

Facility Causes:

Aging/Degradation:

Neither Pantex, the Design Labs, nor Oak Ridge have identified any information on aging effects of the cladding barrier encapsulating the HEU in nuclear explosive components. Normal aging of the facility could be a potential cause of failure of the magazine structure (e.g., loss of the earth berm).

Other Collocated Hazards:

Detonation of collocated nuclear explosives containing high explosives (HE), and collocated with HEU could be a cause for a barrier failure in Zone 4.

Combustible Loadings:

Combustible loadings could cause a reduction in the effectiveness of Fire Protection programs. The magazines are maintained with minimal combustible loading.

Fire:

Fire extinguishers are present to mitigate forklift fires discussed in the Safety Analysis. These potential fires will not lead to failure of materials, packages or HEU barriers.

External Causes:

Aircraft Crash:

Large cargo planes, Air Force bomber and fighter aircraft, and commercial aircraft directly impacting the magazines are a potential cause for the failure of multiple barriers, (i.e., facility and packaging). An aircraft crash could result in the explosive dispersal of HEU.

Vehicle Accident:

The Final Safety Analysis and the Basis for Interim Operation for the Pantex Plant describe operational accidents of a forklift puncturing a pit container that could cause the release of radioactive material to the worker, the environment and the public. This same scenario could also apply to the CSA containers.

Other:

Natural Phenomena:

Earthquakes and tornados would be the natural phenomena which could potentially cause a barrier breach in Zone 4.

SITE: Pantex Plant

FACILITY (Building or Location): Zone 4 Magazines (101, 102, 103, 105, 108 and 110 through 142)

PARTITIONED AREA: Current Facility

Question 6: What are the potential consequences from the effects identified?

Effect	WORKER			ENVIRONMENT			PUBLIC		
	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Explosion	N	N	N	N	N	N	N	N	N
Contamination	N	N	N	N	N	N	N	N	N
Structural Failure	N	N	N	N	N	N	N	N	N
Loss of Site/ Building Integrity	Y	Y	Y	Y	Y	Y	Y	Y	Y

Explanation:

Explosion:

The estimated frequency for this event is less than 1×10^{-6} events per year (beyond extremely unlikely). The estimated frequency of occurrence is based on the following preventive and mitigative features: (1) training; (2) Nuclear Explosive Safety Program; (3) procedures; (4) limit on allowable quantities of explosives in adjacent magazines; (5) component design; (6) and container design.

Contamination:

A breach of containers resulting in a material release would be mitigated by procedures established to minimize radiation exposure both internally and externally. Should a radioactive spill occur, Radiation Safety responds in accordance with Internal Operating Procedure D-5254, "Response to spill of Radioactive Material." The "As Low As Reasonably Achievable" Policy and Program is practiced at the Pantex Plant.

Structural Failure:

The response of the magazines and their contents to earthquake motion is analyzed deterministically in Appendix C of the Final Safety Analysis Report (FSAR) for Zone 4 Magazines.

The annual probability of the design basis earthquake and maximum credible earthquake are approximately 1.0×10^{-3} and 1.5×10^{-5}, respectively. Neither are deemed to have any effect on the environment, workers, or the public. Also, the likelihood of a Design Basis Tornado at the Pantex Site has been estimated to have an annual frequency of 2.0×10^{-5} with no effect on the environment, workers, or the public.

SITE: Pantex Plant	FACILITY (Building or Location): Zone 4 Magazines (101, 102, 103, 105, 106 and 110 through 142)
	PARTITIONED AREA: Current Facility

Material Release:

The operational accident pertinent to this issue is the forklift puncture of a pit container. This analysis focused on plutonium as the material released; however, this same issue is applicable to the HEU staged in the DT-9 container in Zone 4. The likelihood of this occurring is considered extremely unlikely with an annual probability of less than 1.0×10^{-6}, per handling operation. (Reference: Basis for Interim Operation.) Since there are so few of these items and they handled less than the pits containing plutonium, this annual probability would appear to be much less.

Loss of Site/Building Integrity-Aircraft Crash:

This vulnerability is addressed by Vulnerability Assessment Form number "SAT/01."

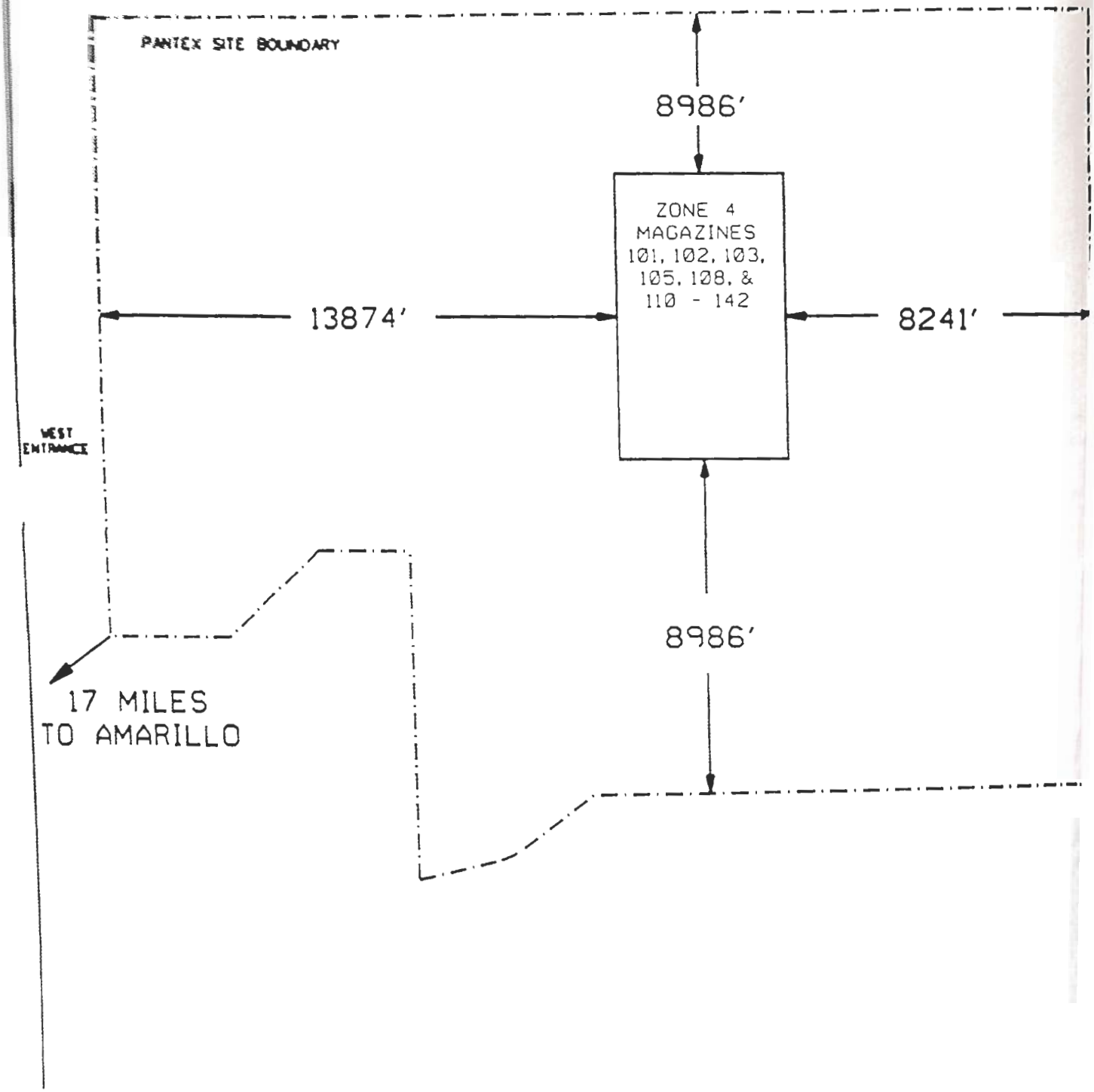
Applicable References:

Basis for Interim Operation (BIO) for the Pantex Plant, Amarillo, Texas, Rev. 3, Errata B, March 1996

Final Safety Analysis Report Zone 4 Magazines, December 1992

ZONE

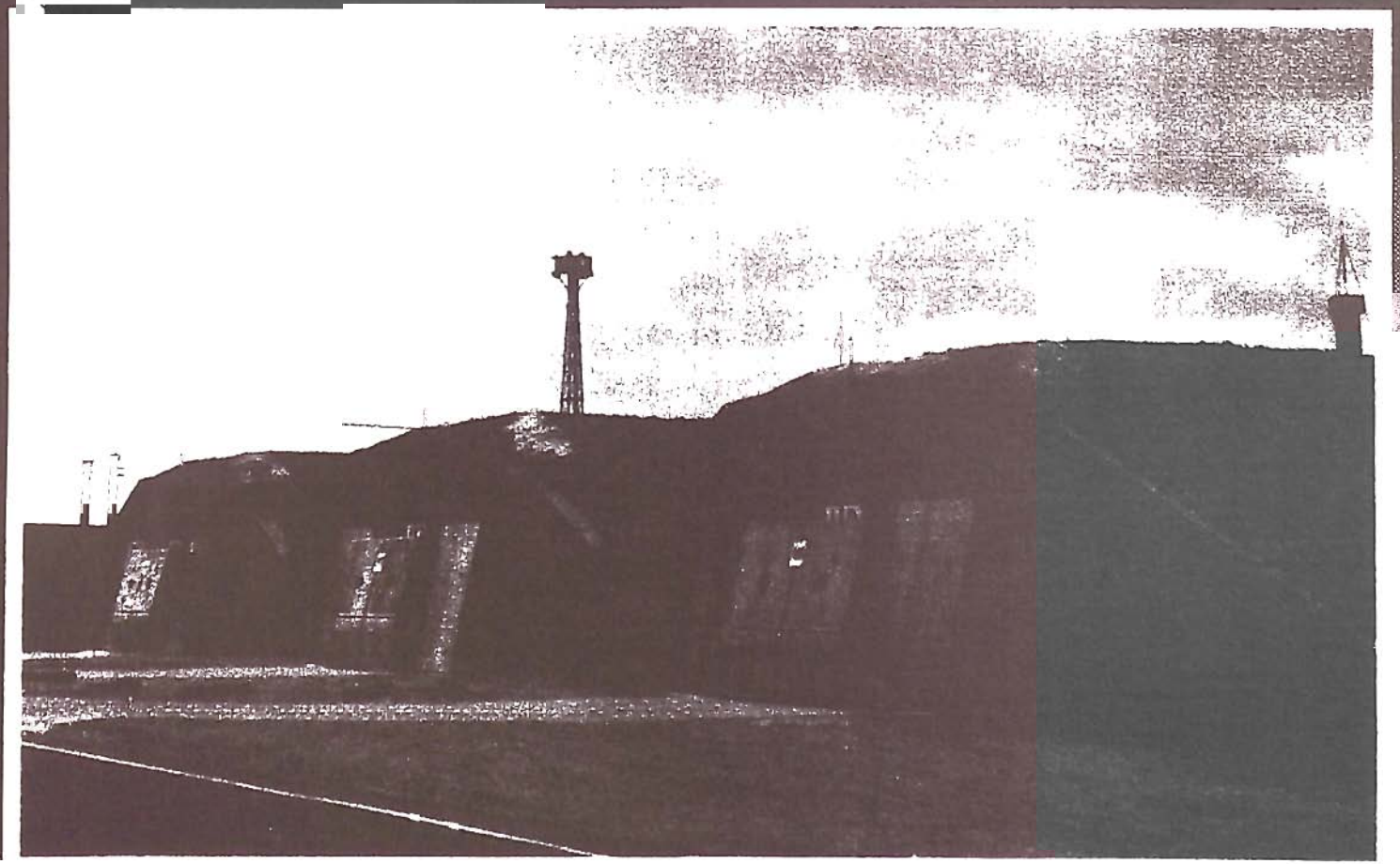
PANTEX PLANT
HEU FACILITY LOCATION SKETCH

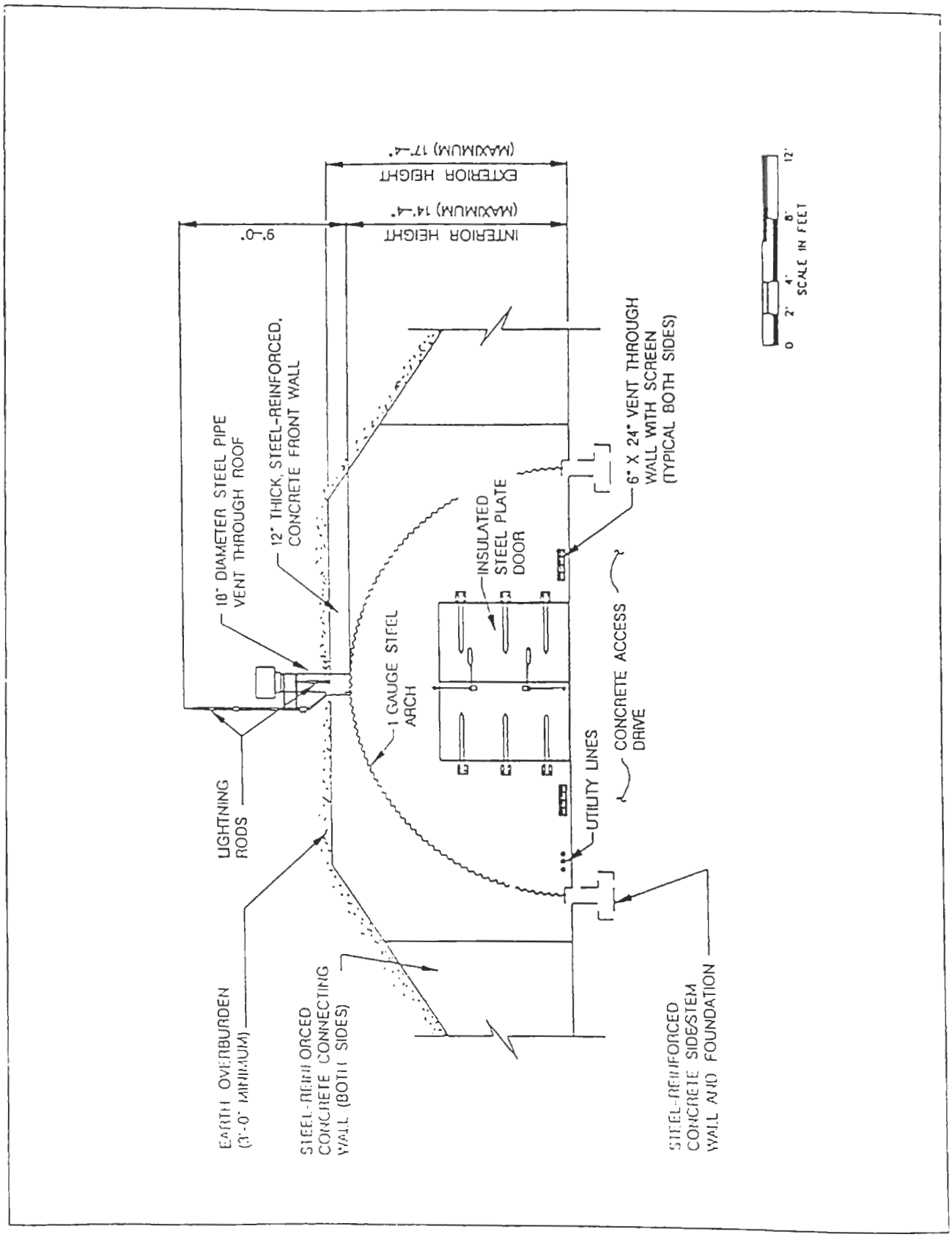


ZONE 4

Attachment "Zone 4 - 2"

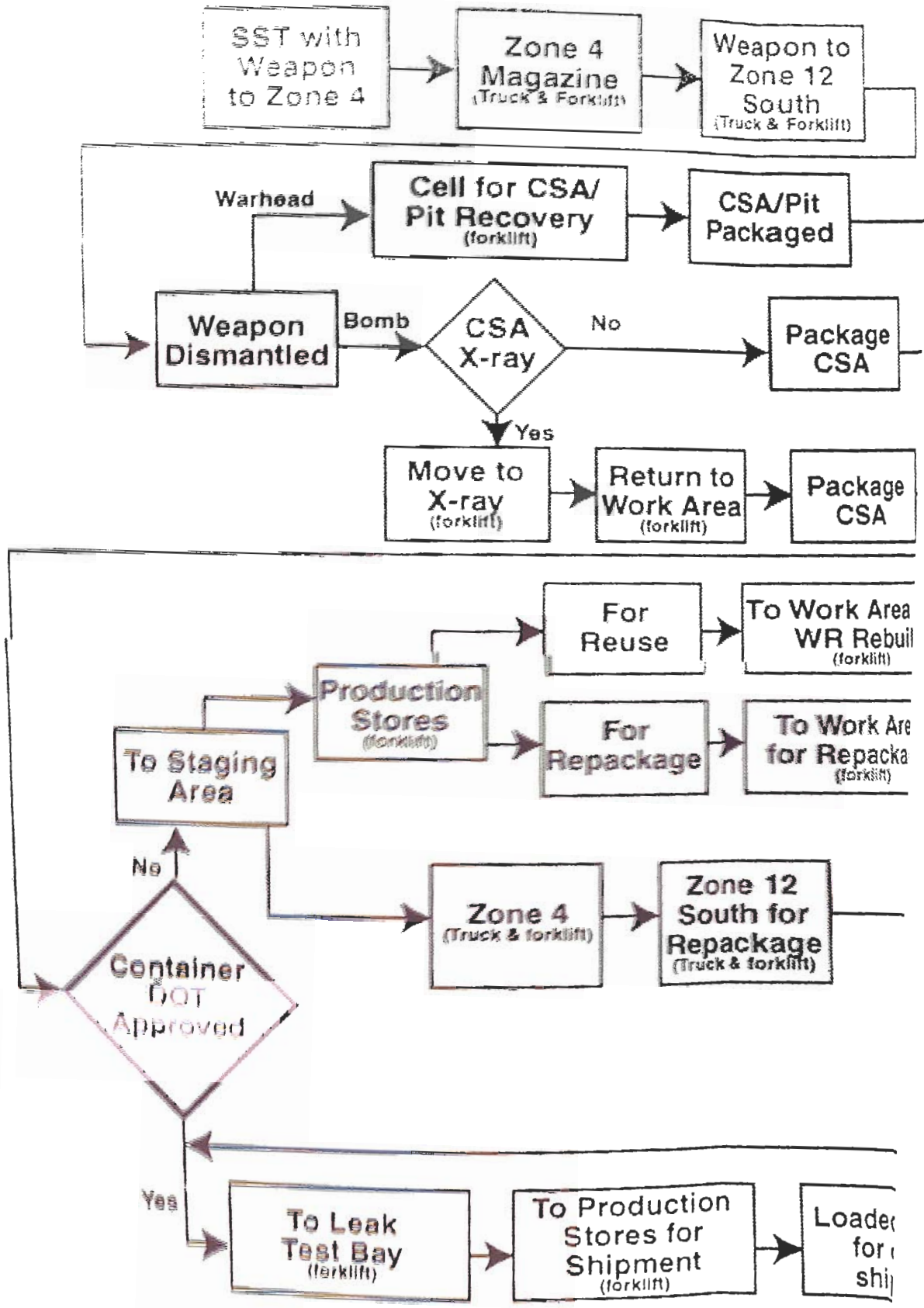
Steel Arch Construction Magazine

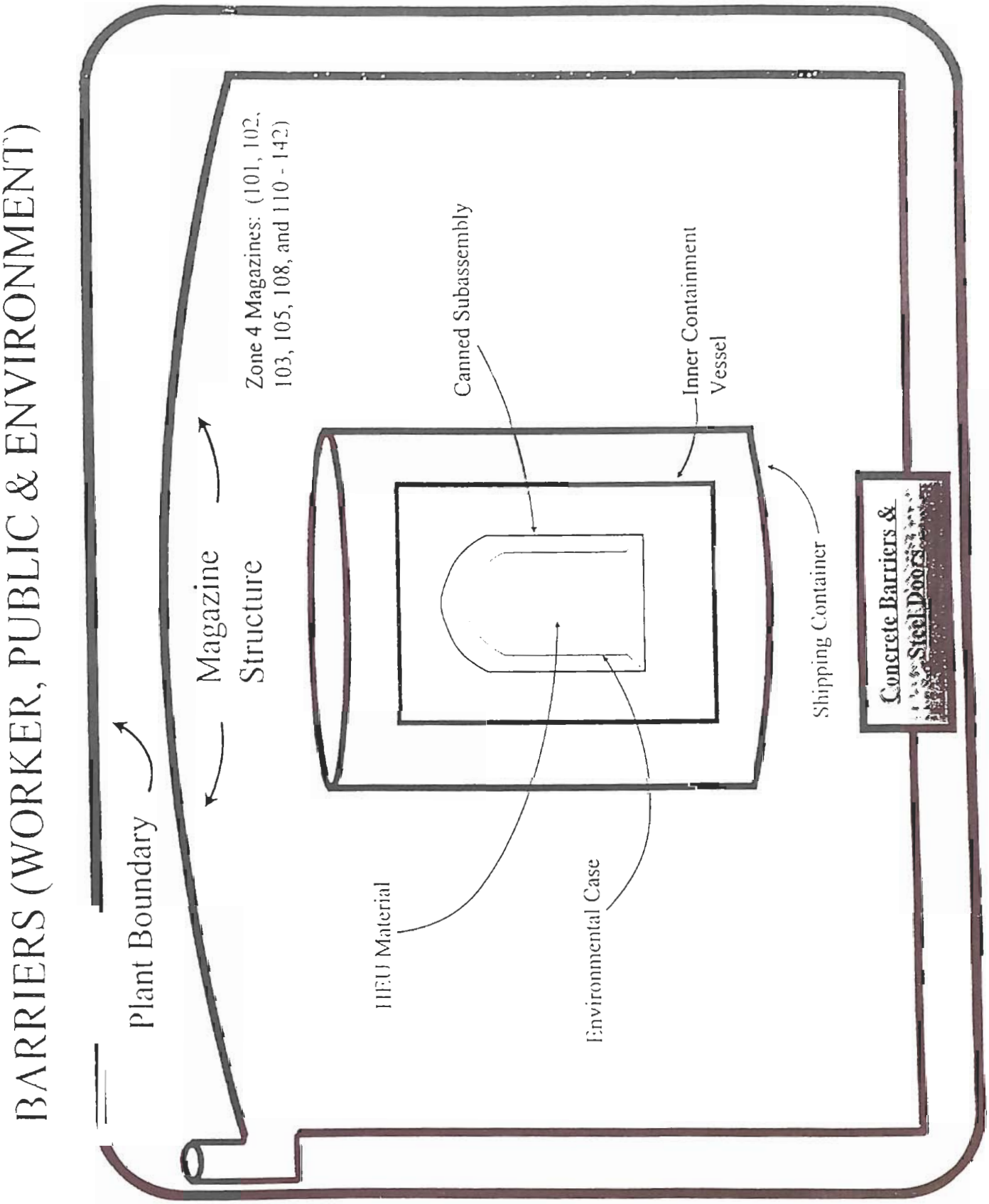




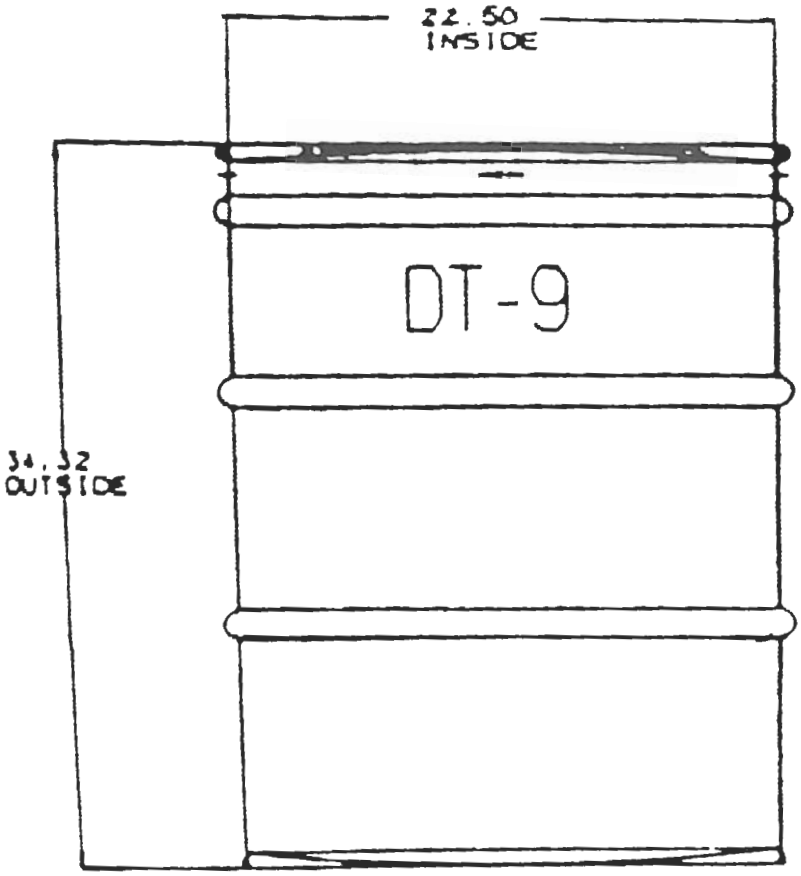
SAC Magazine Layout of Principal Features
(Front View-Security Barriers Omitted for Clarity)
Attachment "Zone 4 - 5"

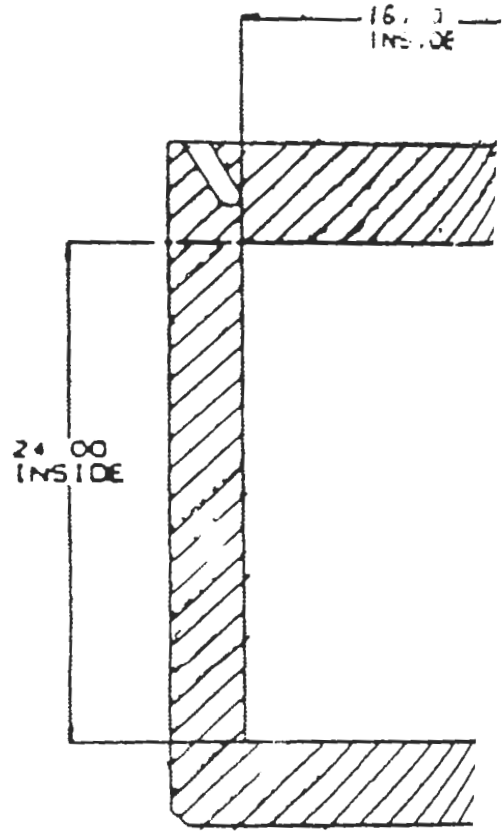
PANTEX PLANT HEU MOVEMENTS





Zone 4 Magazines HEU Barriers



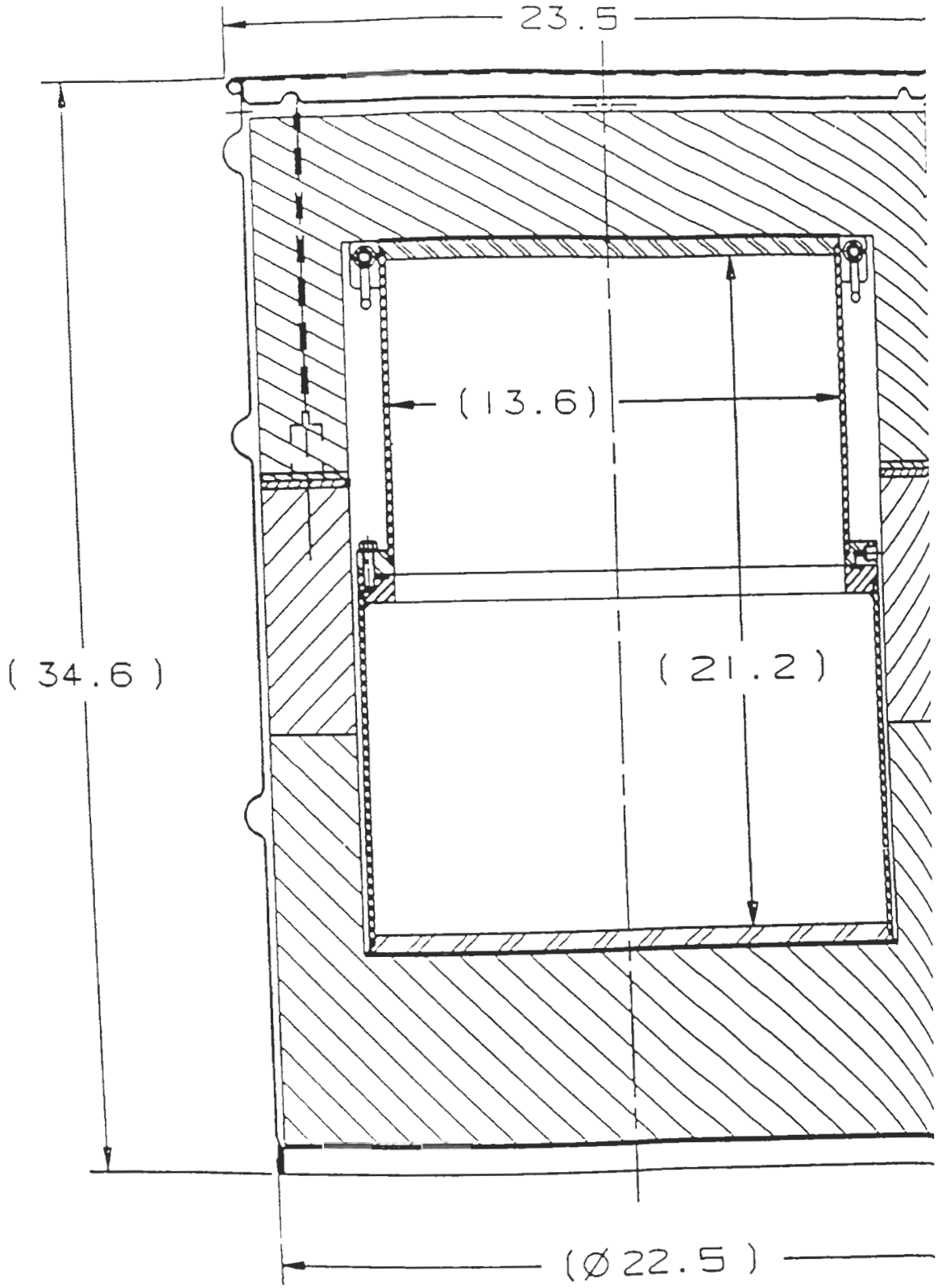


DT-9
DRUM 17-H 55 GAL.

CELOTE
INSER

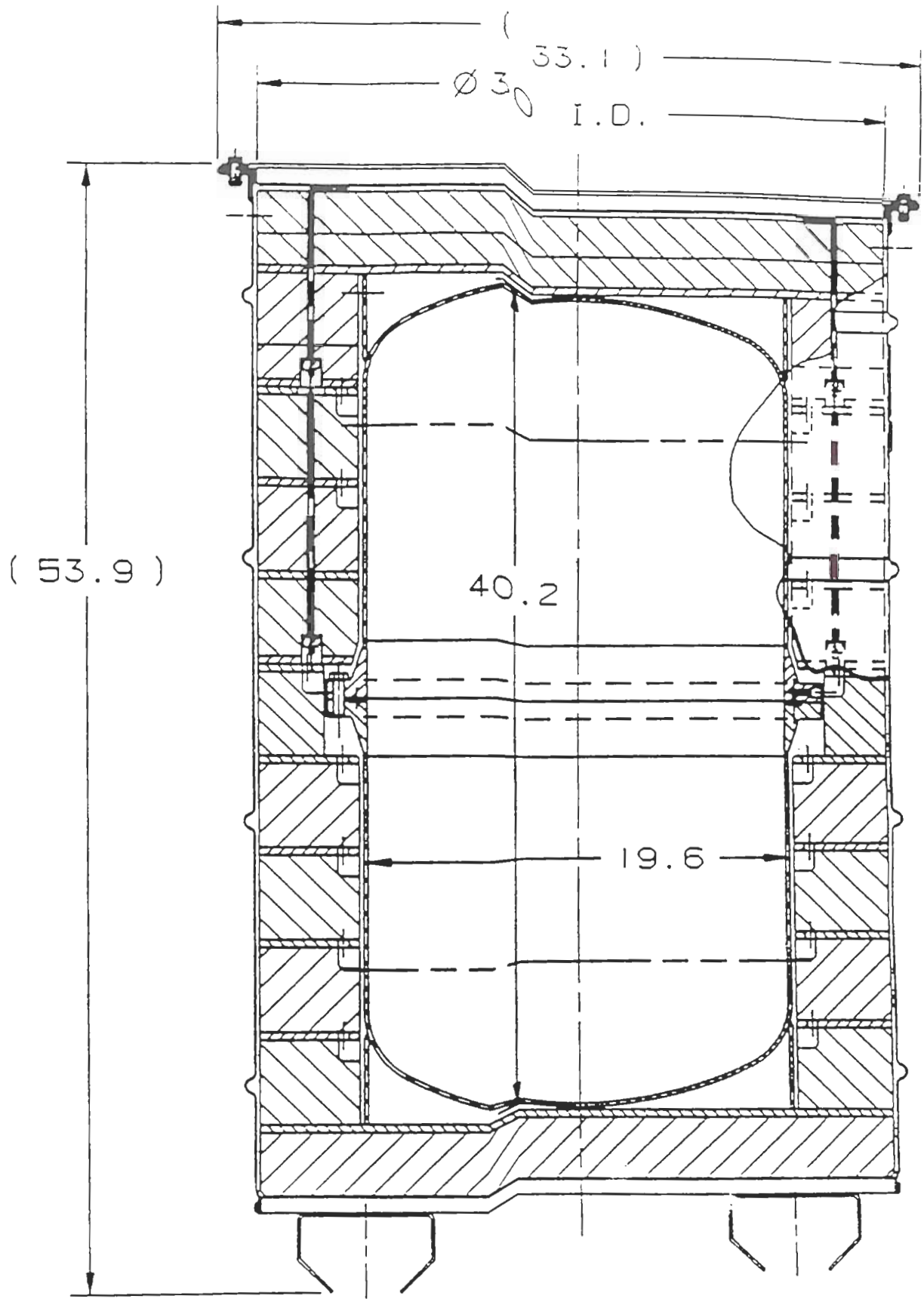
Attachment "Zone 4 - 9"

See Classified Appendix E



DT18

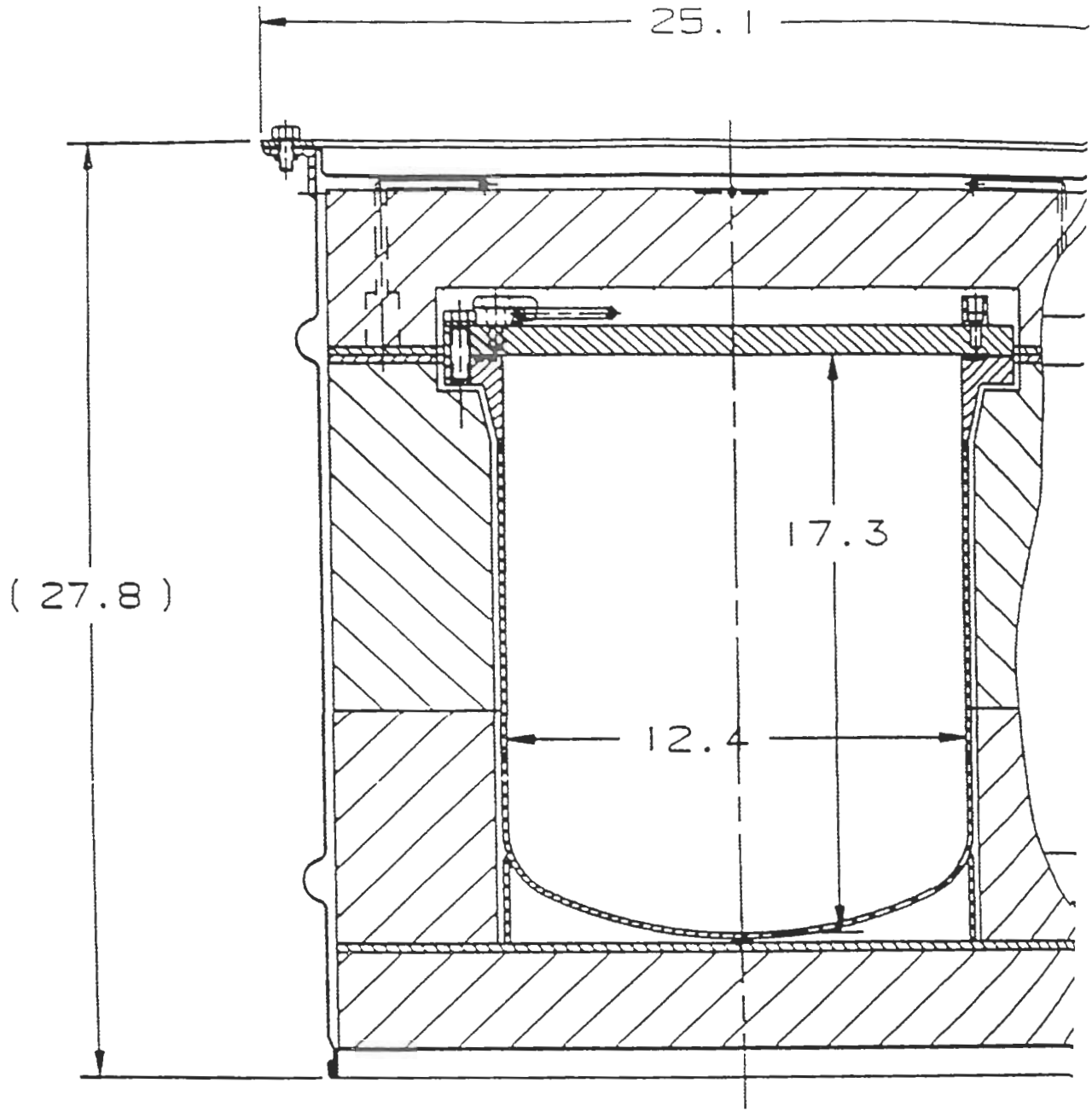
MAX GROSS WEIGHT 500 L



DT20

MAX GROSS WEIGHT 1084 LBS

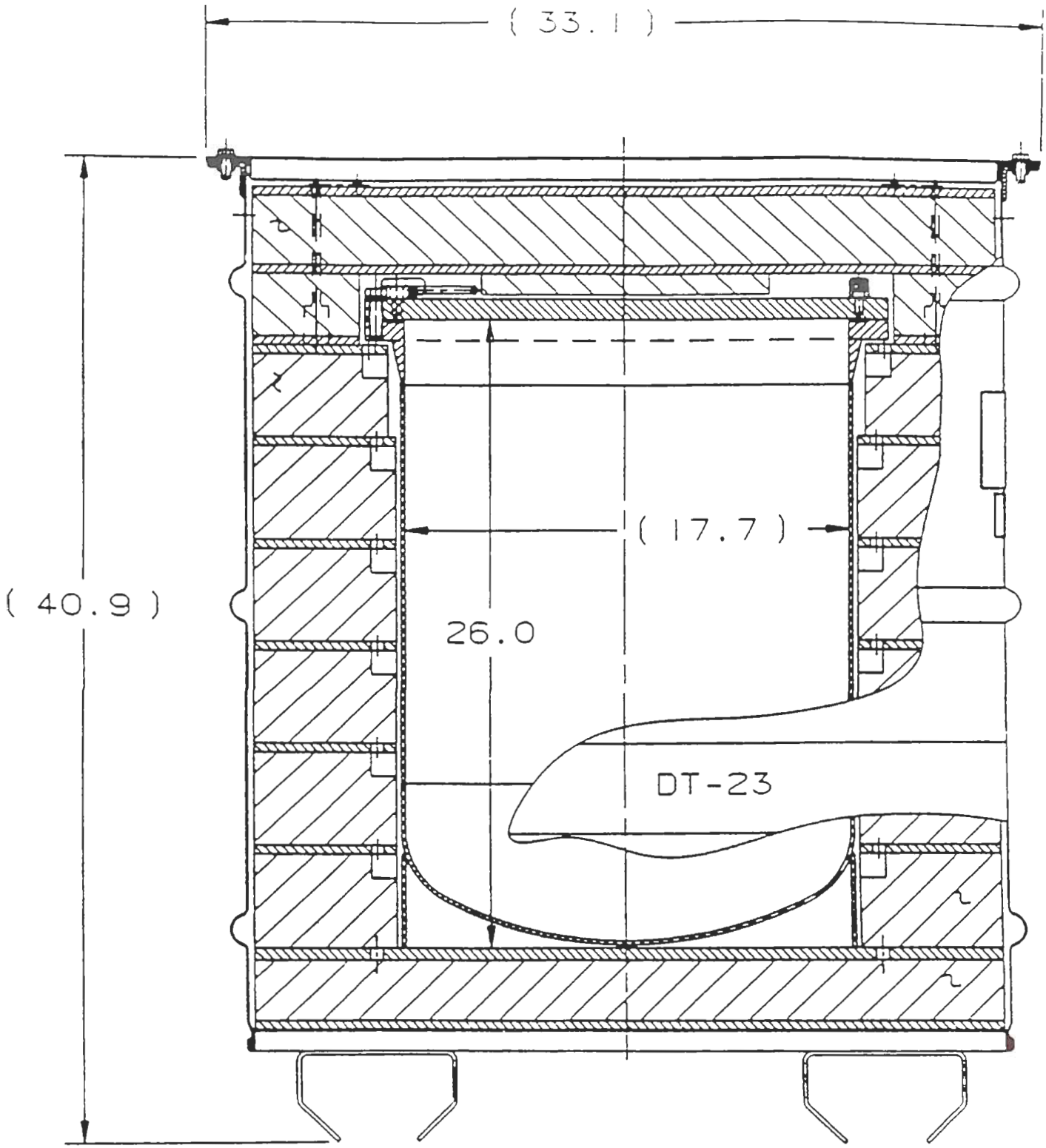
Attachment "Zone 1 - 2"



DT22

MAX GROSS WEIGHT 385 LB

Attachment "Zone 1 - 12"



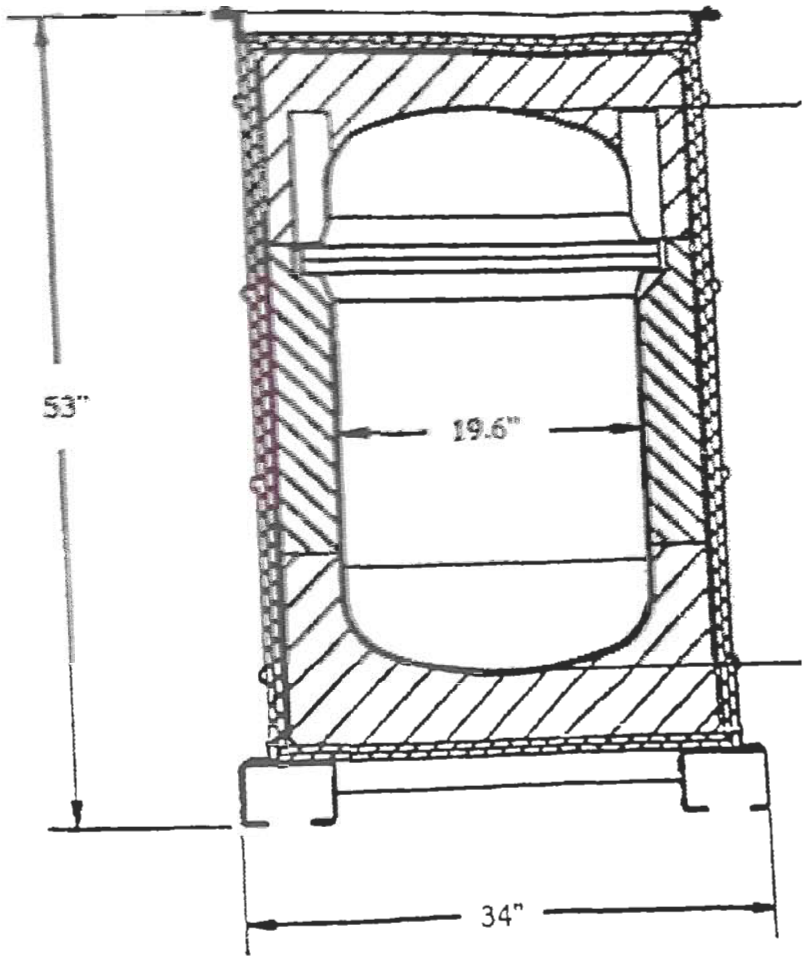
DT23

MAX GROSS WEIGHT 800 LBS

Attachment "Zone 4 - 13"

MH2800

Max. Gross Weight = 1320 lbs



SITE: Pantex Plant	FACILITY (Building or Location): Building 12-58 (Bays 4, and 5); Building 12-60 (Bays 3, 4, and 5)
	FUNCTION: Staging

DOE HEADQUARTERS FACILITY LANDLORD DOE/DP-1

DOE HEADQUARTERS PROGRAM SPONSOR DOE/DP-24

FACILITY AGE 27-30 years DESIGN LIFE 43-53 years

Question 1: What facilities are used for processing, handling, and storing HEU?

Summary description of the facility:

- The location of the facility on the site and the distance to the site boundary.

  Buildings 12-58 and 12-60 are located in close proximity to each other in the Zone 12 Material Access Area (MAA), which is located in the Southwest quadrant of the Pantex Site. The distances from both facilities to the nearest site boundaries are approximately: 5,159 feet to the east-site boundary; 1,564 feet to the south-site boundary; 10,418 feet to the west-site boundary; and 16,375 feet to the north-site boundary (see Attachment "Staging - 1"). There are two bays in Building 12-58 and three bays in Building 12-60 that are used to stage Canned Sub-assemblies (CSAs) containing HEU.

- The design mission, interim mission, current use, and operational status.

  Building 12-58 (Bays 4 and 5):

  This building was constructed in the early 1970s for low hazard high explosive (HE) storage. There was a mission change for Bays 4 & 5 from HE storage to storing pits, and a later change to storing CSAs. Currently, Bays 4 and 5 are exclusively used for the staging of CSAs. Bay limits are not to exceed 4300 kg. per bay for HEU.

  Building 12-60 (Bays 3, 4, and 5):

  This building was originally designed to be used as a Mass Properties Test Facility. There was a mission change for Bays 3-6 in Building 12-60 due to the temporary shut down of facilities at Oak Ridge. An Unreviewed Safety Question (PX-USQD-95-18) was completed to evaluate using these bays for staging CSAs. Currently, only Bays 3, 4, and 5 of this facility are being used to stage containerized CSAs; bay limits are not to exceed 3,000 kg per bay for HEU.

- Operational Status.

  Currently in use.

SITE Pantex Plant	FACILITY (Building or Location) Building 12-58 (Bays 4, and 5), Building 12-60 (Bays 3, 4, and 5
	FUNCTION Staging

Historical Information, Continued:

PX-USQD-95-01	Pantex Plant, CSSM Change - 5480.31 Requirements for Shutdown Mode, 3/02/95
PX-USQD-95-22	Pantex Plant (MAA), Fire Alarm Upgrades, 11/06/95
PX-USQD-95-25	Pantex Plant (MAA), Electronics Enhancements Security Upgrade Project, 2/21/96
PX-USQD-96-06	Pantex Plant (MAA), Implementation of Criticality Controls Recommendations in BIO, 3/07/96

Pending Unreviewed Safety Question Determinations:

PX-USQD-95-28	Building 12-58, Change of Mission from ORO to Pit Staging

DNFSB Concerns:

DNFSB Recommendation 95-2 (10/11/95): Standards/Requirements Implementation Documents (S/RIDS).

NOTE: This DNFSB recommendation concerns the entire DOE complex. S/RIDS are currently under development at the Pantex Plant.

- The authorization basis.
  - Final Safety Analysis Report, Building 12-58 (Bays 4 and 5), 9/2/87
  - Final Environmental Impact Statement, Pantex Plant Site, DOE/EIS-0098, October 1983
  - Basis for Interim Operation (BIO) for the Pantex Plant, Amarillo, Texas, Rev. ,3 Errata B, March 1996
  - Critical Safety Systems Manual (CSSM), MNL 1101, Rev. 3C, December 1995
  - Nuclear Explosive Safety Master Studies, 1993

Other Pertinent ES&H Documentation:

- Pantex Plant FY1996 CAMP Report, Capital Asset Management Process, April 1994
- Technical Manual Nuclear Safety Criteria (Title U, Report SRD), DOE-DNA TP 20-7, September 1986 (as amended)
- DOE Order 5480.22 and 5480.23 Implementation Plan, June 1995

SITE Pantex Plant	FACILITY (Building or Location): Building 12-58 (Bays 4, and 5), Building 12-60 (Bays 3, 4, and 5)
	FUNCTION: Staging

Design Features, Continued:

Building 12-60:

Structural Design:

This facility was constructed in the middle to late 1960s. (See Attachment "Staging - 4.") Neither an original design criteria document nor a final architect's report can be located for this building. Applicable building guidelines are codes for structures of this type in effect at that time included U.S. Air Force design parameters for hardened structures, the International Conference of Building Officials Uniform Building Code with modifications by the Atomic Energy Commission, and the Ammunition and Explosives Safety Standards Manual. Building 12-60's general architectural and structural design features include wall and roof construction, flooring materials, fire protection and emergency egress paths, emergency lights and electric wiring and equipment hazard classes.

The front and back walls of the bays in Building 12-60 are made of 15-inch reinforced concrete. Vertical and horizontal steel reinforcement bars are located toward the inner and outer surfaces of the walls. The bays are also separated by earth fill with a minimum thickness of 12 ½ feet. The roof is constructed using 0.3-inch thick corrugated steel arches. The floors of the bays are composed of 6 inch thick reinforced concrete slab over a 6 inch coarse aggregate fill. A seamless resilient urethane flooring material then covers the floors. Building 12-60 is constructed of noncombustible materials except for the limited use of wood trim.

As part of the Safety Analysis Report preparation, it was determined through calculations that the structure of the building will withstand DOE-S.D.-1020-94 earthquake loads (peak horizontal acceleration of $0.13g_0$). Likewise, calculations show that the building will withstand a tornado wind speed of 132 mph at a height of 10 meters in its existing condition. Other natural phenomena are considered too unlikely to occur during the life of the facility for consideration and were not considered. The facility design meets the level of protection required to prevent fatalities and severe injury to personnel in all occupied areas other than the bay of occurrence, as outlined in the DOE Explosives Safety Manual for Explosives Hazards Class II.

Building 12-60 Bays 1 and 2 meet all the explosive safety requirements for Class I and Class II levels of protection.

Fire Protection:

Each bay is equipped with a wet pipe sprinkler system that automatically discharges water in the event of a fire. When activated, a fire alarm is sounded locally and an emergency signal is automatically transmitted to the Plant Fire Department.

Radiation Monitor:

This facility is not currently equipped with a radiation monitoring system, however, the necessary hardware is installed if required in the future. The tritium continuous air monitor (CAM) and radiation alarm monitoring system (RAMS) local warning lights and alarms were temporarily deactivated during interim staging of Canned Sub-assembly (CSA) components.

SITE: Pantex Plant	FACILITY (Building or Location): Building 12-58 (Bays 4 and 5) Building 12-60 (Bays 3 4, and 5)
	FUNCTION: Staging

Structural Design, Continued:

Structural Design:

Earth Covered

Weaknesses:

Building 12-58:

None

Building 12-60:

Over the past several years, settling has occurred causing cracks in the ramp walls and concerns about the structural integrity of the building ramp. An engineering study determined that there is no immediate concern for safety. A periodic inspection program is in effect to monitor the condition of the ramp and a modification has been installed that provides additional ramp structural support.

Description of Partitioned Areas:

These facilities are not partitioned. Both buildings have specific staging areas (bays) used for staging/storage of HEU in approved containers.

- Amounts and locations of hazardous materials collocated or commingled with HEU.

  The HEU is located in Buildings 12-58 (Bays 4 and 5) and 12-60 (Bays 3, 4, and 5). The amount of HEU in each bay is contingent upon the particular nuclear explosive system components that are stored there and the limit is dependent upon the number of containers that can physically fit within the footprint of the facility. For quantities of HEU currently staged in these bays, see Appendix E of this document.

- Process material transfers within the facility.

  Both of these facilities are used as receiving, staging, and shipping locations for nuclear explosive components in their containers. Containers are deposited in the ramp area by a forklift and usually moved by a hand operated pallet jack into the bays through the entry doors.

- On-site transportation and its interfaces with the facility or partitioned area.

  Attachment "Staging - 5" illustrates the flow of nuclear explosive components containing HEU into and out of Buildings 12-58 and 12-60 located in the Zone 12 Material Access Area (MAA). Shipments into and out of the Zone 12 MAA originate and end at any of the three loading docks. Details of on-site transportation are provided in the "Transportation Question Set."

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-53 (Bays 4 and 5); 12-60 (Bays 3, 4, and 5).
	FUNCTION: Staging

Question 2: What barriers are used to protect workers, the public and environment from HEU?

Barrier Types			
Worker Barrier	Public/Environmental Barrier	Criticality	Administrative Barrier
☐ Gloveboxes	☒ Facility/Building Boundary	☐ Containers	☒ Procedures: Operation, Maintenance
☐ Transfer System	☐ HVAC/Confinement	☐ Physical Dividers	☒ Material Limits
☐ Duct	☐ Liquid Containment Dike	☐ Poisons	☒ Monitoring
☐ Filter	☒ Bays, Cells, Magazines	☐ Concentration Control	☒ Configuration Contr
☐ Vault	☐ Canyons	☐ Stirrers	☐ Quality Assurance
☐ Room	☐ Pads	☐ Volume Control	☒ Conduct of Operations
☐ Hot Cell/Canyon	☒ Site Boundary	☐ Double Contingency	☒ Authorization Basis
☐ Hood	☐ Trenches	☒ Other (Criticality)	☒ Training
☐ Piping	☐ Storage Vault		☒ Organization
☐ Shielding	☒ Fire Suppression		☒ Lessons Learned
☐ Distance	☐ Alarm System		☐ Testing
☐ Respiratory Protection	☒ Other (listed below)		☐ Trending
☐ Protective Clothing			☐ Records
☐ Remote Handling			☒ Standards
☒ Confinement System			☐ External Regulation
☐ Burial Ground			☒ Surveillance
☐ Tanks			☒ Personnel Reliabilit Assurance Progra
☒ Alarm System			☒ Worker Access/ Occupancy Limits
☐ Temporary Barriers			☒ Emergency Respon
☒ Other (listed below)			☐ Other (specify)
☐ None			

SITE Pantex Plant	FACILITY (Building or Location) Buildings 12-58 (Bays 4 and 5); 12-60 (Bays 3, 4, and 5)
	FUNCTION Staging

Other Worker Barriers:

Fire Suppression System
Uninterruptible Power Supply
Facility Construction/Blast Design
Communications
Emergency Lights
Zone Access Control

Other Public/Environmental Barriers:

Zone Access Control

Note: Worker, Public and Environment barriers are shown in Attachment "Staging - 6."

Worker Barriers:

Alarm System:

The Fire Alarm system provides warning to facility occupants for evacuation from the facility, and provides notification to the Fire Department for response. Fire Department notification is initiated on the detection of water flow in the fire suppression system.

Confinement System:

The HEU component containers provide a confinement barrier that protects the packaged components. These containers are designed to maintain proper criticality spacing and may be placed skin to skin in accordance with the DOE-approved Pantex Plant Basis for Interim Operation. Also, the bays provide a barrier preventing the release of hazardous material to the collocated worker and the environment.

Fire Suppression System:

Detects and extinguishes a fire that could potentially lead to the release of radioactive material from the containerized CSAs. The system would minimize the potential fire loss within a facility, and also delay the spread of a fire in order to give the Fire Department increased response time to a fire in the facility.

Uninterruptible Power Supply (Building 12-60 only):

Ensures that all critical safety equipment that requires emergency electrical power will operate properly in the event of a power loss to the facility. This system is necessary for the proper continuous operation of other safety systems. Any critical systems located in Building 12-58 which require backup electrical power are supplied with such via self contained batteries.

SITE Pantex Plant	FACILITY (Building or Location) Buildings 12-58 (Bays 4 and 5) 12-60 (Bays 3, 4 and 5)
	FUNCTION Staging

Other Public/Environmental Barriers:

Site Boundary

The nearest major population area is Amarillo, Texas, which is located 17 miles southwest of the Pantex site boundary. Buildings 12-58 and 12-60 are located in close proximity to each other in the Zone 12 Material Access Area (MAA), which is located in the Southwest quadrant of the Pantex Site.

Fire Suppression System:

The basis of the fire suppression system is to detect and extinguish a fire. The system would minimize the potential fire loss within a facility, and also delay the spread of a fire in order to give the Fire Department increased response time to these facilities.

Zone Access Control:

Zone access control is maintained by zone security fences, security guards (gate access control), guard towers, and security intrusion systems.

Criticality Barriers:

Criticality:

The Pantex Criticality Safety Program and Risk Management Department (RMD) personnel assure the double contingency principle is met by requiring that process designs incorporate sufficient factors of safety to require at least two unlikely, independent, and concurrent changes in process conditions must occur before a criticality accident is possible. Protection is required by either (1) the control of two independent process parameters; or (2) a system of multiple (at least two) controls on a single parameter. No single failure can result in a criticality accident. Administrative controls are in place to prevent submersion of HEU items in liquids, maintain planar array staging configurations for CSAs, and limit the mass of material not containerized at any time. The "Pantex Plant Criticality Safety Program Analysis" (U), February 28, 1996, Mason & Hanger RMD (secret restricted data document) demonstrates that a postulated critical excursion is not credible at the Pantex Plant.

Administrative Barriers:

Procedures: Operation, Maintenance:

Handling and movement of HEU and associated storage containers are performed in accordance with approved procedures.

Material Limits:

The amount of HEU in each bay is contingent upon the particular nuclear explosive system components that are stored there and the limit is dependent upon the number of containers that can physically fit within the foot print of the facility, not to exceed 3,000 kg per bay in building 12-60 and 4,300 kg. per bay in building 12-58. For quantities of HEU currently staged in these bays, see classified Appendix E of this document.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-58 (Bays 4 and 5); 12-60 (Bays 3, 4, and 5).
	FUNCTION Staging

Administrative Barriers, Continued:

Monitoring:

The overall performance of operations is monitored relative to the environment, safety, and productivity using performance indicators. These indicators track the trends and progress toward the goals and objectives of the Plant as established by the Plant General Manager, or as negotiated with the DOE for Cost Plus Award Fees (CPAF) performance. These indicators serve as instruments in monitoring compliance with laws, regulations, and orders to ensure that organizations critically examine performance of activities/functions, and identify strengths and weaknesses and develop/implement effective corrective actions. (Reference: Pantex Plant Assessment Program, DIR-0106).

Configuration Control:

Configuration control exists for structures, systems, and components (SSCs) that are critical to safety. The Configuration Management Program is described in Appendix G of the Basis for Interim Operation for the Pantex Plant.

Conduct of Operations:

The effective coordination of formality in the conduct of operations at the Pantex Plant is based on bench marking and implementation of best practices into the program. The program is administered in accordance with the Pantex Plant Conduct of Operations Manual, MNL-00040.

Authorization Basis:

The authorization basis is defined through the existing Final Safety Analysis Reports, the Nuclear Explosi Master Studies, and the Basis for Interim Operation for the Pantex Plant in conjunction with the Critical Safety System Manual, until such time that new FSARs are developed in accordance with DOE Order 5480.23.

Training:

The Pantex training program provides all personnel with appropriate education, training, and certificatio programs that promote an increased state of awareness of the responsibilities and operating practices at Plant.

Organization:

The operating organization is part of a network of supporting management, technical, and support func that is sufficient to assure that hazards and safety issues are identified, communicated, evaluated, resol and documented.

Lessons Learned:

Pantex Plant Standard STD-6216 establishes a process for reviewing and analyzing operational management experiences and translating these experiences into lessons learned.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-58 (Bays 4 and 5) 12-60 (Bays 3 4 and 5)
	FUNCTION: Staging

Administrative Barriers, Continued:

Standards:

Pantex Standards are management control documents that outline both specific management objectives and how processes and activities are to be accomplished and controlled. These standards are based on and developed from the Plant policy directives which are those management documents that provide direction, assign responsibilities, and define goals on a Plant-wide basis.

Surveillance:

Formal procedures and processes are in place to ensure that structures, systems, and components (SSCs) that are critical to safety will perform as intended.

Personnel Reliability Assurance Program:

This program establishes the requirements and responsibilities for screening, selecting, and continuously evaluating those employees being assigned to or considered for assignment to critical duties.

Worker Access/Occupancy Limits:

The Material Access Area (MAA) access is controlled by security fences, security guards (gate access control and guard towers), and security intrusion systems. Each bay has specific personnel limits that are administratively controlled.

Emergency Response:

Pantex has an emergency management program that includes the management, planning, preparedness, readiness assurance, response, and mitigation of emergency conditions.

uilding or Location)

nt Facility

num

				Age of Packaging (in years)
		aging pes		
Weapon Components		55 gallon, DT Drums		3-30

Descriptio and its intended protective functi

Packaging

DT drum shipping cont d at the Pantex Plant in the staging bays include th DT-23 (see Attachment g-7," "Staging-8," "Staging-9," and "Staging-10"). type containers that mee requirements of 10 CFR 71, which is documented packaging (SARP). Th tainer includes an inner containment vessel that is drum is made of stainle cept for the DT-18, which is made of carbon steel 55 to 212 gallons. Celotex inserts form the inner barrier of the outer drum. An inner containment of stainless steel. Rubber inserts formed to dimensions of each particular CSA are used inside the containment vessel. Additionally, a sling or holding fixture as required by the configuration may b containment

Additional CSA staging containers used at Pantex include Nuclear Assembly H-Gear (Hand Truck Type), Wooden Boxes (8000 series), and decertified DT containers (DT-3, DT-5, DT-16, etc). Th do not meet the requirements of 10 CFR 71 and do not contain an inner containment vessel; howe DOE approved for on-site transportation and staging of nuclear explosive components.

The 8000 s only used in Building 12-60. They have a steel base that contains bands to secure CSAs in place. The lid consists of a steel frame with wooden planks making The lid is secured to the base using 6 to 8 bolts

The MH2800 is a 146 gallon container with inserts and an inner containment vessel (se 11"). It meets the requirements of the Type B configuration; however, it is not authori for CSAs other than one type of CSA. It is used to store other CSAs, based on size.

The modified M 800s have had t containment vessel removed; what remains is th n inserts This c tion does not meet the Type B requirements. Th

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-58 (Bays 4 and 5; 12-60 (Bays 3, 4, and 5)
	PARTITIONED AREA: Current Facility

All containers used at the Pantex Plant are designed to protect the contents from damage during transportation and staging, and provide for criticality safety (Pantex Plant Criticality Safety Program Analysis, February 28, 1996, and the DOE-approved Basis for Interim Operation for the Pantex Plant). The approved shipping containers also provide an additional containment barrier for the contents (hermetically sealed inner containment vessel). Where required, the packaging consists of several receptacles, neutron absorbing materials, spacing for structural integrity, thermal insulation, radiation shielding, devices for absorbing mechanical shock, and sometimes the conveyance, tie-down system, and auxiliary equipment. These items are in place to protect the item inside the container.

Describe material at risk, which constitutes a source term.

The number of packages (inventory) and the associated material at risk per container is information which is located in the classified Appendix E of this document.

SITE Pantex Plant	FACILITY (Building or Location): Buildings 12-58 (Bays 4 and 5), 12-60 (Bays 3, 4, and 5)
	PARTITIONED AREA: Current Facility

Question 4: What are potential causes for the failure of materials, packages, and barriers?

Potential Causes

Facility	Material	External
☐ Process Material Transfers	☐ Aging	☐ Fire
☐ Inadvertent Transfers	☐ Container Seal Degradation	☒ Explosion
☐ Aging/Degradation	☐ Pressurization	☐ Earthquakes
☐ Equipment Failure	☐ Pyrophoricity	☐ Subsidence
☐ Change in Mission	☐ Radioactivity	☒ Winds
☐ Other Collocated Hazards	☐ Chemical Reactivity	☐ Floods
☐ Corrosion/Embrittlement	☐ Radiolysis	☐ Extreme Temperature
☐ Inadequate Configuration Knowledge	☐ Volumetric Expansion	☐ Snow
☒ Combustible Loading	☐ Oxidation	☐ Ash/Lowlings
☐ Inadequate Seals	☐ Flammability	☒ Aircraft/Crash
☐ Water Sources	☐ Toxicity	☒ Vehicle Accident
☐ Inadequate Drains	☐ Hydrolysis	☐ Onsite Transportation
☐ Preventive Maintenance Failure	☐ Crystallization	☐ Adjacent Facility Accident
☐ Administrative Controls	☐ Other (specify)	☐ Other (specify)
☐ Human Error		
☐ Chemical Reactions		
☐ Contamination		
☐ Inadequacy of Design Basis		
☐ Design Deficiency		
☐ Flooding		
☒ Fire		
☐ Other SAR Accidents (specify)		
☐ Other (specify)		

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-58 (Bays 4 and 5), 12-60 (Bays 3, 4, and 5)
	PARTITIONED AREA: Current Facility

Facility Causes:

Combustible Loadings:

The bays are maintained with minimal combustible loading. Excessive combustible loadings could cause a reduction in the effectiveness of Fire Protection programs.

Fire:

Fire would be a possible cause for failure of the container barrier, possibly resulting in the release of HEU.

External Causes:

Explosion:

An explosion in adjacent bays with the doors of the acceptor bay open, may result in breaching the facility barrier for the acceptor bay.

Winds/Tornado:

Winds/Tornado debris generate missiles. Failure of the bay doors would leave the bay vulnerable to these missiles, which could lead to a failure of the containers as barriers.

Aircraft Crash:

Large cargo planes, Air Force bomber aircraft, and commercial aircraft directly impacting these facilities are a potential cause for the failure of multiple barriers (e.g., facility and packaging). An aircraft crash could result in the explosive dispersal of HEU.

Vehicle Accident:

The Final Safety Analysis Report and the Basis for Interim Operation for the Pantex Plant describe operational accidents of a forklift puncturing a pit container, releasing radioactive material to the environment.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-58 (Bays 4 and 5); 12-60 (Bays 3, 4, and 5).
	PARTITIONED AREA: Current Facility

Question 4: What are potential causes for the failure of materials, packages, and barriers?

Potential Causes		
Facility	Material	External
☐ Process Material Transfers	☐ Aging	☐ Fire
☐ Inadvertent Transfers	☐ Container Seal Degradation	☒ Explosion
☐ Aging/Degradation	☐ Pressurization	☐ Earthquakes
☐ Equipment Failure	☐ Pyrophoricity	☐ Subsidence
☐ Change in Mission	☐ Radioactivity	☒ Winds
☐ Other Collocated Hazards	☐ Chemical Reactivity	☐ Floods
☐ Corrosion Embrittlement	☐ Radiolysis	☐ Extreme Temperature
☐ Inadequate Configuration Knowledge	☐ Volumetric Expansion	☐ Snow
☒ Combustible Loading	☐ Oxidation	☐ Ash Loading
☐ Inadequate Seals	☐ Flammability	☒ Aircraft Crash
☐ Water Sources	☐ Toxicity	☒ Vehicle Accident
☐ Inadequate Drains	☐ Hydrolysis	☐ Onsite Transportation
☐ Preventive Maintenance Failure	☐ Crystalization	☐ Adjacent Facility Accident
☐ Administrative Controls	☐ Other (specify)	☐ Other (specify)
☐ Human Error		
☐ Chemical Reactions		
☐ Contamination		
☐ Inadequacy of Design Basis		
☐ Design Deficiency		
☐ Flooding		
☒ Fire		
☐ Other SAR Accidents (specify)		
☐ Other (specify)		

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-58 (Bays 4 and 5); 12-60 (Bays 3, 4, and 5)
	PARTITIONED AREA Current Facility

Facility Causes:

Combustible Loadings:

The bays are maintained with minimal combustible loading. Excessive combustible loadings could cause a reduction in the effectiveness of Fire Protection programs.

Fire:

Fire would be a possible cause for failure of the container barrier, possibly resulting in the release of HEU.

External Causes:

Explosion:

An explosion in adjacent bays with the doors of the acceptor bay open, may result in breaching the facility barrier for the acceptor bay.

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Winds/Tornado debris generate missiles. Failure of the bay doors would leave the bay vulnerable to these missiles, which could lead to a failure of the containers as barriers.

Aircraft Crash:

Large cargo planes, Air Force bomber aircraft, and commercial aircraft directly impacting these facilities are a potential cause for the failure of multiple barriers (e.g., facility and packaging). An aircraft crash could result in the explosive dispersal of HEU.

Vehicle Accident:

The Final Safety Analysis Report and the Basis for Interim Operation for the Pantex Plant describe operational accidents of a forklift puncturing a pit container, releasing radioactive material to the environment.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-58 (Bays 4 and 5), 12-60 (Bays 3, 4, and 5).
	PARTITIONED AREA: Current Facility

Question 5: What are potential effects from the causes identified?

Potential Effects	
Facility ☒ Fire ☒ Explosion ☒ Contamination ☐ Criticality ☐ Leakage Spills ☐ Other Accidents (specify) ☐ Structural Failure ☐ Equipment Failure ☐ Material Release ☐ Increased Radioactivity Level ☐ Other (specify) Material ☐ Criticality ☐ Material Release ☐ Breach of Packaging ☒ Fire ☐ Other (specify)	External ☐ Loss of Site Integrity ☒ Loss of Building Integrity ☒ Release of Materials ☐ Radiation and Releases from Criticality

SITE. Pantex Plant	FACILITY (Building or Location): Buildings 12-58 (Bays 4 and 5), 12-60 (Bays 3, 4, and 5)
	PARTITIONED AREA: Current Facility

The duplicated effects above will be consolidated in the following discussions.

Facility/Material Effects:

Fire:

A fire could damage the bay and its contents. In a fully involved fire, a potential exists for the release of radioactive materials if containers are breached. The principal concern for a fire in the bay would be the resulting dispersal of highly enriched uranium (HEU), as well as failure of the containment function of the bay.

Explosion:

The principal effects of an accidental explosives detonation external to the facility are blast over-pressure, fragments generated by the explosion, and the shock loads produced by the shock wave through the air or on the ground. These effects can cause damage to structures, systems and components (SSCs) within the bay, injury or death to the workers in the bay of the incident and to collocated workers. Also, the explosion could cause radioactive material release to the environment.

Contamination:

Any event that breaches the Canned Sub-assemblies (CSA) and their containers has the potential to result in HEU contamination within the bay. Breaching the 8000 series container and the CSA environmental case with a forklift tine is an operational scenario that may result in the release of small quantities of HEU within the bay.

External Effects:

Loss of Building Integrity:

Natural phenomena events can cause damage to structures, systems, and components important to environment, safety and health (ES&H) concerns. An aircraft crash event can cause damage to systems, structures and components (SSCs) within the bay, injury or death to workers in the bay of the incident, and to collocated workers. Natural events that could affect ES&H are: earthquake damage, wind/tornado damage, and flood damage.

Release of Materials:

Electric forklifts are used to transport material into and out of the bays. The forklift tines could puncture a container. In the worst case, there would be only a minor release of radioactive material within the bay. Minor localized radiological contamination is possible.

uilding

ility

dispersal of HEU at a level
n 1 x 10^{-6} events per year (b
lowing preventive and mitig
protection/suppression systems; (3) National *Electric Code* wiring and equipment; (4) g
combustible material loading; (7) requirements that components be containerized durin
housekeeping; (
(10) prohibition of ignition sources.

Explosion:

Internal Explo: ossible due to restrictions on high explosives (HE) or insensi
of external explosions is the dispersal of HEU at a level that
this event is less than 1 x 10^{-6} events per year (beyond extre
frequency of o ed on the following preventive and mitigative features: (1)
is packaged in inistrative procedures; (4) training; (5) prohibiti
nat ite (7) limited combustible materials. In addition, the only oper
dic inve ns) involve the manual (or forklift-aided) placement and retrieval
omainers. Many of the transportation containers are certified to withstand extreme environ
Conse there are mul o prevent or mitigate a release of hazardous materi
adjace

g in a material release would be mitigated by actions establi
exposure o xternally. Should a radioactive spill occur, Radiation Safety
Internal O ocedure D-5254, "Response to spill of Radioactive Material." The "
Achievabl d Program is practiced at the Pantex Plant

SITE Pantex Plant	FACILITY (Building or Location) Buildings 12-58 (Bays 4 and 5), 12-60 (Bays 3, 4, and 5)
	PARTITIONED AREA: Current Facility

Material Release:

The operational accident pertinent to this issue is the forklift puncturing an 8000 series container (two on site). Per the Basis for Interim Operations for the Pantex Plant, material from such an event has received a semi-qualitative Process Hazards Analysis, and the annual frequency of occurrence is less than 1×10^{-6} (beyond extremely unlikely). Components staged in the 8000 series containers will not be moved until such time as approved shipping containers are available. At that time they will be packaged and shipped.

Loss of Site/Building Integrity-Aircraft Crash:

This vulnerability is addressed by Vulnerability Assessment Form number "SAT/01."

Applicable References:

- Basis for Interim Operation (BIO) for the Pantex Plant, Amarillo, Texas, Rev. 3, Errata B, March 1996
- Final Safety Analysis Report, Building 12-58 (Bays 4 and 5), September 2, 1987
- Final Safety Analysis Report, Nuclear Explosive Special Purpose Facilities (Buildings 12-50, 12-60, 12-94, and 12-104A, DRAFT A, September 1995
- Final Safety Analysis Report, Pantex Plant Building 12-58, Bays 4 and 5 (ORO Component Staging Facility), Rev. 0, Draft, February 18, 1994

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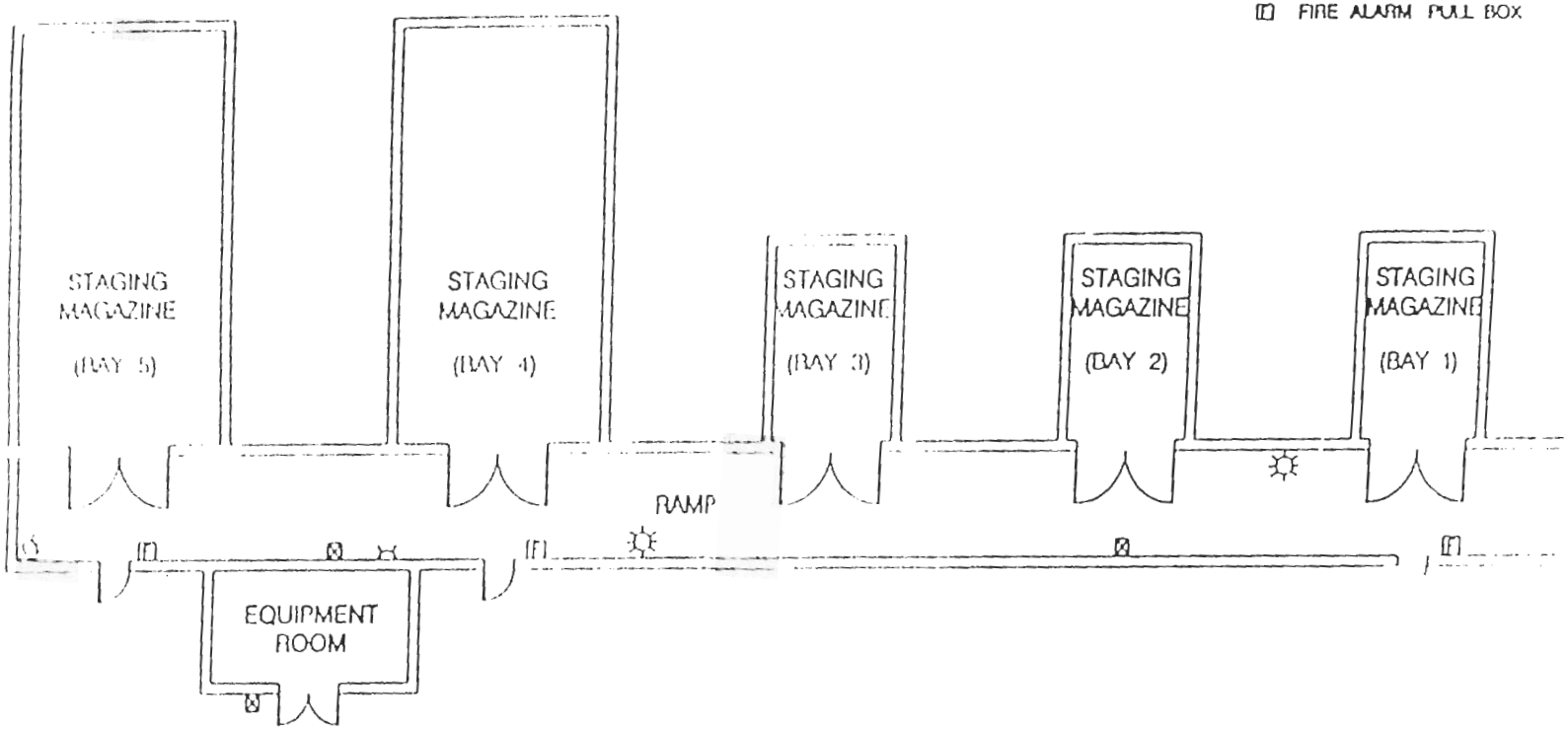
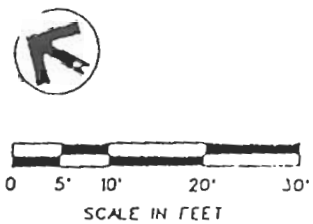
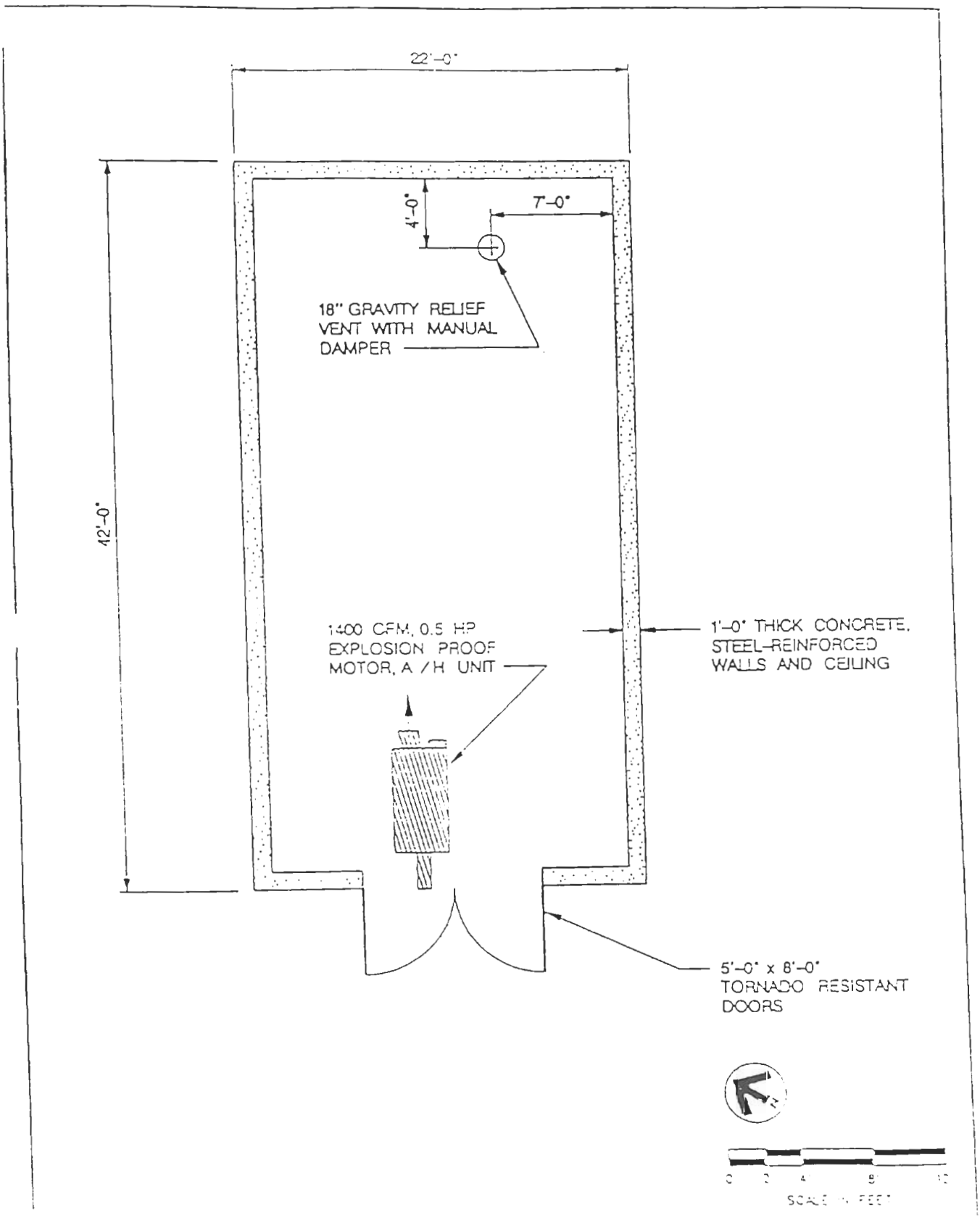


LEGEND

- PUBLIC ADDRESS SYSTEM
- EMERGENCY LIGHTS
- FIRE ALARM BELL
- FIRE EXTINGUISHER
- FIRE ALARM PULL BOX

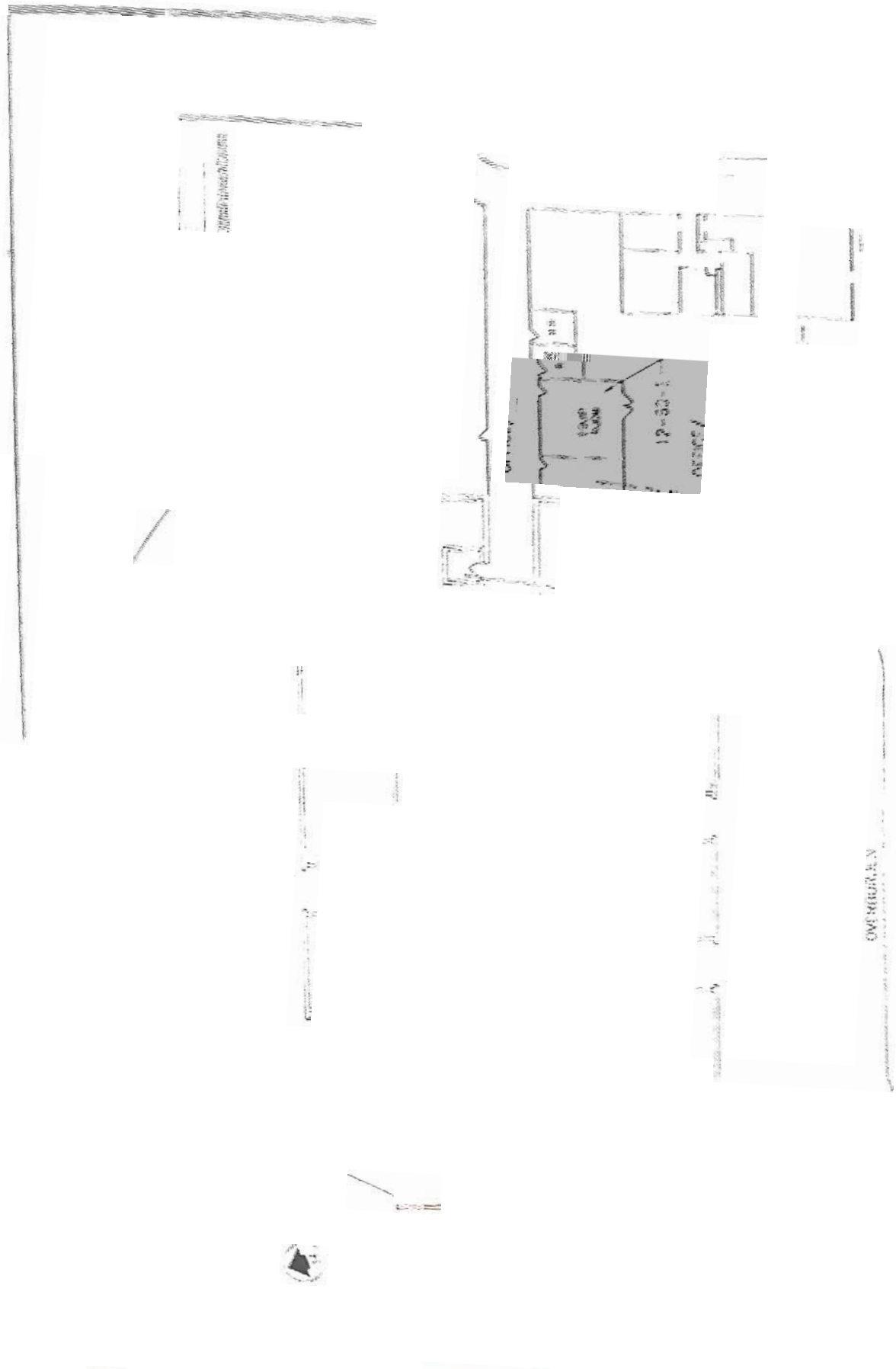




BUILDING 12-58 TYPICAL BAY

Attachment "Staging - 3"

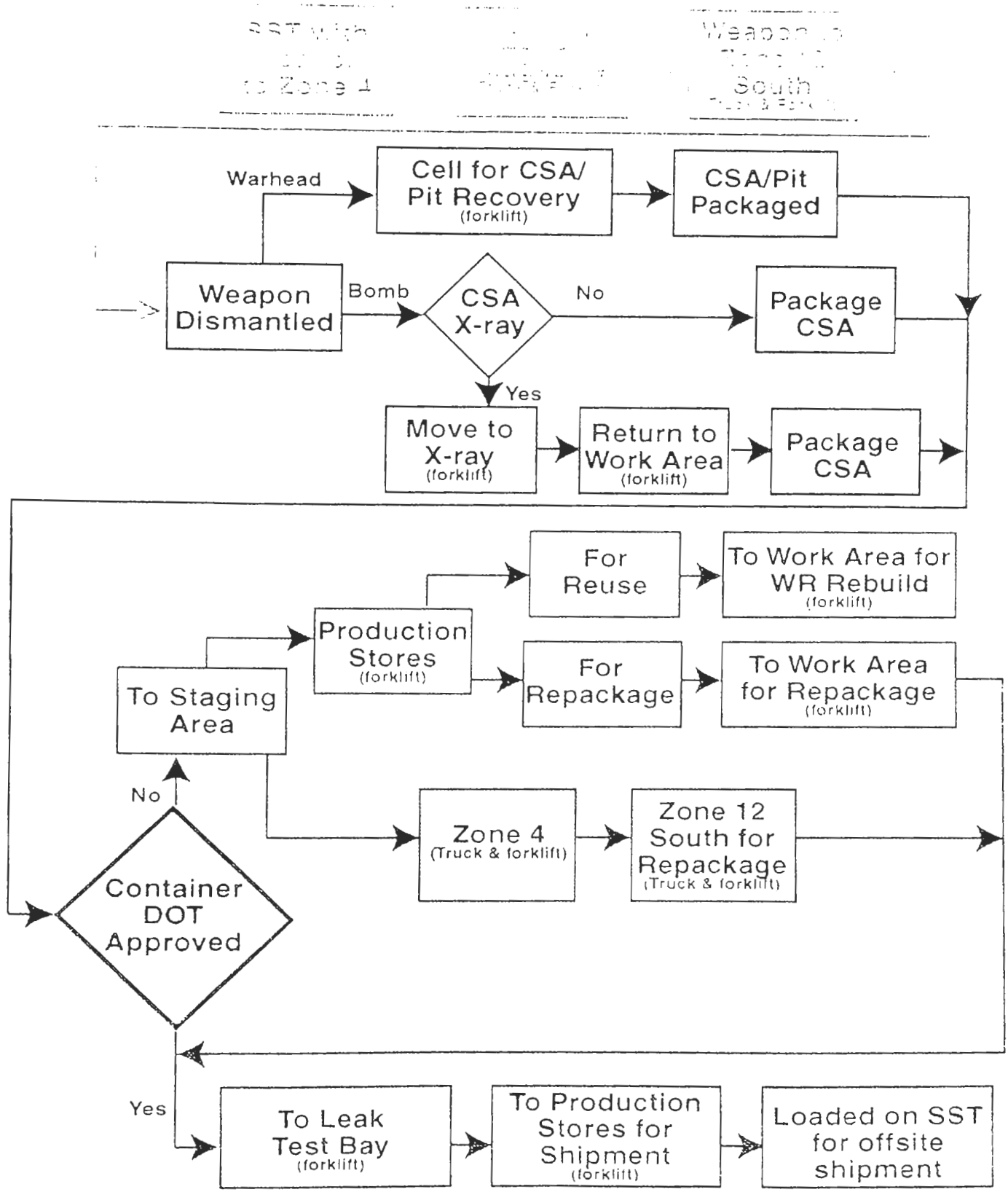
Pantex Plant



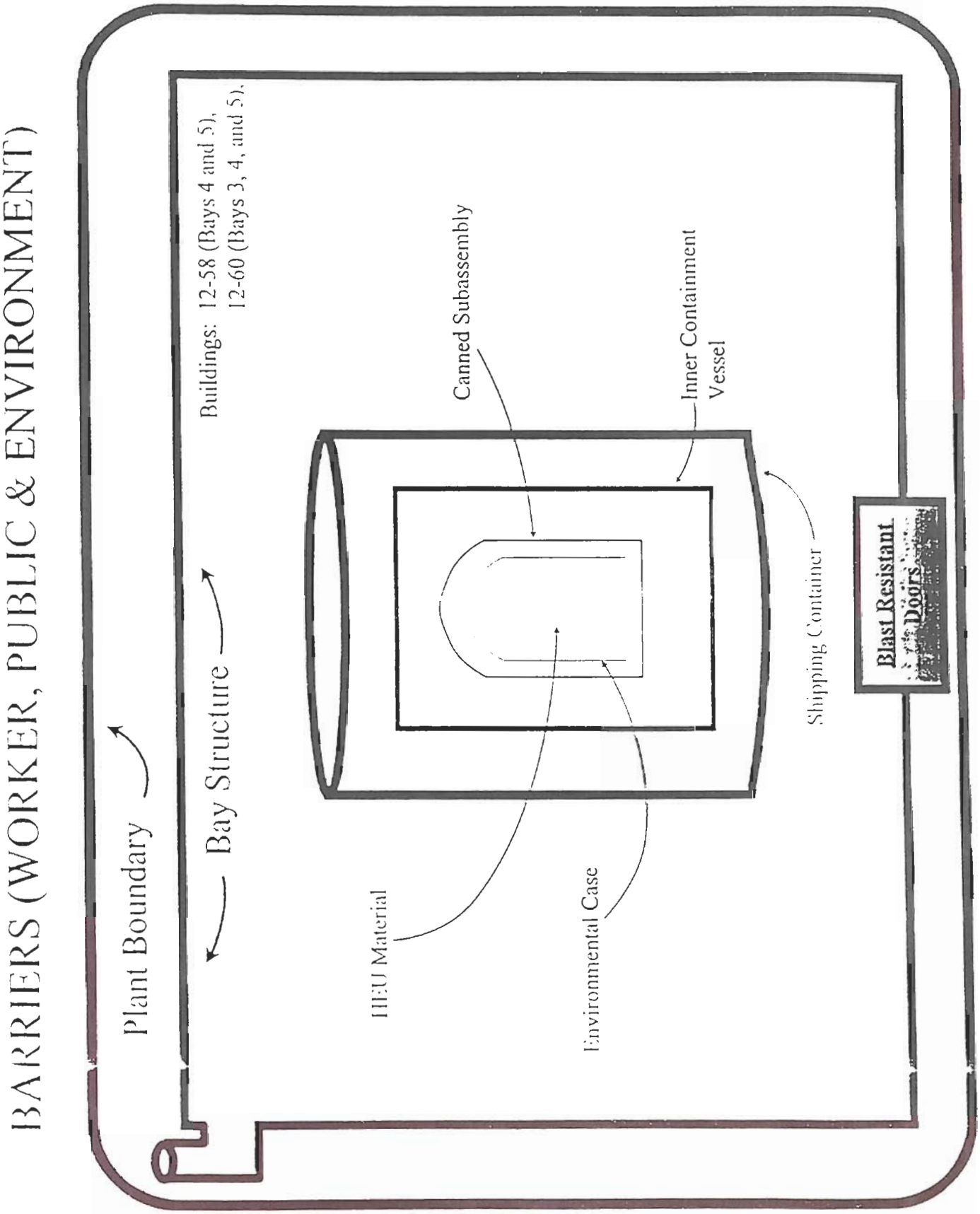
Building 12-60 Floor Plan

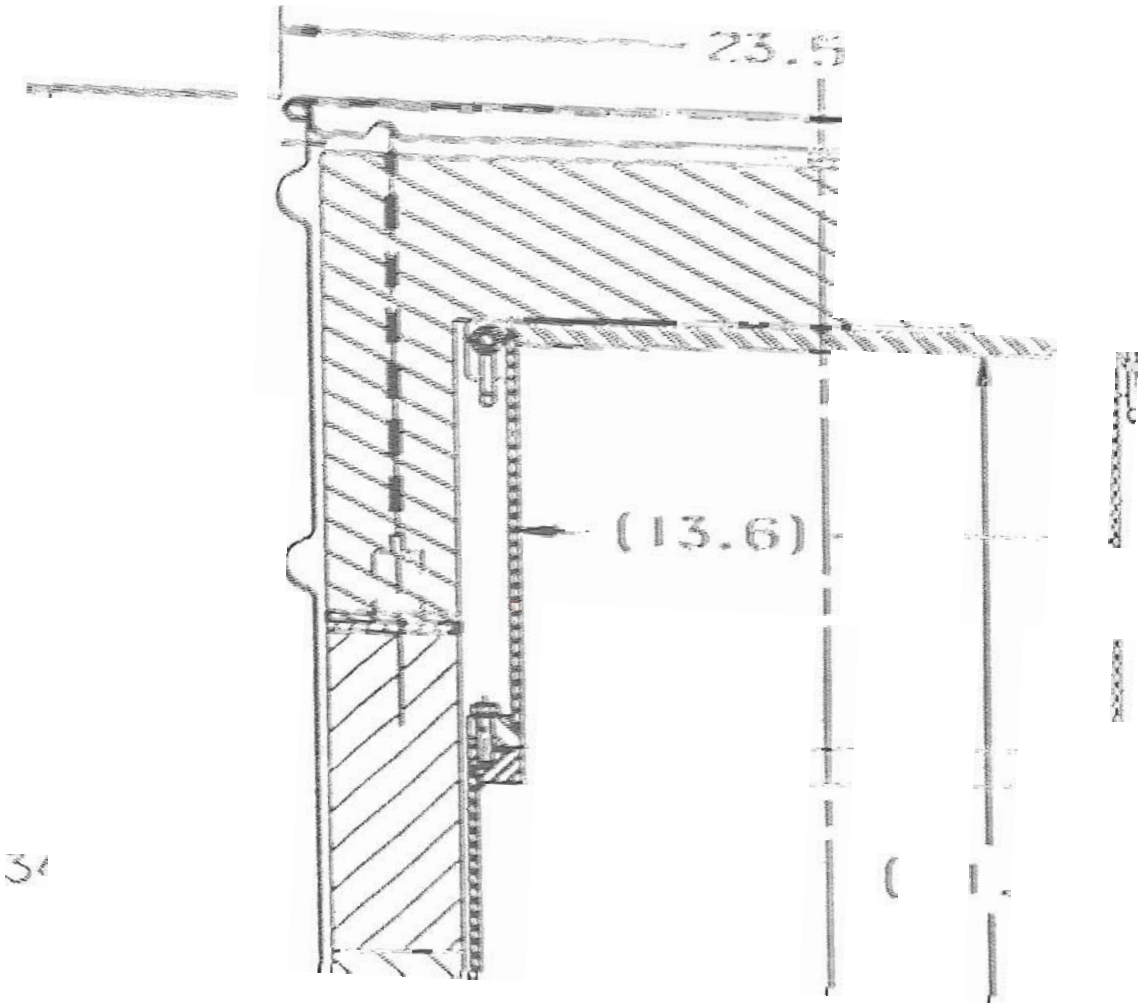
Attachment "Staging - 4"

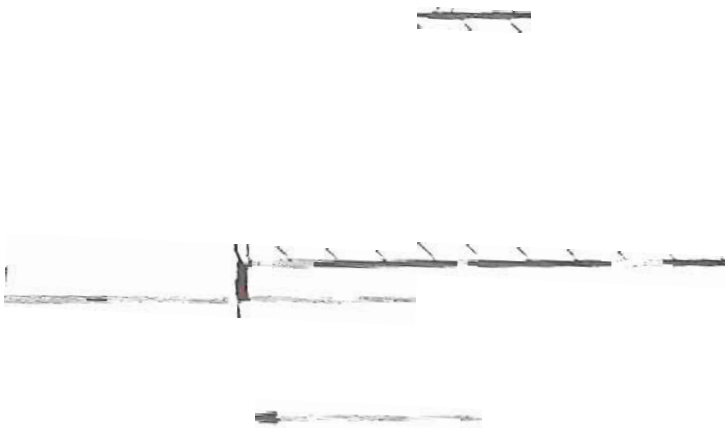
PANTEX PLANT
HEU MOVEMENTS



Attachment "Staging - 5"


BARRIERS (WORKER, PUBLIC & ENVIRONMENT)
Plant Boundary
Bay Structure
Buildings: 12-58 (Bays 4 and 5),
12-60 (Bays 3, 4, and 5).
HEU Material
Environmental Case
Canned Subassembly
Inner Containment
Vessel
Shipping Container
Blast Resistant





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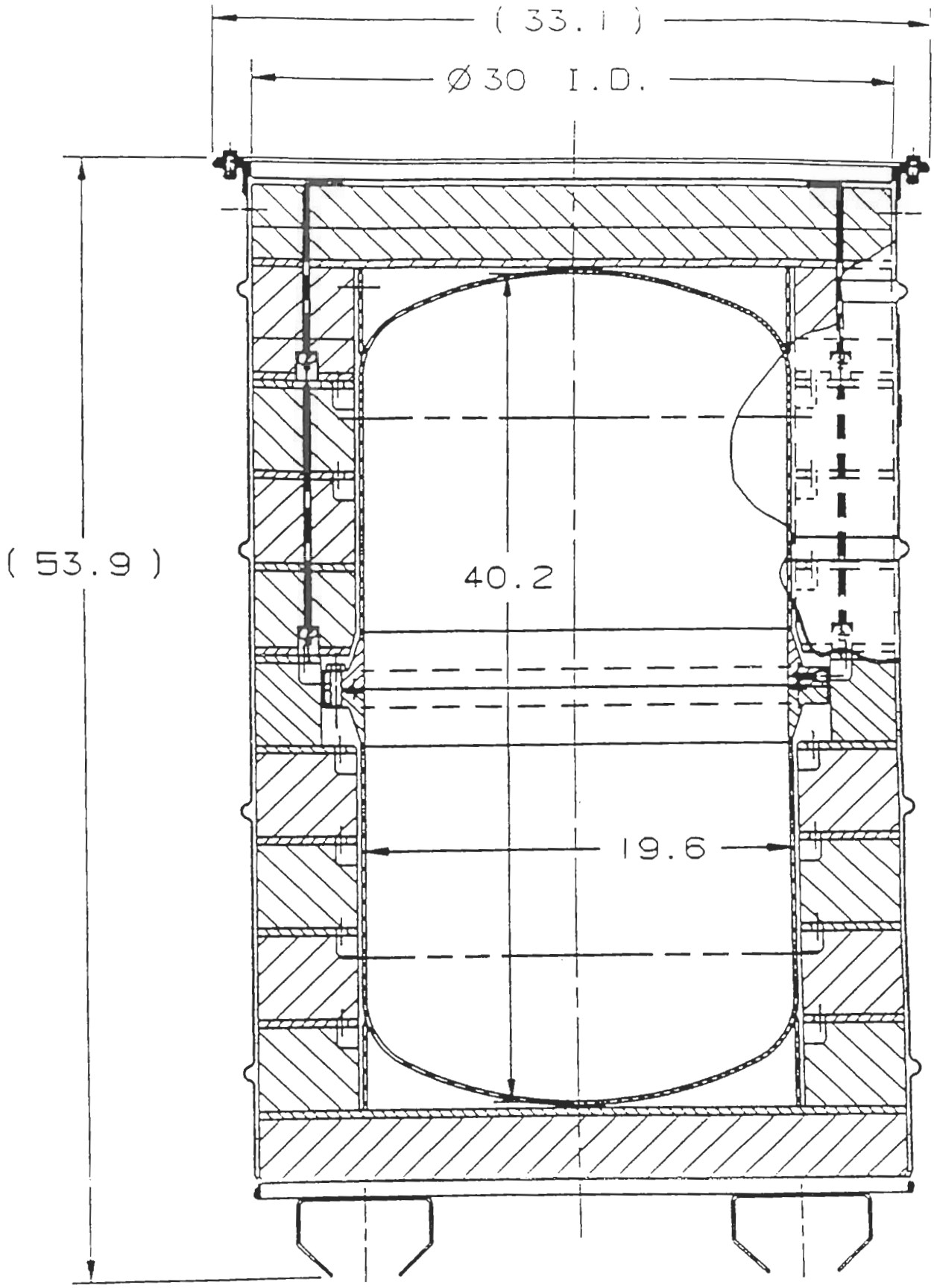
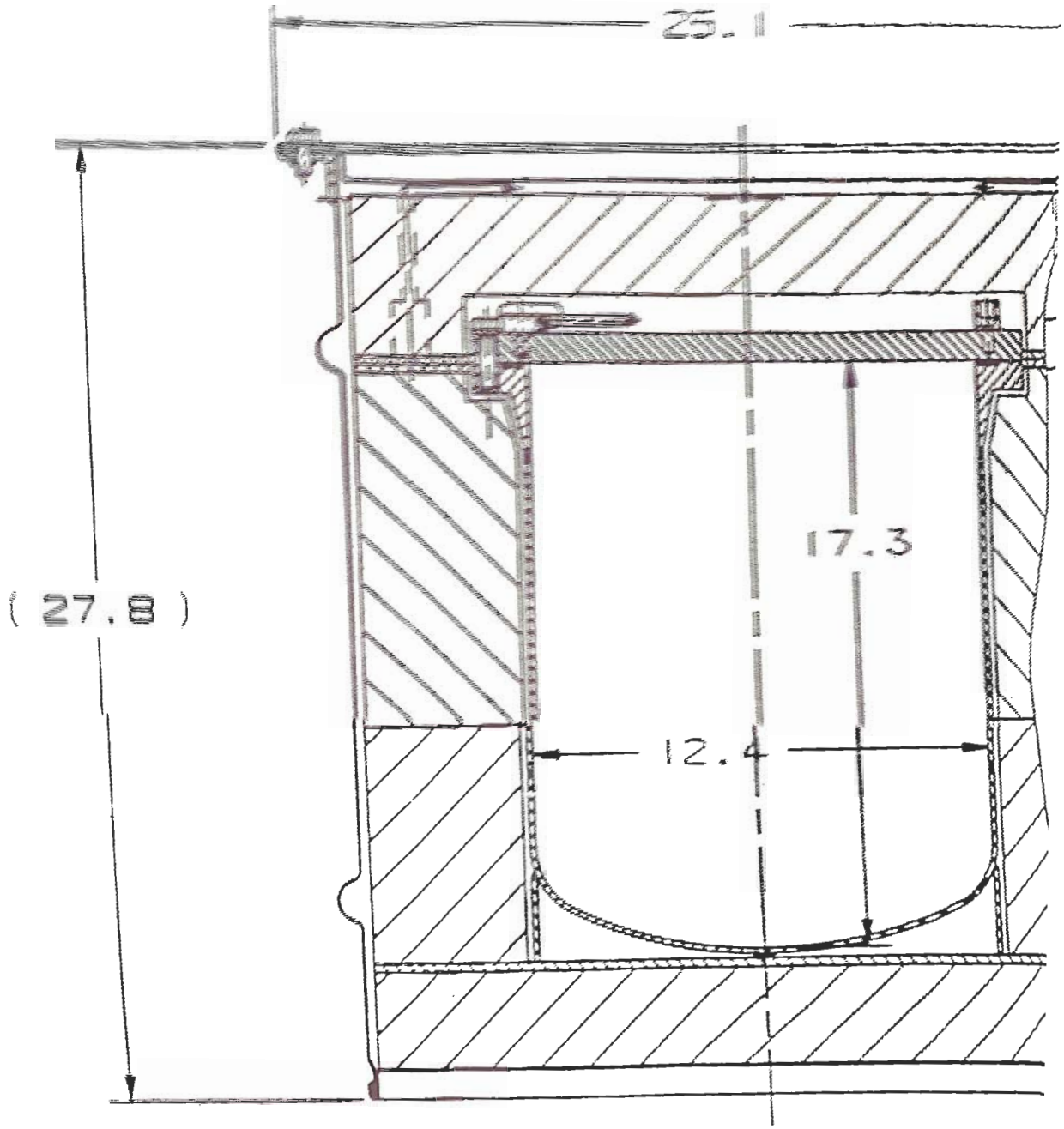


DT20

MAX GROSS WEIGHT 1084 LB

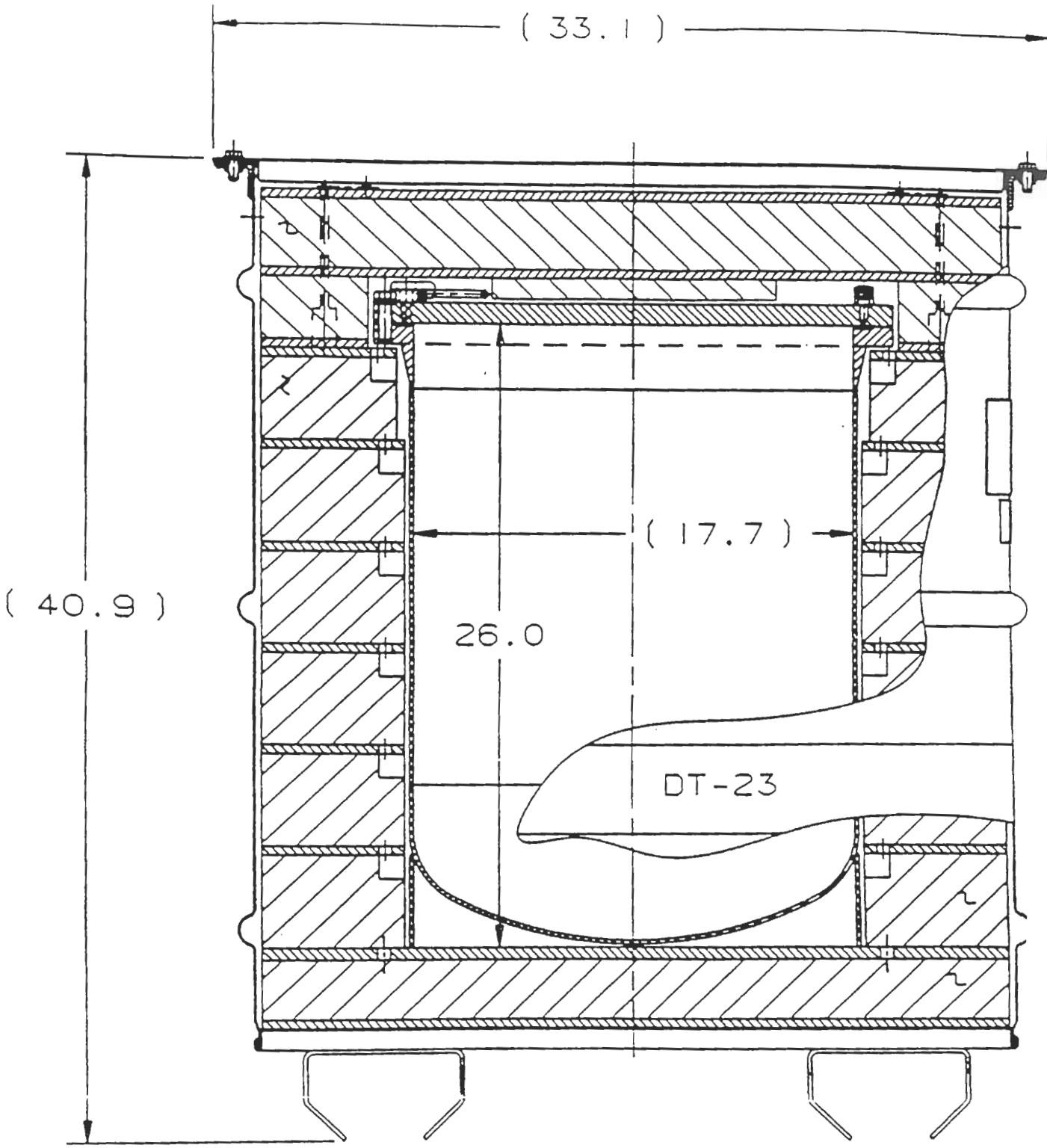
Attachment "Staging - 8"



DT22

MAX GROSS WEIGHT 385

Attachment "Drawing - 9"



DT23

MAX GROSS WEIGHT 800 LBS

Attachment "Staging - 10"

SITE. Pantex Plant	FACILITY (Building or Location): Building 12-44, (Cells 2-6), Building 12-85/96 (Cells), and Building 12-98 (Cells 1, 2, and 3)
	FUNCTION: Cells

DOE HEADQUARTERS FACILITY LANDLORD DOE/DP-1

DOE HEADQUARTERS PROGRAM SPONSOR DOE/DP-24

FACILITY AGE 10-37 years DESIGN LIFE 46-58 years

Question 1: What facilities are used for processing, handling, and storing HEU?

Summary description of the facility:

- The location of the facility on the site and the distance to the site boundary.

  Buildings 12-44 (Cells 2-6), 12-85, 12-96, and 12-98 (Cells 1,2 and 3) are located in the Zone 12 Material Access Area (MAA) (see Attachment "Cells - 1"). (The cells listed in this question set are the cells that potentially could be used for HEU operations during this assessment.) The distances from these facilities to the nearest site boundaries are approximately: 4,907 feet to the east-site boundary; 1,432 feet to the south-site boundary; 9,481 feet to the west-site boundary; and 16,135 feet to the north-site boundary (see Attachment "Cells - 2").

- The design mission, interim mission, current use, and operational status.

  The cells were originally designed as assembly/disassembly cells with the capability to process uncased explosives and weapon components that contain plutonium and other hazardous materials such as HEU. The major operations conducted in these cells are the pit-high explosives (HE) assembly; pit-HE disassembly; and complete nuclear explosive assembly and disassembly, which includes Canned Sub-assemblies (CSAs) that contain HEU. These cells are used extensively for the disassembly of nuclear explosives that have been returned to the DOE by DOD.

- Operational Status.

  Currently in use.

SITE: Pantex Plant	FACILITY (Building or Location): Building 12-44, (Cells 2-6), Building 12-85/96 (Cells), and Building 12-98 (Cells 1, 2 and 3)
	FUNCTION: Cells

- Historical information on Occurrence Reports (including occupational safety incidents), unreviewed safety questions, Defense Nuclear Facilities Safety Board concerns, and other regulatory concerns.

Unusual Occurrence Reports:

UOR #1992-0068	Unexpected Cracking of Weapon Component, 11/13/92
UOR #1993-0057	Pit Packaging Issues Associated With The W48 Program, 10/29/93
UOR #1994-0001	Accountability of Radiological Materials Previously Entered in Any Accountability System, 1/13/94
UOR #1994-0022	Malfunction of Blast Valves Noted During Preventive Maintenance Check (Buildings 12-44, 12-85, 12-96, and 12-98), 02/22/94
UOR #1994-0046	Failure of Preventive Maintenance Testing (DOP) of HEPA Filters in Assembly/Disassembly Cells (Buildings 12-44, 12-85, 12-96, and 12-98), 3/29/94
UOR #1994-0072	Loss of Accountability Of A Check Source In Building 12-96 Categorized per DOE Notice N5400.9, 05/06/1994
UOR #1994-0125	Blast Valve Failed During Semi-annual Preventive Maintenance Building 12-44 Cell 3, 8/12/94
UOR #1994-0132	Blast Valves in Building 12-44, Cells 4 and 5, Failed Semi-annual Preventive Maintenance Testing, 8/23/94
UOR #1994-0146	Design Concerns of Blast Door Interlock System at Building 12-44, 9/22/94
UOR #1994-0159	Blast Door Interlock Malfunction, Building 12-44 Cell 2, 10/6/94
UOR #1995-0046	Blast Valve in Building 12-85 Failed Semi-Annual Surveillance Maintenance testi 03/13/95
UOR #1995-0130	Fire Suppression System Surveillance Failure in Building 12-44 Cell 3, 8/15/95
UOR #1995-0155	Blast Valve in Building 12-44, Cell 3, Failed the Monthly Surveillance Testing, 09/20/95
UOR #1995-0190	Violation of Critical Safety System Manual (CSSM) / Emergency Light Surveill Deficiency Building 12-44, Cell 4, 11/13/95
UOR #1995-0216	Inadequate Accident Analysis of Potential Dose Rates, 12/12/95
UOR #1996-0039	Blast Valve Semi-Annual Surveillance Failure, Building 12-85, 02/14/96
UOR #1996-0040	Blast Valve Semi-Annual Surveillance Failure, Building 12-96, 02/15/96

SITE: Pantex Plant	FACILITY (Building or Location): Building 12-44 (Cells 2-6), Building 12-85/96 (Cells), and Building 12-98 (Cells 1, 2, and 3)
	FUNCTION: Cells

Historical Information, Continued:

Completed Unreviewed Safety Question Determinations:

Building Specific:

PX-USQD-94-02	Building 12-44, Should HEPA Filters Be Included as OSRS for Bays and Cells?, 5/18/94
PX-USQD-94-03	Building 12-44, Emergency Generator for Cell 8 RM-12-044C8-002, 4/28/94
PX-USQD-94-05	Building 12-44, Fire and Activation RM-12-044-007, 4/28/94
PX-USQD-94-08	Building 12-85, Fire Protection Configuration RM-12-085/096-001, 10/12/94
PX-USQD-94-09	Building 12-98, Fire Protection Configuration Rm-12-098-003, 4/28/94
PX-USQD-94-10	Building 12-44, Blast Valve Requirement for Operations of the Assembly Cells, 4/28/94
PX-USQD-94-26	Building 12-44, Bell Jar Vacuum Chamber System RM-12-044-010, 10/13/94
PX-USQD-94-29	Building 12-98, W48 Ret. Partial Nuclear Body Disassembly with Cracked Pit, 6/22/94
PX-USQD-94-37	Building 12-44, CCTV and Hot Water System RM-12-044-008, 10/13/94
PX-USQD-94-38	Building 12-85/96 and 12-99, Exhaust Fan Face Velocity, 6/23/94
PX-USQD-94-41	Building 12-44, W48 Center Item Repackaging, 5/30/95
PX-USQD-94-43	Building 12-98, Hot Water/DMSO Bath, 9/27/94
PX-USQD-94-51	Building 12-44, Deluge Fire Alarm Signal Constantly Activated for Cell 1, 7/22/94
PX-USQD-94-59	Building 12-44, Modification of HEPA Filter Frame, 8/15/94
PX-USQD-94-64	Building 12-98, Removal of Raschig Rings From Sump Pits, 3/14/96
PX-USQD-94-68	Building 12-44, Event: Blast Door Interlocks Defeated, 11/10/94
PX-USQD-94-69	Building 12-44, Radiation Alarm Evacuation, 11/17/94
PX-USQD-94-78	Building 12-85/96 and 12-98, Surge Protection Installation, 2/23/95
PX-USQD-94-82	Building 12-44, Discovery of Closed Blast Valve, 2/27/95

SITE: Pantex Plant	FACILITY (Building or Location): Building 12-44, (Cells 2-6), Building 12-85/96 (Cells), and Building 12-98 (Cells 1, 2 and 3)
	FUNCTION: Cells

Historical Information, Continued:

PX-USQD-94-83	Building 12-44, Blast Door Interlock Proposal, 2/16/95
PX-USQD-95-05	Building 12-44, Use of a X-Ray Fluorescence Analyzer in 12-44, Cell 8, 11/7/95
PX-USQD-95-07	Building 12-98, Repair Inlet Plumbing for a Regenerative Blower, 4/19/95
PX-USQD-95-08	Building 12-44, Analysis of Pit Cladding From All Programs, 10/2/95
PX-USQD-95-23	Building 12-85, Hot Water Installation, 10/20/95
PX-USQD-95-42	Building 12-98, Modification to the Existing Hot Water System, 11/27/95
PX-USQD-96-01	Building 12-44/85/96/98, Weapons Assembly Cells Door Seals, 1/5/96
PX-USQD-96-04	Building 12-64, Weapons Staging Compatibility, 2/28/96
PX-USQD-96-09	Building 12-44, Manual Transfer Operation When Robot is Inoperative, 4/19/96

Plant Wide:

PX-USQD-94-13	Pantex Plant, Materials Handling Equipment RM-FS-023-001, RM-FS-021-008,9/9/94
PX-USQD-94-21	Pantex Plant, Pantex Plant Aerial Radiological Survey, 5/24/94
PX-USQD-94-34	Pantex Plant, Pantex Plant Aerial Radiological Survey Assuming an Accident, 6/8/
PX-USQD-94-35	MAA, Alpha Cams Calibrated for U-238, 2/23/95
PX-USQD-94-66	Pantex Plant, Pantex Plant Aerial Radiological Survey - New Information, 9/22/9
PX-USQD-94-76	Pantex Plant (CSSM Buildings), CSSM Change-Firewatch, 11/22/94
PX-USQD-95-01	Pantex Plant, CSSM Change-5480.31 Requirement For Shutdown Mode, 3/2/95
PX-USQD-95-22	MAA, Fire Alarm Upgrade, 11/6/95
PX-USQD-95-25	MAA, Electronic Enhancements Security Upgrade Project, 2/21/96
PX-USQD-96-06	MAA, Implementation of Critically Controls Recommendations in BIO, 3/7/9

SITE: Pantex Plant	FACILITY (Building or Location): Building 12-44, (Cells 2-6), Building 12-85/96 (Cells), and Building 12-98 (Cells 1, 2 and 3)
	FUNCTION: Cells

- The authorization basis.
  - Basis for Interim Operation (BIO) for the Pantex Plant, Amarillo, Texas, Rev. 3, Errata B, March 1996
  - Critical Safety Systems Manual (CSSM), MNL 1101, Rev 3C, December 1995
  - Final Safety Analysis Report for Pantex Building 12-44, 3/26/81
  - Final Safety Analysis Report for 2 Assembly Cells With Associated HE Service Magazines for Buildings 12-85 and 12-96, 3/28/84
  - Final Safety Analysis Report for Building 12-98, 9/22/87
  - Final Environmental Impact Statement, Pantex Plant Site, DOE/EIS-0098, October 1983
  - Input Documents for the Nuclear Explosives Safety Master Studies, 1993
  - Nuclear Explosive Safety Master Studies, 1993

Other Pertinent ES&H Documentation.

- DOE Order 5480.22 and 5480.23 Implementation Plan, June 1995
- Pantex Plant FY1996 CAMP Report, Capital Asset Management Process, April 1994
- Technical Manual Nuclear Safety Criteria (Title U, Report SRD), DOE-DNA TP 20-7, September 1 (as amended)

SITE: Pantex Plant	FACILITY (Building or Location): Building 12-44 (Cells 2-6), Building 12-85/96 (Cells), and Building 12-98 (Cells 1, 2, and 3)
	FUNCTION: Cells

- Important or unique facility design features.

Design Features:

Buildings 12-44, 12-85, 12-96, and 12-98 were designed and constructed before the currently applicable criteria in DOE Orders 6430.1A and 5480.23 were in effect. The initial requirements for building designs at the Pantex Plant were developed by Mason & Hanger based on DOE program needs and are described in Design Criteria Documents. Typically, these initial building designs evolve, because of changes in program needs, resource limitations, and changes in safety requirements.

The original design requirements for Buildings 12-85, 12-96, and 12-98 refer to design criteria in the Pantex Plant Design Criteria Manual or PDCM. MC Appendix 6301 (predecessor to DOE Order 6430.1A), U.S. Army Technical Manual TM 5-1300, "Structures To Resist the Effects of Accidental Explosions," various National Fire Protection Association (NFPA) codes, the National Electric Code (NEC), and others. Structural design basis accidents for wind and tornado loads and HE (high explosive) detonation are also specified in the original design criteria.

The original design criteria documents for Building 12-44 are unavailable. However, Building 12-44 construction drawings are available and have dates as early as 1956 with as-built date stamps of 1958. Applicable building guidelines and codes in effect at the time for structures for this type, would have included Atomic Energy Commission criteria, the Military Ordnance Manual, and local and national codes in effect at the time. Documentation of the adequacy of design for Building 12-44 is located in the DOE approved Final Safety Analysis Report.

The cells are "Gravel Gertie" structures. An external view of a typical "Gravel Gertie" structure is shown in Attachment "Cell - 3." Gravel Gerties are characterized by a main Round Room (see Attachment "Cells - 4"), a number of staging cubicles, a unit equipment mechanical room, equipment and personnel passageways, and blast doors. A typical cell arrangement is shown in Attachment "Cells - 5." The mounded earth and gravel cover over the cell Round Room is supported by a cable network. The cell roof consists of the support cables, four layers of wire mesh, gravel and earth coverings, and typically a gunite or concrete cap.

The Round Room walls are constructed of reinforced concrete. The equipment airlock blast doors are hinged on one side and close against the wall jambs. The doors are designed to withstand the blast from accidental detonation of 550 lb of TNT-equivalent explosives located in the Round Room of the cell. The two blast doors are interlocked so that only one door can be opened at a time.

In addition to the Round Room, the cell area contains a number of supporting rooms. The supporting rooms include cubicles for staging special nuclear material (SNM), tooling, and inert parts; a corridor area; and a unit equipment mechanical room. All of these areas are inside the blast-resistant cell structure and provide protection from external events, including explosions, winds, and tornados. General layout diagrams for Buildings 12-44, 12-85, 12-86 and 12-98 are shown in Attachments "Cells - 6," "Cells - 7," "Cells - 8," "Cells - 9," "Cells - 10," "Cells - 11," and "Cells - 12."

The staging cubicles support various cell operations. The cell corridors provide access to the staging cubicles and the round room.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-44 (Cells 2 - 6), 12-85, 12-96, 12-98 (Cells 1, 2, and 3).
	PARTITIONED AREA: Current Facility

Question 2: What barriers are used to protect workers, the public and environment from HEU?

Barrier Types

Worker Barrier	Public/Environmental Barrier	Criticality	Administrative Barrier
☐ Gloveboxes	☒ Facility/Building Boundary	☐ Containers	☒ Procedures: Operation, Maintenance
☐ Transfer System	☒ HVAC/Confinement	☐ Physical Dividers	☒ Material Limits
☐ Duct	☐ Liquid Containment/Dike	☐ Poisons	☒ Monitoring
☒ Filter	☒ Bays, Cells, Magazines	☐ Concentration Control	☒ Configuration Control
☐ Vault	☐ Canyons	☐ Stirrers	☐ Quality Assurance
☐ Room	☐ Pads	☐ Volume Control	☒ Conduct of Operations
☐ Hot Cell/Canyon	☒ Site Boundary	☐ Double Contingency	☒ Authorization Basis
☐ Hood	☐ Trenches	☒ Other (Criticality)	☒ Training
☐ Piping	☐ Storage Vault		☒ Organization
☐ Shielding	☒ Fire Suppression		☒ Lessons Learned
☐ Distance	☐ Alarm System		☐ Testing
☐ Respiratory Protection	☒ Other (listed below)		☐ Trending
☒ Protective Clothing			☐ Records
☐ Remote Handling			☒ Standards
☐ Confinement System			☐ External Regulation
☐ Burial Ground			☒ Surveillance
☐ Tanks			☒ Personnel Reliability Assurance Program
☒ Alarm System			☒ Worker Access/ Occupancy Limits
☐ Temporary Barriers			☒ Emergency Response
☒ Other (listed below)			☐ Other (specify)
☐ None			

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-44 (Cells 2 - 6), 12-85, 12-96, 12-98 (Cells 1, 2, and 3).
	PARTITIONED AREA: Current Facility

Other Worker Barriers:

Ventilation RAMS Interlock
Fire Suppression System
Contaminated Vacuum
Uninterruptible Power Supply
Diesel Generator for Auxiliary Power
Facility Construction/Blast Design
Blast Door Interlocks
Blast Valves
Contaminated Waste Isolation Valves
Communications
Emergency Lights
Zone Access Control

Other Public and Environmental Barriers:

Blast Door Interlocks
Blast Valves
Contaminated Waste Isolation Valves
Zone Access Control

Note: Worker, Public, and Environment barriers are shown in Attachment "Cells - 14."

Worker Barriers:

HEPA Filters (intake and exhaust):

Provide clean environment within facilities suitable for weapons quality work. Provides limited defense-in-depth protection of personnel, by mitigating the potential release of plutonium and HEU to the environment, through the ventilation duct work in the event of an operational accident.

Protective Clothing:

Appropriate personal protective equipment and clothing is used to protect the worker from radioactive or hazardous substance contamination.

Alpha Alarm System :

Provides warning to personnel to allow prompt evacuation in the event of radioactive materials release, or in the event of catastrophic failure of the containment system for alpha radioactive materials.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-44 (Cells 2 - 6), 12-85, 12-96, 12-98 (Cells 1, 2, and 3).
	PARTITIONED AREA: Current Facility

Worker Barriers, Continued:

Beta Alarm System:

Provides warning to personnel to allow prompt evacuation, in the event of release of radioactive materials.

Radiation Alarm Monitoring System (RAMS) Local Warning Lights and Alarms:

Provide warning to personnel in the event of a catastrophic failure of the containment system for radioactive materials. The system provides prompt evacuation alarms for personnel in the event of release of radioactive materials and sends an alarm to the emergency operations center.

Fire Detection and/or Alarm System:

To protect life, property, and the continuity of operations by giving early warning of a fire. Provides warning to facility occupants for evacuation from the facility, and provides notification to the Fire Department for response.

Ventilation RAMS Interlock:

The RAMS is interlocked with the facility ventilation system to shut down the supply and exhaust fans on the detection of alpha contamination. On the detection of tritium, the ventilation supply fan will either start or continue to operate. Also, the RAMS are interlocked with the Blast Door Interlock system to facilitate egress from the facility in the event of a plutonium or tritium release.

Fire Suppression System:

Detects and extinguishes a fire that could potentially lead to a high explosives (HE) detonation. The system would minimize the potential fire loss within a facility, and also delay the spread of a fire in order to give the Fire Department increased response time to a fire in a facility.

Contaminated Vacuum :

Supports the alpha continuous air monitors by providing a continuous flow of air across the monitor for air sampling. This enables the monitors to provide early warning of an alpha release.

Uninterruptible Power Supply (UPS):

Ensures that all critical safety equipment that require emergency electrical power will operate properly in the event of a power loss to the facility. This system is necessary for the proper continuous operation of other safety systems, such as emergency lighting.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-44 (Cells 2 - 6), 12-85, 12-96, 12-98 (Cells 1, 2, and 3).
	PARTITIONED AREA: Current Facility

Worker Barriers, Continued:

Diesel Generator for Auxiliary Power (Building 12-98 only):

The Uninterruptible Power Supply (UPS) provides emergency power for the proper continuous operation of other safety systems, such as emergency lighting. Building 12-98 uses an emergency generator to supplement the emergency power system provided by the UPS for periods greater than the designed 30 minutes of the UPSs. The UPSs of other cells (i.e., 12-44, 12-85, and 12-96) will provide emergency power for a minimum of one and a half hours. No other emergency generators are provided in 12-44, 12-85, or 12-96.

Facility Construction/Blast Design:

Facility structure is comprised of concrete walls, a concrete slab, earth overburden, Gravel Gertie, and blast doors. The basis of the facility structure is to provide a significant barrier that prevents many types of accidents external to the structure and natural phenomena (e.g., tornados, earthquakes, external blasts, external fires, missiles, and credible aircraft crashes) from damaging the facility and subsequently, the facility's contents, and from releasing hazardous materials.

Blast Door Interlocks (BDI):

The BDI System for the cells ensures that at least one set of blast doors is closed at all times to minimize the probability of plutonium or HEU dispersal to the environment, to mitigate the effect of a blast wave or blast fragment from an external explosion, to mitigate the impact of wind borne missiles, and to mitigate the pressure effect of a tornado.

Blast Valves:

The basis for the Blast Valves is that in the event of an accidental high explosive detonation within a cell, the valves will be closed and latched from the blast pressure and prevent the release of radioactive material to the environment through the ventilation system.

Contaminated Waste Isolation Valves (Buildings 12-85, 12-96 and 12-98 only):

The basis for Contaminated Waste Isolation Valves is to prevent the communication of blast pressure between cells that share a common waste tank, in the event of an accidental HE detonation within a cell. The valves would also prevent the release of radioactive materials in the event of an accidental HE detonation.

Communications (Telephone and PA):

The basis for this system is to be able to communicate with personnel in the cells and notify personnel in the facility of an external explosion, earthquake, tornado, fire, or a release of radioactive materials that may require certain types of actions inside the facility.

Emergency Lighting:

To provide the required illumination automatically in the event of any interruption of normal lighting. This lighting will allow safe shutdown of operations in and egress from the affected facility in the event of loss of power.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-44 (Cells 2 - 6), 12-85, 12-96, 12-98 (Cells 1, 2, and 3).
	PARTITIONED AREA. Current Facility

Worker Barriers, Continued:

Zone Access Control:

Zone access control is maintained by zone security fences, security guards (gate access control and guard towers) and security intrusion systems.

Public/Environmental Barriers:

Facility/Building Boundary:

The facility structure consists of concrete walls, a concrete slab, earth overburden, Gravel Gertie, and blast doors. The basis for the cell structure is to provide a significant barrier that prevents many types of accidents external to the structure and natural phenomena (e.g., earthquakes, external blasts, external fires, missiles, and credible aircraft crashes) from damaging the facility and subsequently, the facility's contents, and from releasing hazardous materials. The facility structure provides additional protective features to minimize the release of radioactive material in the event of an accidental high explosives (HE) detonation within the facility.

Blast Door Interlocks:

Minimize the probability of plutonium or HEU dispersal to the environment and mitigate the effect of a blast wave or blast fragment from an external explosion. Assures that at least one set of blast doors is closed at all times to mitigate the impact of wind borne missiles and the over-pressure effect of a tornado or an external accidental HE detonation.

Blast Valves (Ventilation System confinement):

The basis for the blast valves is that in the event of an accidental HE detonation within a cell, the valves will be closed and latched from the blast pressure and they will prevent the release of radioactive material to the environment through the ventilation system.

Contaminated Waste Isolation Valves (Buildings 12-85, 12-96 and 12-98):

Prevent the communication of a blast pressure, between cells that share a common waste tank, in the event of an accidental high explosive (HE) detonation within a cell. The valves would also prevent the release of radioactive materials in the event of an accidental HE detonation.

Site Boundary:

The nearest major population area is Amarillo, Texas, which is located 17 miles southwest of the Pantex site boundary. Within the perimeter of the site boundaries, the cells are located 16,135 feet from the Northern boundary; 4,907 feet from the Eastern boundary; 1,432 feet from the Southern boundary; and 9,481 feet from the Western boundary.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-44 (Cells 2 - 6), 12-85, 12-96, 12-98 (Cells 1, 2, and 3).
	PARTITIONED AREA: Current Facility

Administrative Barriers, Continued:

Configuration Control:

Configuration control exists for structures, systems, and components that are critical to safety. The Configuration Management Program is described in Appendix G of the Basis for Interim Operation for the Pantex Plant.

Conduct of Operations:

The effective coordination of formality in the conduct of operations at Pantex is based on bench-marking and implementation of best practices into the program. The program is administered in accordance with the Pantex Plant Conduct of Operations Manual, MNL-00040.

Authorization Basis:

The authorization basis is defined through the existing Final Safety Analysis Reports, the Nuclear Explosive Master Studies, and the Basis for Interim Operation of the Pantex Plant, in conjunction with the Critical Safety System Manual until new FSARs are developed in accordance with DOE Order 5480.23.

Training:

The Pantex training program provides all personnel with appropriate education, training, and certification programs that promote an increased state of awareness of the responsibilities and operating practices at the Plant.

Organization:

The operating organization is part of a network of supporting management, technical, and support functions that is sufficient to ensure that hazards and safety issues are identified, communicated, evaluated, resolved, and documented.

Lessons Learned:

Pantex Plant Standard STD-6216 establishes a process for reviewing and analyzing operational management experiences and translating these experiences into lessons learned.

Standards:

Plant Standards are management control documents that outline both specific management objectives and how processes and activities are to be accomplished and controlled. These standards are based on and developed from Plant policy directives which are those management documents that provide direction, assign responsibilities, and define goals on a Plant-wide basis.

Surveillance:

Formal procedures and processes are in place to ensure that structures, systems, and components that are critical to safety will perform as intended.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-44 (Cells 2 - 6), 12-85, 12-96, 12-98 (Cells 1, 2, and 3).
	PARTITIONED AREA: Current Facility

Administrative Barriers, Continued:

Personnel Reliability Assurance Program:

This program establishes the requirements and responsibilities for screening, selecting, and continuously evaluating those employees being assigned to or considered for assignment to critical duties.

Worker Access/Occupancy Limits:

The Material Access Area access is controlled by security fences, security guards (gate access control and guard towers), and security intrusion systems. Each cell has personnel limits posted at the respective cell entrance for cell occupancy limits.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-44 (Cells 2 - 6), 12-85, 12-96, 12-98 (Cells 1, 2, and 3).
	PARTITIONED AREA: Current Facility

Administrative Barriers, Continued:

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This program establishes the requirements and responsibilities for screening, selecting, and continuously evaluating those employees being assigned to or considered for assignment to critical duties.

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SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-44 (Cells 2 - 6), 12-85, 12-96, 12-98 (Cells 1, 2 and 3).
	FUNCTION: Cells

Question 3: What are the HEU holdings and how are they packaged?

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Age of Packaging (in years)	Number of Packages	Mass (kg)
Weapon Components	Weapons	CSA	55 gallon, DT Drum	Assembly/ Disassembly Cells	3-30	Appendix E	Appendix E

Description of the packaging and its intended protective function.

Packaging Narrative:

Due to the size of the containers, the horizontal shipping containers (HSCs) and the 8000 series containers are not used in the cells. The DT type drums are the containers packaged with CSAs in the cells.

The DT drum shipping containers used by Pantex Plant in the cells include the DT-18, DT-20, DT-22, and the DT-23 (see Attachments "Cells - 15," "Cells - 16," "Cells - 17," and "Cells - 18." The DT containers are drum type containers that meet Type B requirements of 10 CFR 71, which is documented in a safety analysis report for packaging (SARP). The DT container includes an inner containment vessel which is hermetically sealed. The outer drum is made of stainless steel except for the DT-18, which is made of carbon steel. The drum sizes range from 55 to 212 gallons. Celotex inserts form the inner barrier of the outer drum. The inner containment vessel is made of stainless steel. Rubber inserts formed to dimensions of each particular CSA are used inside the inner containment vessel. Additionally, a sling or holding fixture as required by the configuration may be in the inner containment vessel.

Additional CSA staging containers used at Pantex in the Cells include Nuclear Assembly H-Gear (Hand Trucks and Drum Type) and decertified DT containers (DT-3, DT-5, DT-16, etc). These containers do not meet the requirements of 10 CFR 71 and do not have an inner containment vessel; however, they are DOE approved for on-site transportation and staging of nuclear explosive components.

The MH2800 (see Attachment "Cells - 19") is a 146-gallon container with inserts and a inner containment vessel. It meets the requirements of the Type B configuration; however, it is not authorized as a shipping container for CSAs, other than one type of CSA. It is used to store other CSAs, based on size.

The modified MH2800 containers have had the inner containment vessel removed; what remains is the 146 gallon stainless steel drum and foam inserts. This configuration does not meet the Type B container requirements. This configuration is used for on Plant staging only.

All containers used at the Pantex Plant are designed to protect the contents from damage during transportation and staging, and provide for criticality safety (Pantex Plant Criticality Safety Program Analysis, February 28, 1996, and the DOE-approved Basis for Interim Operation for the Pantex Plant). The approved shipping containers also provide an additional containment barrier for the contents (hermetically sealed inner containment vessel). Where required, the packaging consists of several receptacles, neutron absorbing materials, spacing for structural integrity, thermal insulation, radiation shielding, devices for absorbing mechanical shock, and sometimes the conveyance, tie-down system, and auxiliary equipment. These items are in place to protect the item inside the container.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-44 (Cells 2 - 6), 12-85, 12-96, 12-98 (Cells 1, 2, and 3).
	FUNCTION: Cells

Describe material at risk, which constitutes a source term.

The number of packages (inventory) and the associated material at risk per container is information that will be located in classified Appendix E.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-44 (Cells 2 - 6), 12-85, 12-96, 12-98 (Cells 1, 2, and 3).
	PARTITIONED AREA: Current Facility

Facility Causes:

Other Collocated Hazards:

Collocated explosives could cause the explosive dispersal of highly enriched uranium (HEU).

Combustible Loadings:

Excessive combustible loadings could cause a reduction in the effectiveness of Fire Protection programs.

Equipment Failure/Preventive Maintenance Failures:

Equipment failure and inadequate preventive maintenance of systems, structures and components (SSCs) could cause the failure of these SSCs to perform their safety related functions.

Administrative Controls:

Inadequate Nuclear Safety Management Programs could cause a reduction in effectiveness of the ES&H program.

Human Error:

Non-compliance with human engineering principles, practices and requirements could cause human errors to occur. The occurrence of human errors could impact the public, workers and environmental safety. The errors could be due to operator errors, testing and maintenance errors, or inadequate procedures.

Fire:

A fire in a cell could cause: (1) heating cased or uncased high explosives (HE) above its critical temperature; and (2) burning and ignition of cased or uncased HE or insensitive high explosives.

Other:

Dropping cased or uncased HE could cause the detonation of the explosives.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-44 (Cells 2 - 6), 12-85, 12-96, 12-98 (Cells 1, 2, and 3).
	PARTITIONED AREA: Current Facility

External Causes:

Explosion:

An explosion external to the cells could cause blast over-pressure in the cells.

Earthquake:

Earthquake damage concurrent with flooding could cause criticality.

Winds/Tornado:

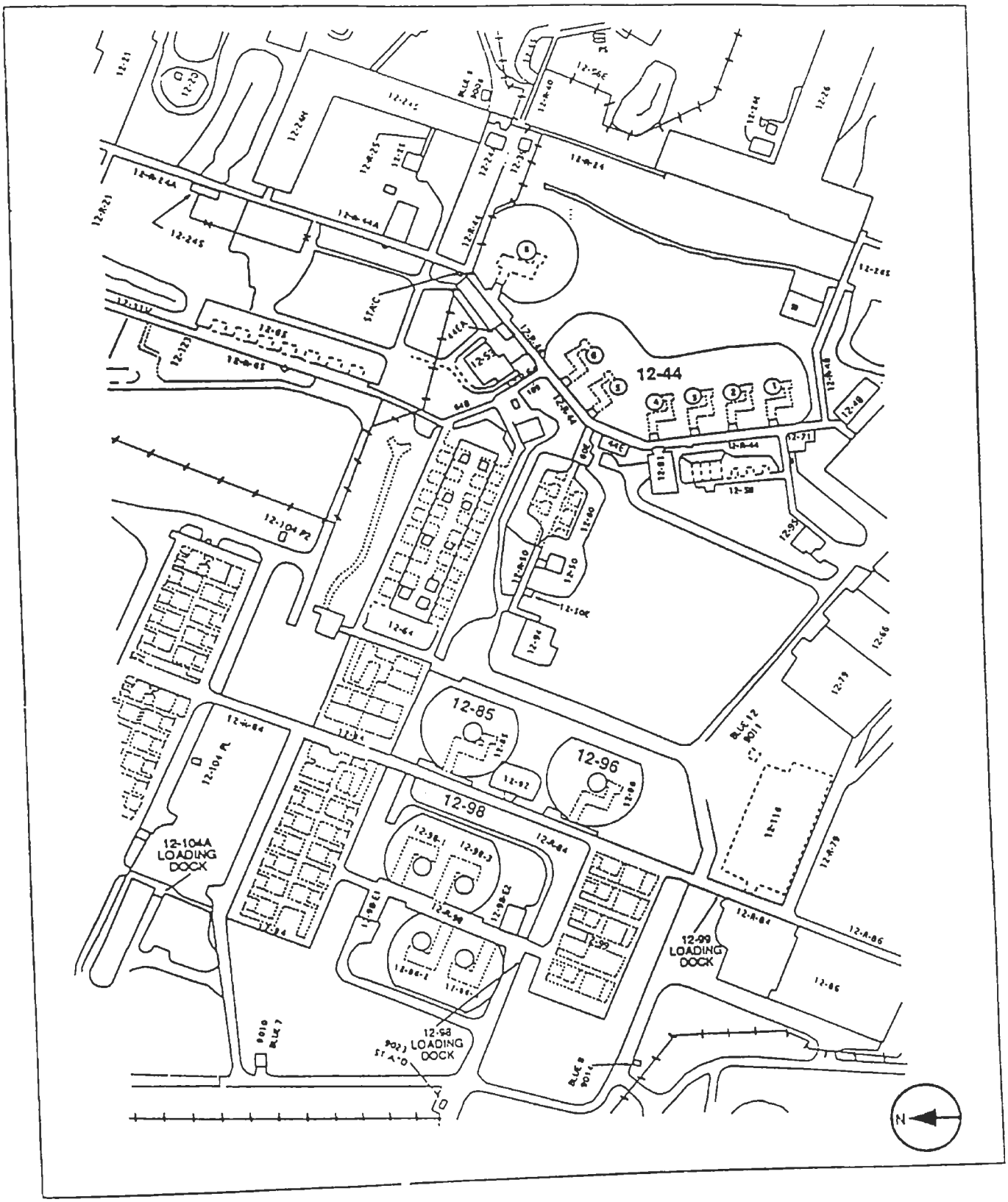
Winds/tornado debris could cause the breach of the facility structure.

Aircraft Crash:

An aircraft crash could cause the breach of the facility structure.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-44 (Cells 2 - 6), 12-85, 12-96, 12-98 (Cells 1, 2, and 3). PARTITIONED AREA: Current Facility
Question 5: What are potential effects from the causes identified?	
Potential Effects	
Facility ☒ Fire ☒ Explosion ☐ Contamination ☒ Criticality ☐ Leakage/Spills ☐ Other Accidents (specify) ☐ Structural Failure ☒ Equipment Failure ☐ Material Release ☐ Increased Radioactivity Level ☐ Other (specify) Material ☐ Criticality ☐ Material Release ☐ Breach of Packaging ☐ Fire ☐ Other (specify)	External ☐ Loss of Site Integrity ☒ Loss of Building Integrity ☐ Release of Materials ☐ Radiation and Releases from Criticality

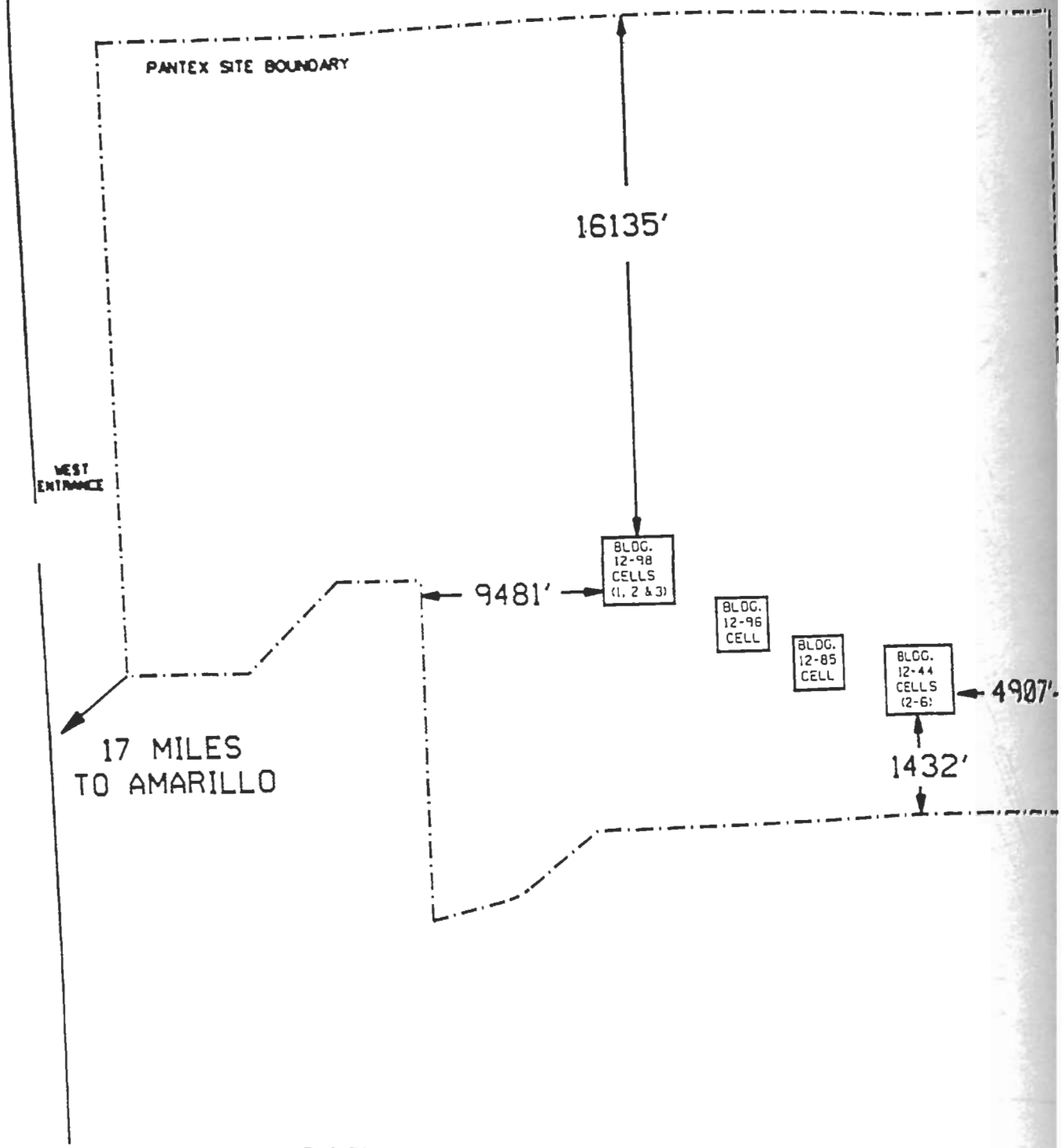
PANTEX PLANT



Location of Cell Facilities in Zone 12

Attachment "Cells - 1"

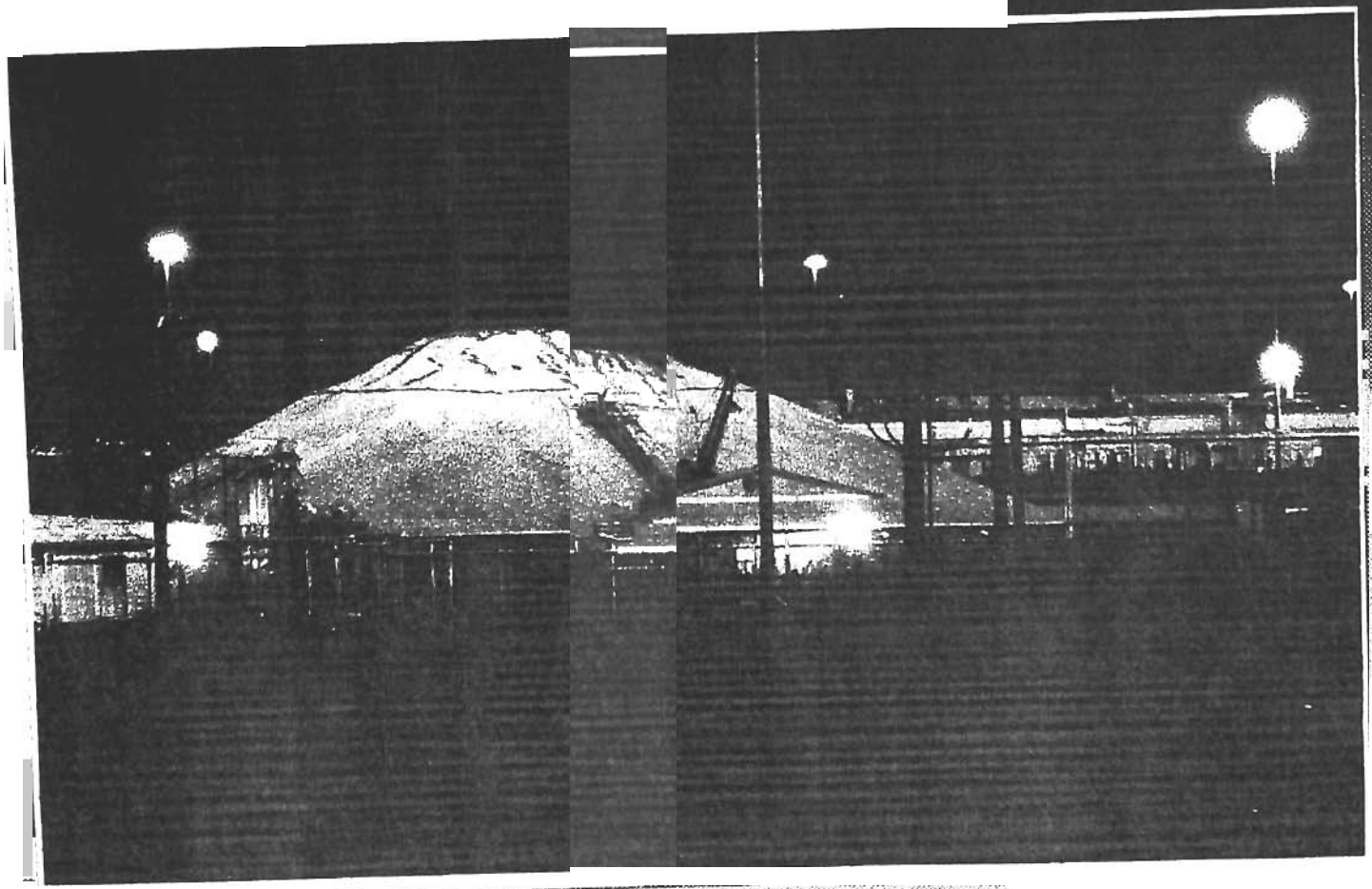
PANTEX PLANT
HEU FACILITY LOCATION SKETCH

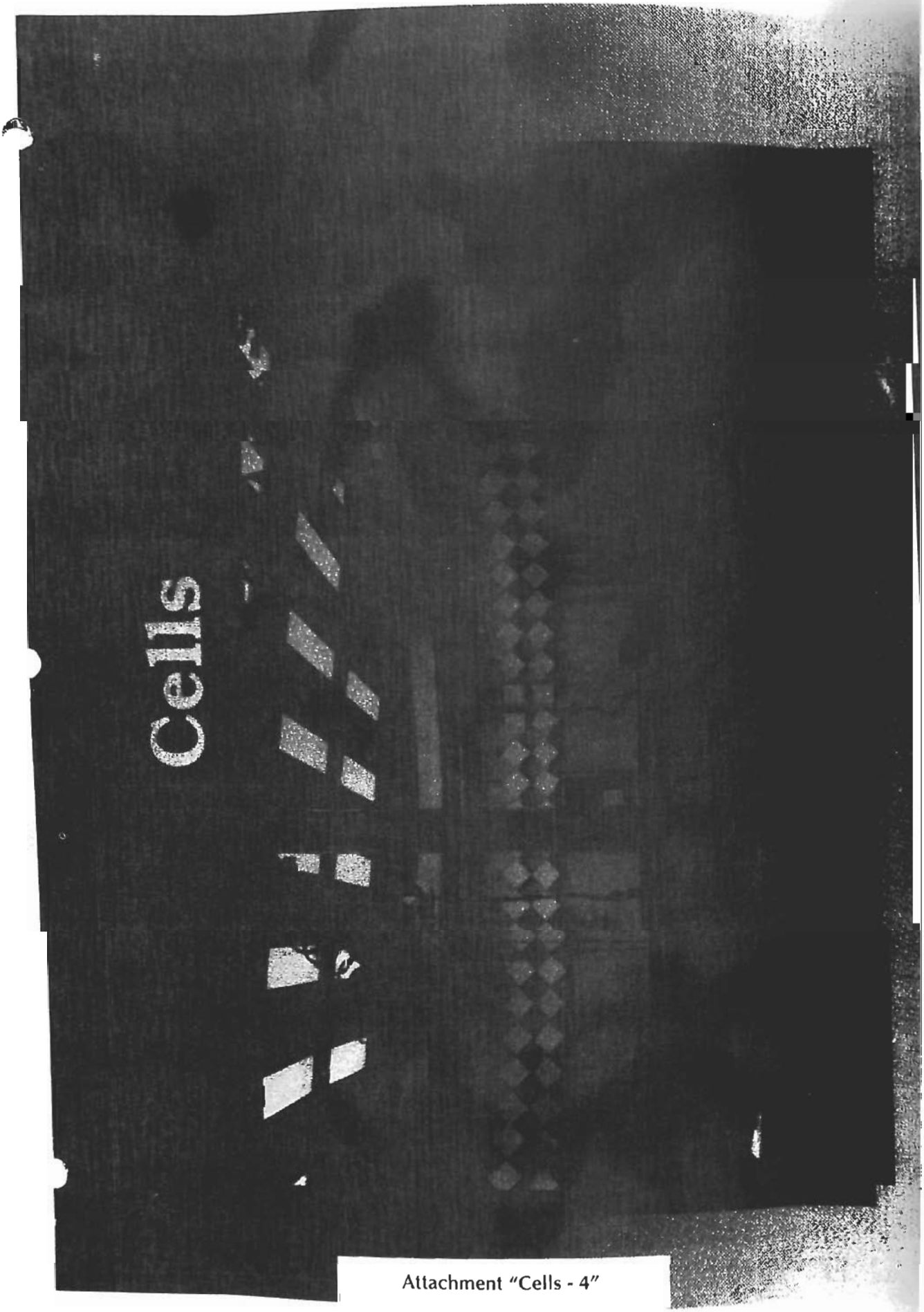


BUILDINGS 12-44, 12-85, 12-96 & 12-98

Attachment "Cells - 2"

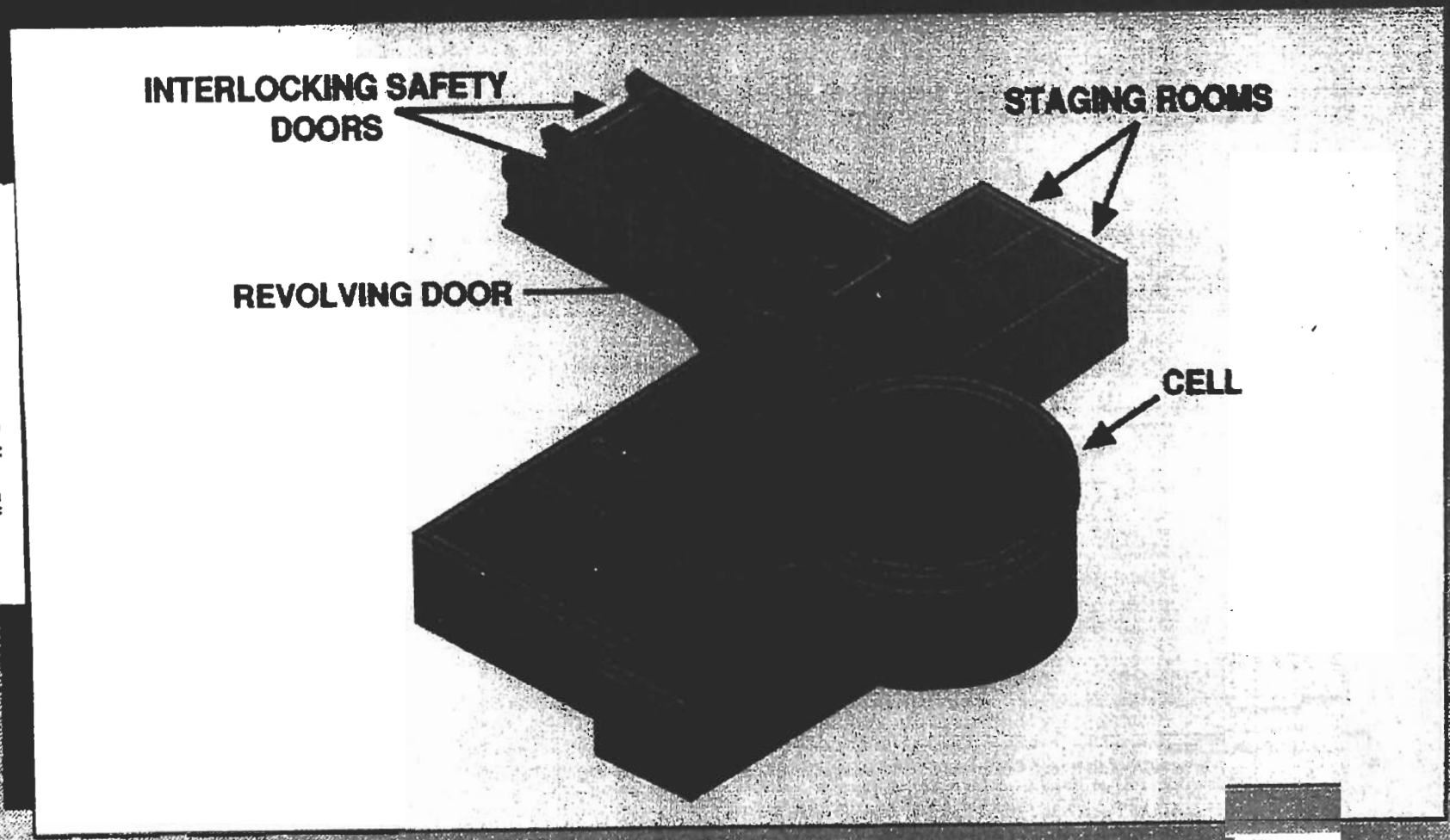
bly Cell
e)





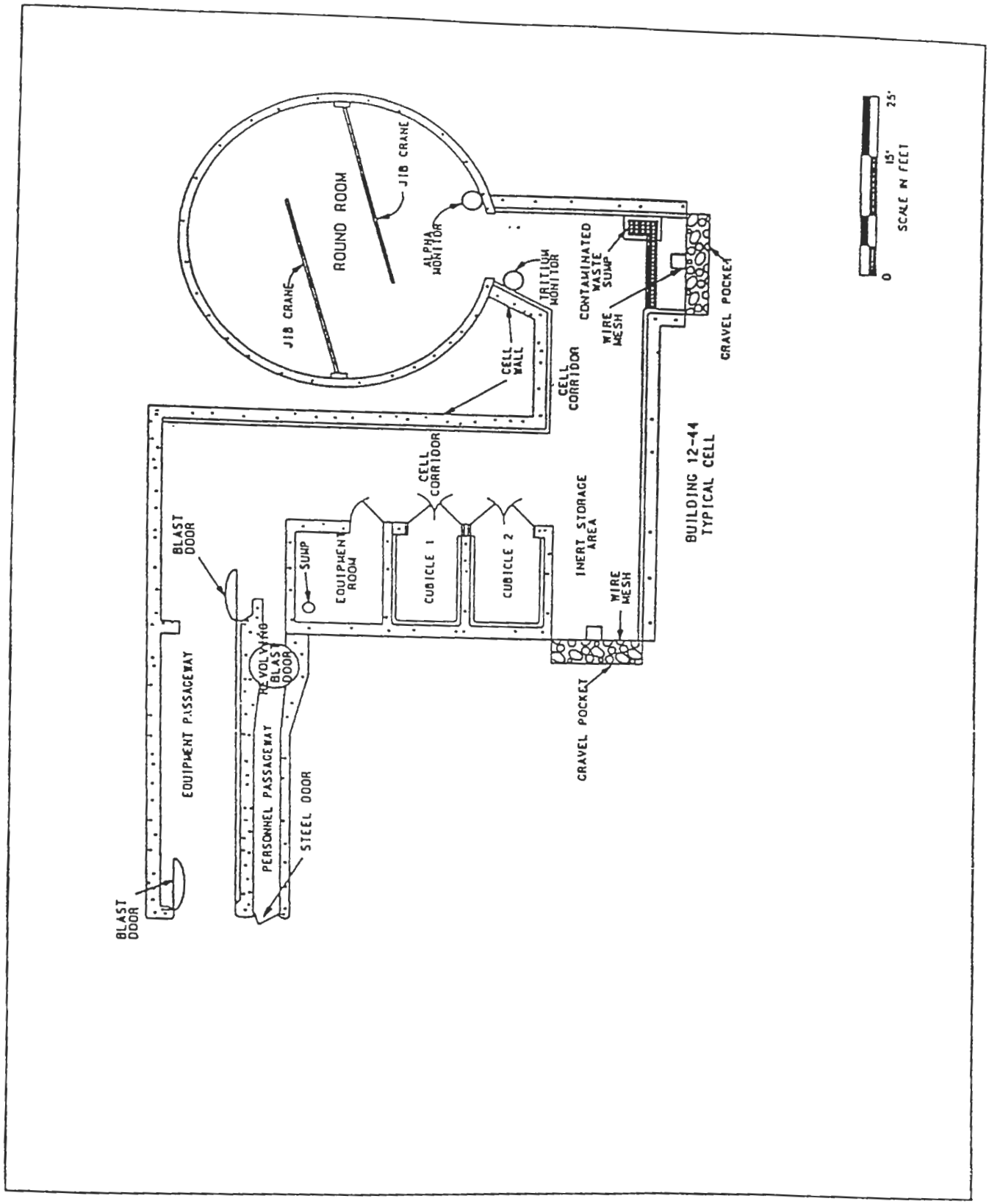
Attachment "Cells - 4"

Cells



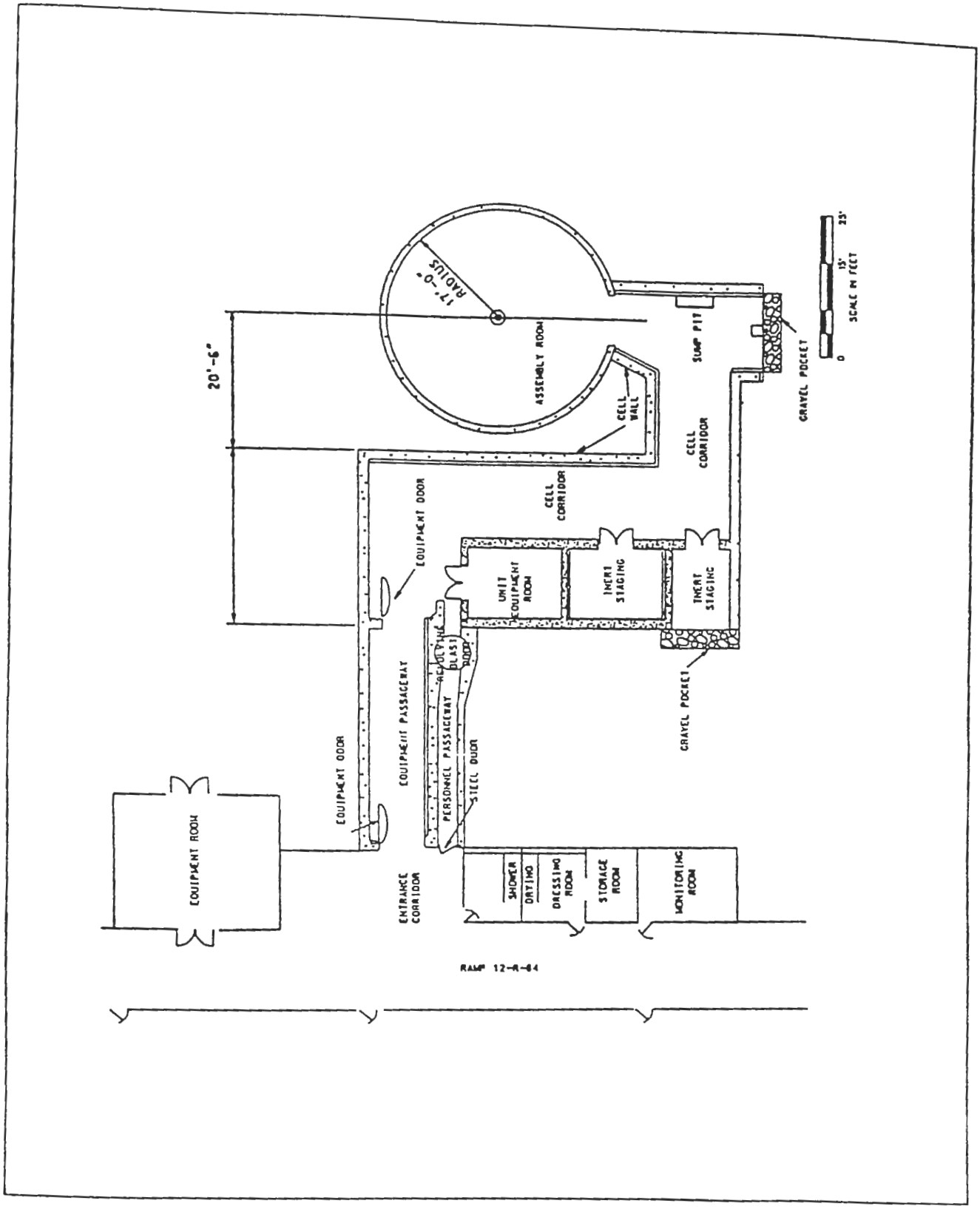
PANTEX - Typical cell layout

Attachment "Cells - 5"



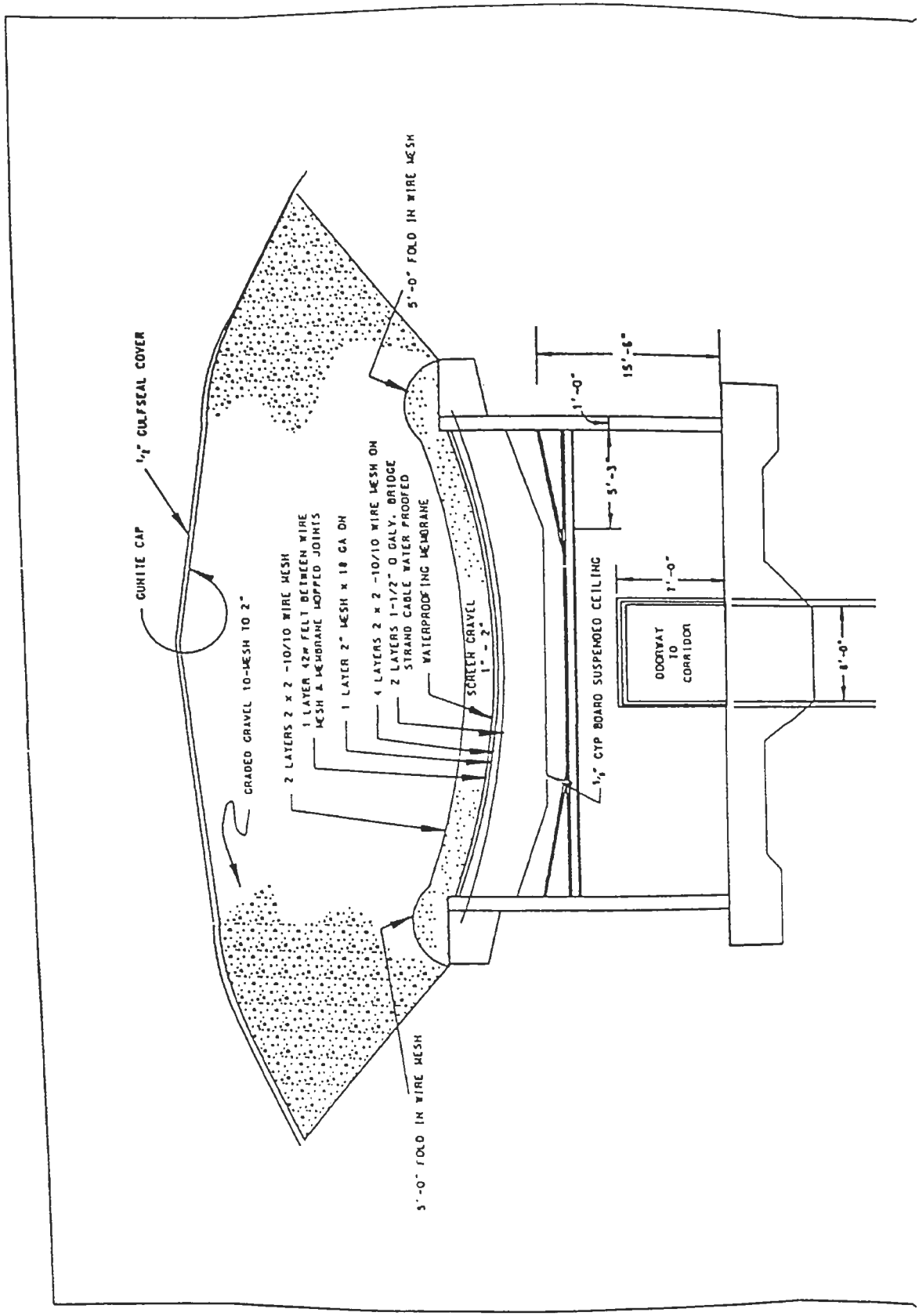
Floor Plan for Building 12-44

Attachment "Cells - 6"



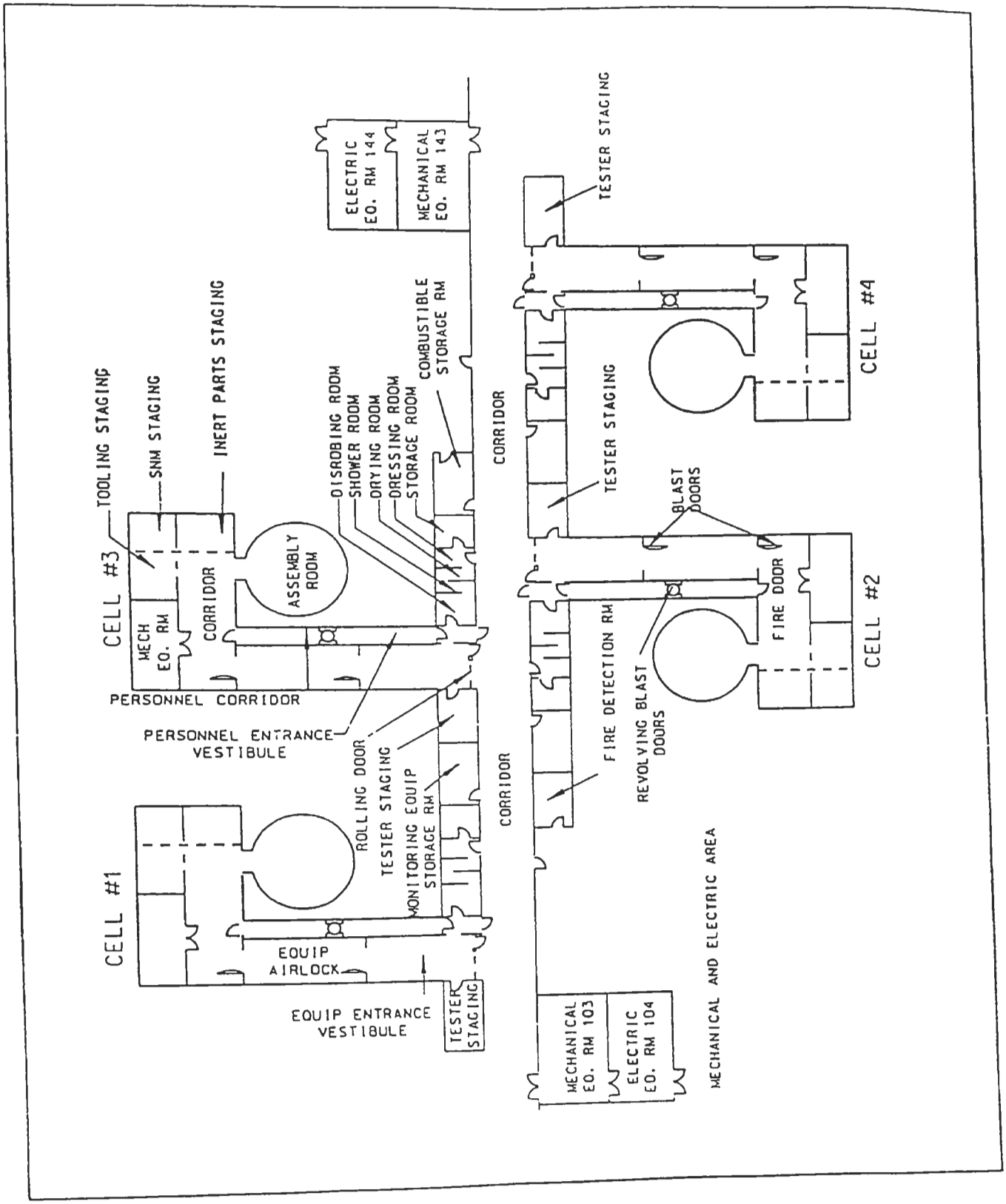
Floor Plan for Buildings 12-85 and 12-96

Attachment "Cells - 8"



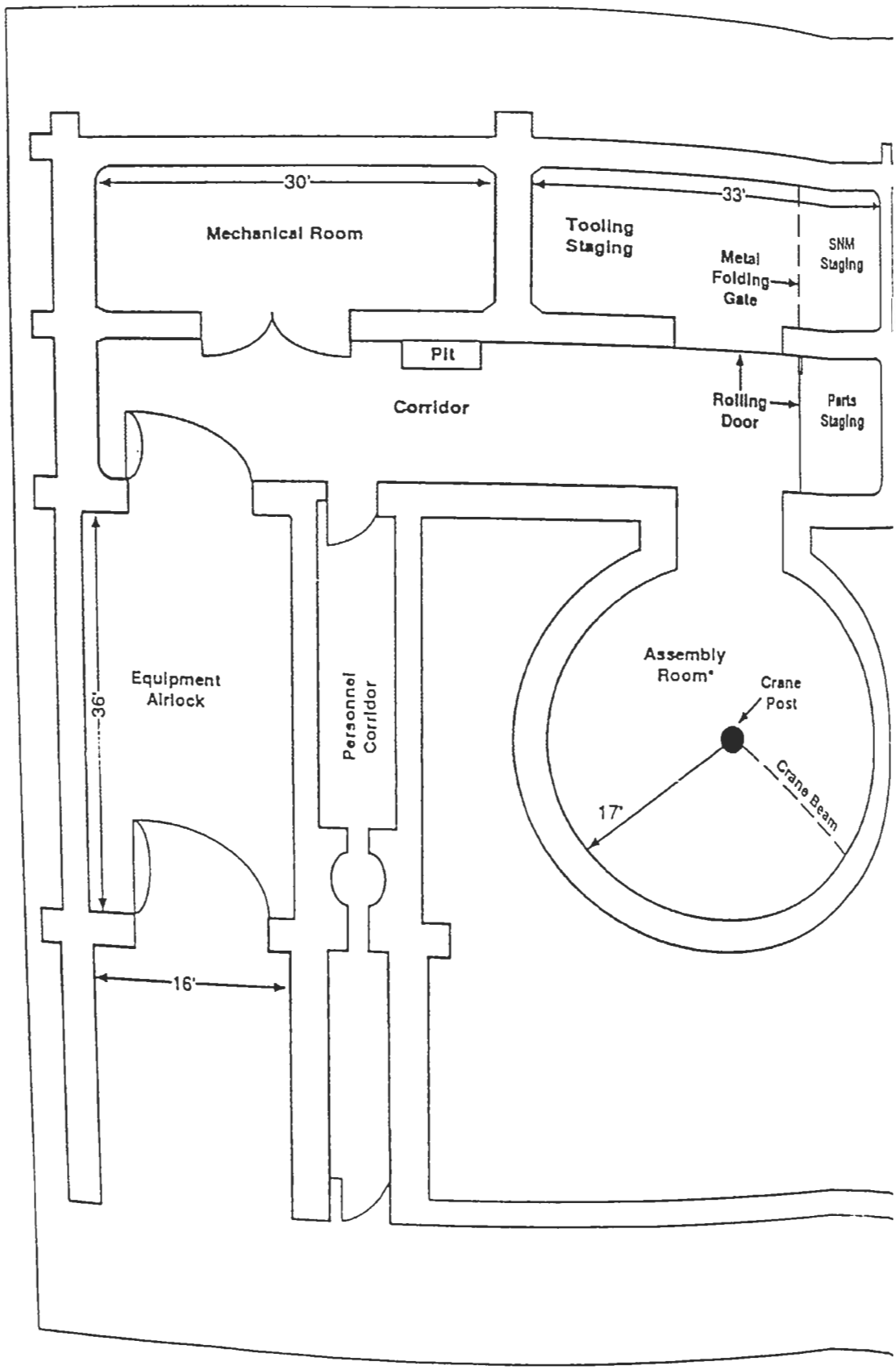
Elevations and Sections for Buildings 12-85 and 12-96

Attachment "Cells - 9"



Floor Plan for Building 12-98

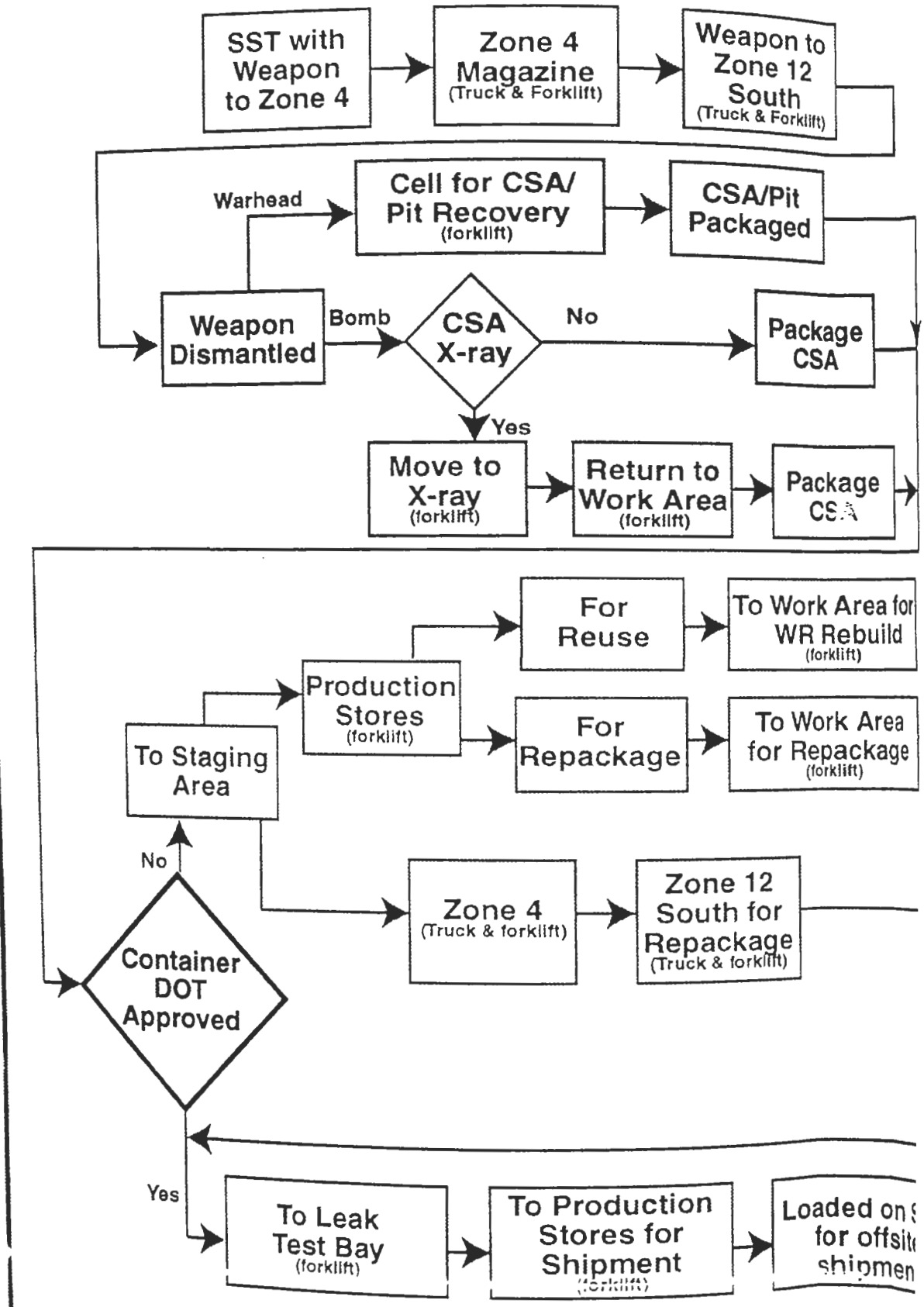
Attachment "Cells - 10"



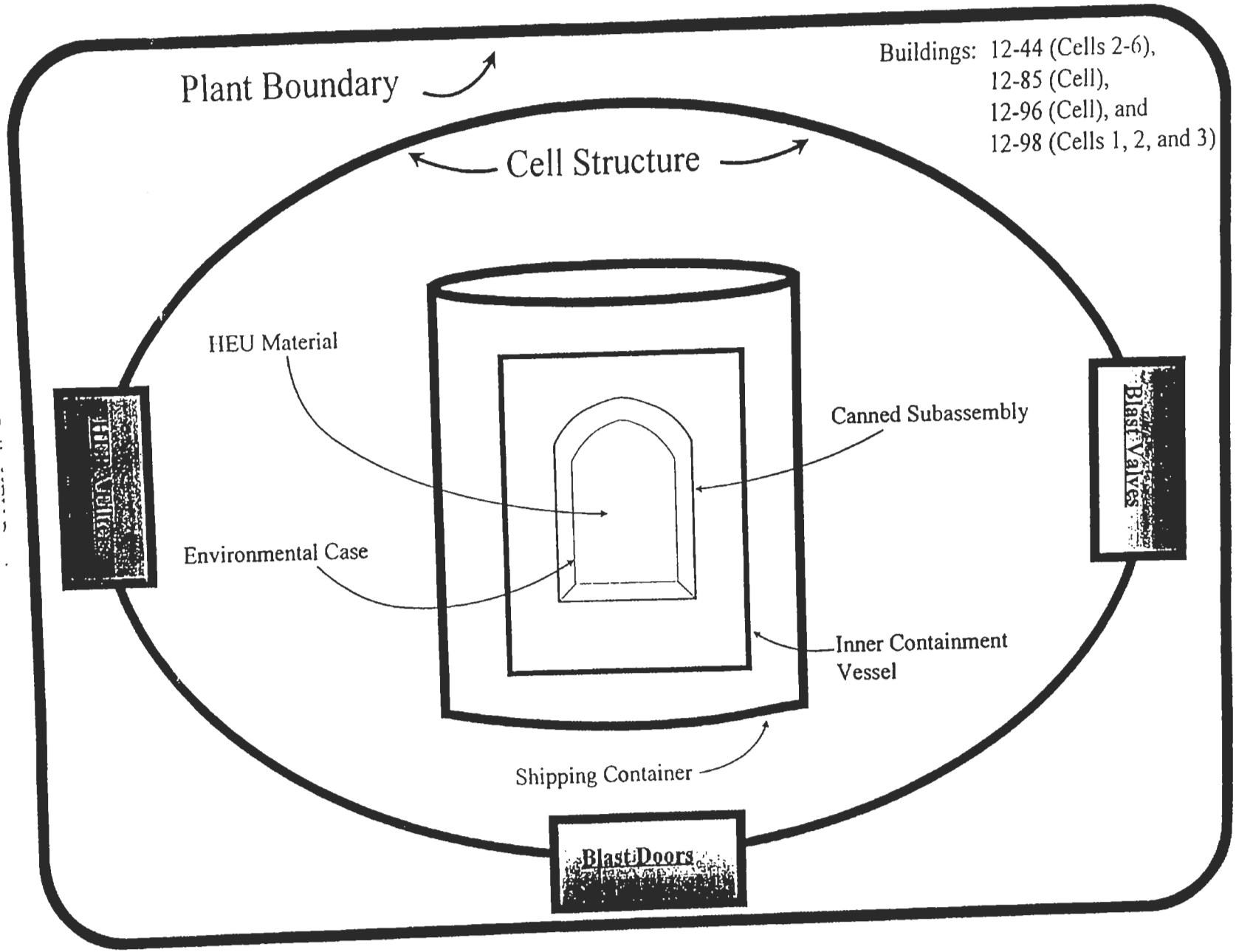
Assembly Cell Floor Plan in Building 12-98

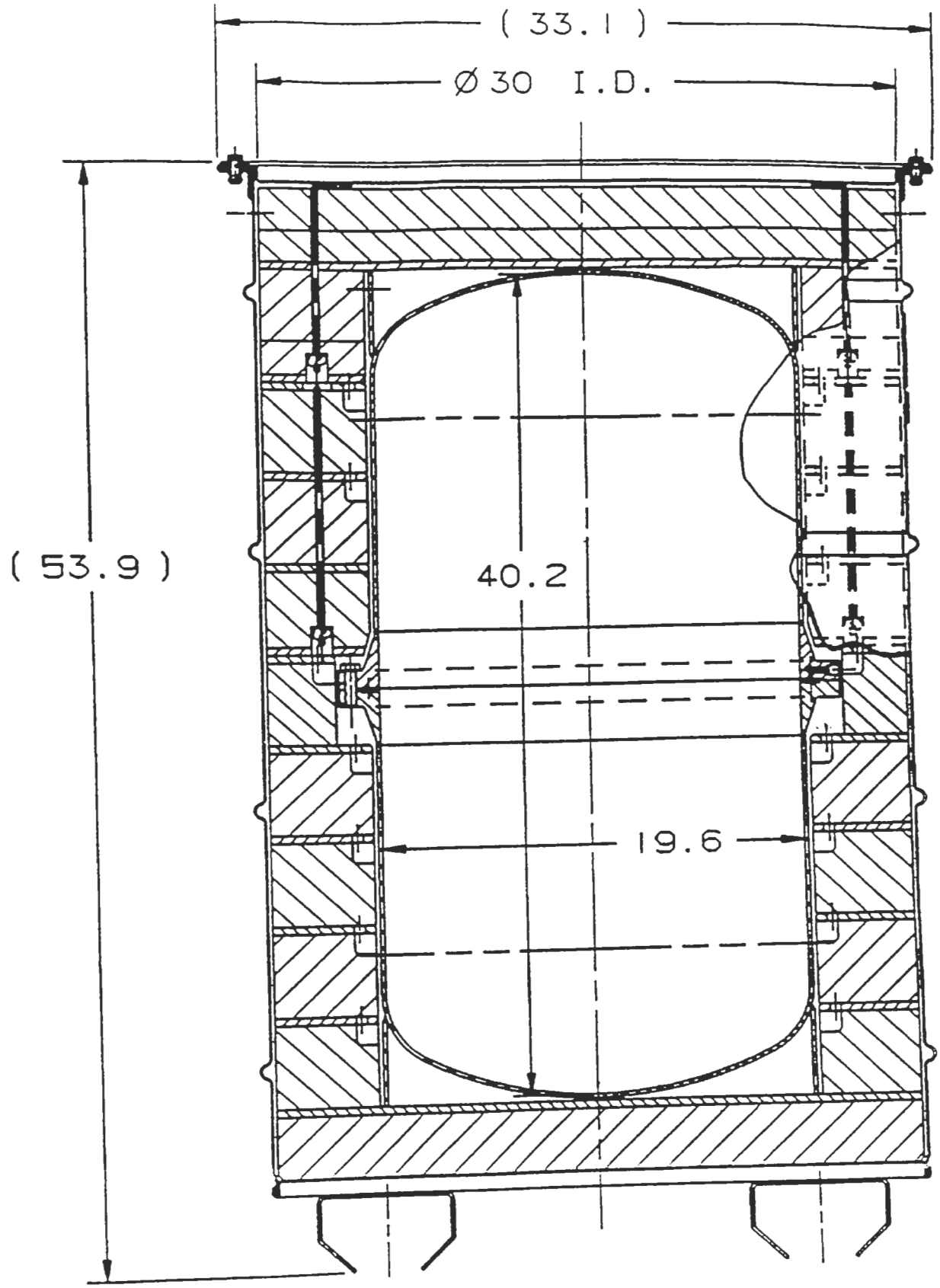
Attachment "Cells - 11"

PANTEX PLANT HEU MOVEMENTS



BARRIERS (WORKER, PUBLIC & ENVIRONMENT)

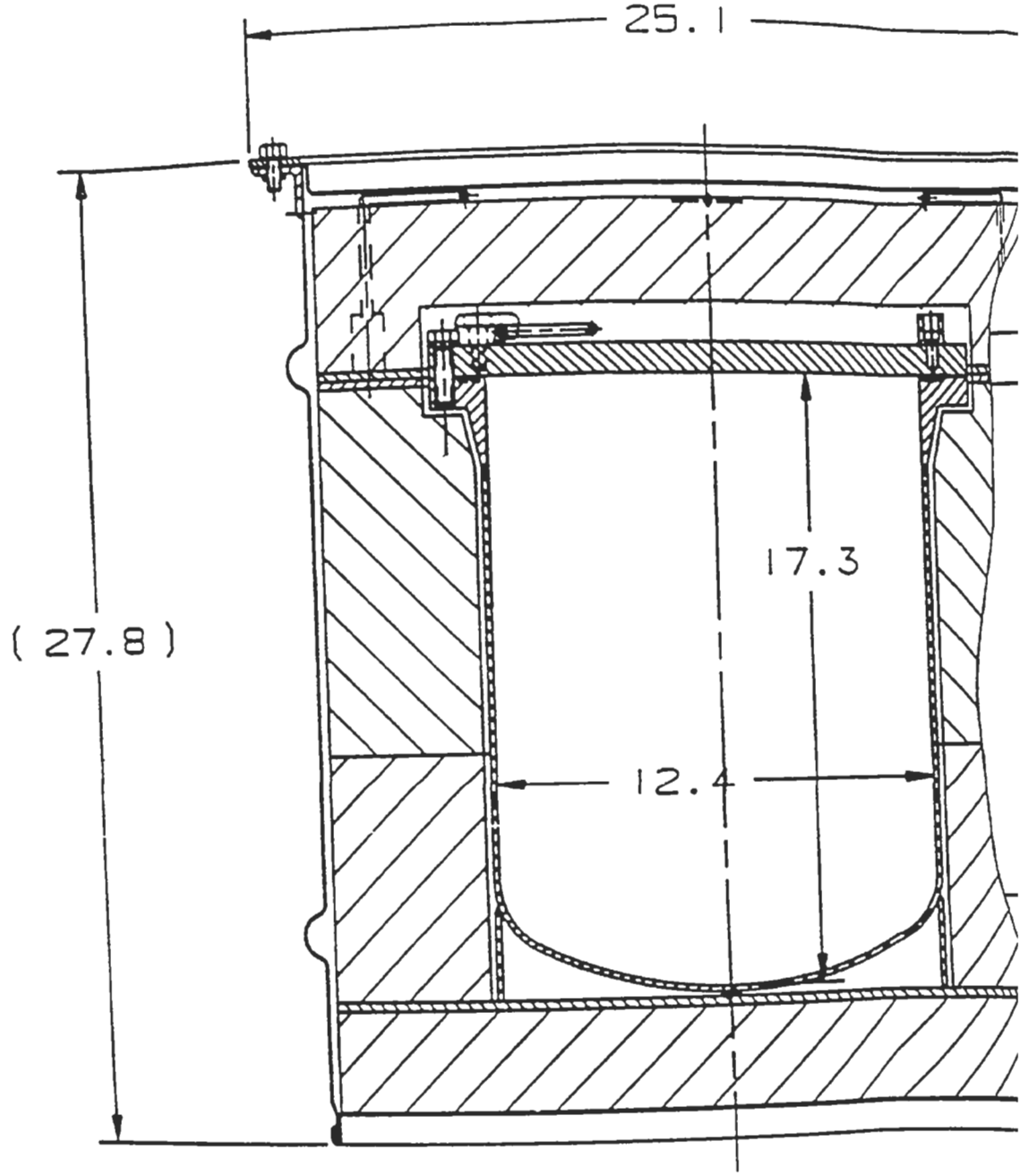




DT20

MAX GROSS WEIGHT 1084 LB

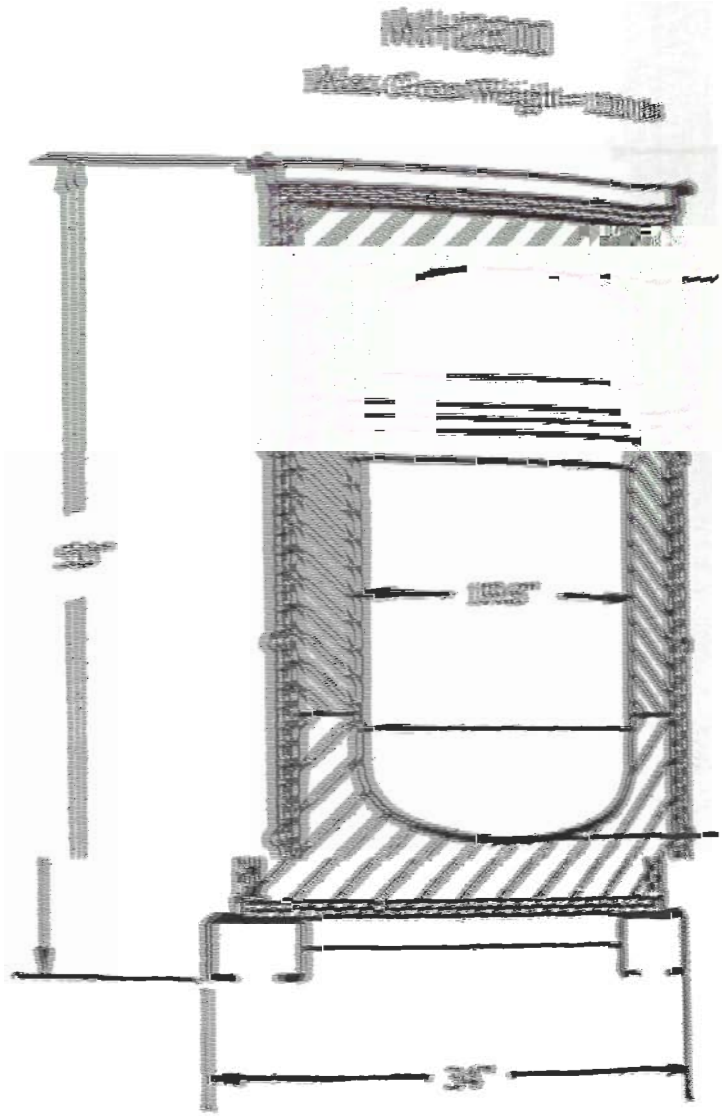
Attachment "Cells - 16"



DT22

MAX GROSS WEIGHT 385 l

Attachment "Cells - 17"


34"

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4 - 16), 12-84 (Bays 1 - 20), 12-99 (Bays 1, 3, 5, 7, and 8), 12-104 (Bays 1 - 16)
	FUNCTION: Bays

DOE HEADQUARTERS FACILITY LANDLORD DOE/DP-1

DOE HEADQUARTERS PROGRAM SPONSOR DOE/DP-24

FACILITY AGE 8-26 years DESIGN LIFE 53-58 years

Question 1: What facilities are used for processing, handling, and storing HEU?

Summary description of the facility:

- The location of the facility on the site and the distance to the site boundary.

  Buildings 12-64, 12-84, 12-99 and 12-104 are part of the production area of Zone 12 and are located inside the Material Access Area (MAA). The location of the buildings within Zone 12 and distances relative to the Plant perimeter are shown in Attachment "Bays - 1" and "Bays - 2." The distances from these facilities to the nearest site boundaries are approximately 5105 feet to the east-site boundary; 1,711 feet to the south-site boundary; 9,450 feet to the west-site boundary; and 15,547 feet to the north-site boundary.

- The design mission, interim mission, current use, and operational status.

  These buildings are designed for nuclear explosives assembly, disassembly, examination, testing, and interim storage or staging of nuclear explosives, and major nuclear explosive components. An internal view of a typical bay is shown in Attachment "Bays - 3." Highly enriched uranium (HEU) can be present in the form of pits and Canned Sub-assemblies (CSAs). Cased high explosives (HE) and insensitive high explosives (IHE) may also be present in the buildings.

- Operational Status.

  Currently in use.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4 - 16), 12-84 (Bays 1 - 20), 12-99 (Bays 1, 3, 5, 7, and 8), 12-104 (Bays 1 - 16)
	FUNCTION: Bays

Historical Information, Continued:

Completed Unreviewed Safety Question Determinations:

PX-USQD-94-28	Building 12-84, Laser Welding, 6/30/94
PX-USQD-94-30	Building 12-84, W48 Mechanical Retirement Disassembly with Possible Cracked Pit, 6/22/94
PX-USQD-94-31	Building 12-84, Replacement of Nickel Cadmium Battery with Lead Acid, 9/09/94
PX-USQD-94-32	Building 12-84, Replacement of Nickel Cadmium Battery with Lead Acid, 10/12/94
PX-USQD-94-33	Building 12-84, Portable Battery Backup System for Inverter, 6/22/94
PX-USQD-94-39	Building 12-84, Bay 14 Fire Protection New Information, 7/06/94
PX-USQD-94-42	Building 12-99, Replacement of the UPS Nickel Batteries W/Lead Acid Batteries, 3/21/95
PX-USQD-94-46	Buildings 12-84 and 12-96, Task Exhaust Velocity Buildings 12-85/96,-99,-84,-98, 6/30/94
PX-USQD-94-53	Building 12-84, Emergency Generator Fuel Tank, 10/27/94
PX-USQD-94-55	Building 12-84, UPS Does Not Supply Fire System, 4/13/95
PX-USQD-94-56	Building 12-84, Bay 18 Laser Welder, 7/11/95
PX-USQD-94-58	Building 12-84, Installation of Nitrogen Gas System, 3/09/95
PX-USQD-94-60	Building 12-84, RAMS Lighting Modification, 11/10/94
PX-USQD-94-71	Building 12-84, Portable Battery Backup System for Inverter, Supplemental, 10/18/94
PX-USQD-94-72	Building 12-84, Removal of Diesel Generator Underground Storage Tank, 2/23/95
PX-USQD-94-74	Building 12-104, B53, Movement into the Bay, 11/01/94
PX-USQD-94-75	Building 12-84, Additional Power Supply, 4/24/95
PX-USQD-94-84	Building 12-84, Fire Suppression System Redesign, 12/23/94

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4 - 16), 12-84 (Bays 1 - 20), 12-99 (Bays 1, 3, 5, 7, and 8), 12-104 (Bays 1 - 16)
	FUNCTION: Bays

Historical Information, Continued:

Pending Unreviewed Safety Question Determinations:

PX-USQD-94-48	Building 12-84, Vacuum Pumps installed in Equipment Rooms
PX-USQD-94-49	Building 12-84, Vacuum Station in Bay 8
PX-USQD-94-50	Building 12-84, Fire Detection and Alarm System Emergency Power
PX-USQD-94-61	Building 12-104, Alpha Cam Change
PX-USQD-95-49	Building 12-99, Removal of Tritium and Task Exhaust Interlocks
PX-USQD-95-50	Building 12-99, Fire Alarm / BDI - Remove Tritium Monitor BDI
PX-USQD-95-32	Building 12-64, Hoist Replacement
PX-USQD-95-47	Building 12-84, Install Time Delay Relays in HVAC Circuits
PX-USQD-96-2	Building 12-64, Weapons Staging for the W79, W69, and W55 Programs
PX-USQD-96-14	Building 12-64, Installation and use of a J. L. Shepherd Model 81 Gamma CAU

DNFSB Concerns:

DNFSB Recommendation 95-2 (10/11/95): Standards/Requirements Implementation Documents (S/RIDS).

NOTE: This DNFSB recommendation concerns the entire DOE complex. S/RIDS are currently under development at the Pantex Plant.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1 and 4 – 16), 12-84 (Bays 1 – 20), 12-99 (Bays 1, 3, 5, 7, and 8), 12-104 (Bays 1 – 16)
	FUNCTION: Bays

- The authorization basis:
  - Basis for Interim Operation (BIO) for Pantex Plant, Amarillo, Texas, Rev. 3, Errata B, March 1996
  - Critical Safety Systems Manual (CSSM), MNL 1101, Rev. 3C, December 1995
  - Final Safety Analysis Reports Building 12-64, Draft, March 1996; Building 12-84, March 1984; Building 12-99, February 1988; Building 12-104, January 1989
  - Final Environmental Impact Statement, Pantex Plant Site DOE/EIS-0098, October 1983
  - Input Documents for the Nuclear Explosive Master Studies, 1993
  - Nuclear Explosive Safety Master Studies, 1993

  Other Pertinent ES & H Documentation:

  - DOE Order 5480.22 and 5480.23 Implementation Plan, June 1995
  - Pantex Plant FY 1996 CAMP Report, Capital Asset Management Process, April 1994
  - Technical Manual Nuclear Safety Criteria (Title 11, Report SRD), DOE-DNA-TP20-7, September 19[illegible] (as amended)

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4 - 16), 12-84 (Bays 1 - 20), 12-99 (Bays 1, 3, 5, 7, and 8), 12-104 (Bays 1 - 16)
	FUNCTION: Bays

- Amounts and locations of hazardous materials collocated or commingled with HEU.

  The HEU in the bays is in Canned Sub-assemblies (CSAs), pits, and approved containers. The amount of HEU in each bay is contingent upon the nuclear explosive undergoing dismantlement, or the particular nuclear explosive systems components that are staged. The limit is dependent upon the number of containers that can physically fit within the footprint of the facility. The quantities of staged HEU is administratively controlled to 3,000 kg. per bay. For quantities of HEU currently staged in the buildings see Appendix E of this document.

  In addition there are many different types of hazardous and radioactive materials that are part of the nuclear explosive assemblies and nuclear explosive components. Plutonium, thorium, uranium, tritium, beryllium, lithium deuteride, and high explosive (HE) or insensitive high explosive (IHE) materials are the primary types of hazardous materials that could be located in the bays. Significantly smaller quantities of other hazardous materials associated with nuclear explosive assemblies and components (for example, cured epoxies, heavy metals, encapsulant material) are also present. All materials are contained within finished, sealed assemblies, steel drums, or wooden and steel boxes. The quantity of hazardous material present throughout the bays can vary significantly depending on the level of activity at the Plant and the current mix of nuclear explosive assemblies and components.

  Small quantities of flammable solvents and cleaners are used in areas where HEU is staged. These solvents include alcohol, acetone, thinner, adhesives, lubricants and hydraulic fluids. The maximum quantity of these materials are controlled to be consistent with good house keeping practices and the need to minimize thermal energy sources. When not in use, the materials must be stored in an approved storage cabinet.

  Under controlled conditions, highly enriched uranium is also staged in areas along with cased high explosives or insensitive high explosives. Under these conditions the quantity of explosives is administratively controlled to be consistent with explosive safety criteria and the design basis accident assumptions used to determine the consequences of the explosive dispersal of HEU.

- Process material transfers within the facility.

  Within each bay, the transfer of components is accomplished using hoists and hand carts. The transfer operation is conducted using approved procedures, and trained, skilled technicians. All items placed into and retrieved from the bays are transferred either manually or with the aid of electric forklifts.

- On-site transportation and its interfaces with the facility or partitioned area.

  Attachment "Bays - 18" illustrates the flow of nuclear explosives and components containing HEU into and out of Zone 4 and Zone 12. Details of on-site transportation are provided in the "Transportation Question Set."

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4 - 16), 12-84 (Bays 1 - 20), 12-99 (Bays 1, 3, 5, 7, and 8), 12-104 (Bays 1 - 16)
	FUNCTION: Bays

- Staffing levels and staff experience (in years).

	Number of Employees	Average Facility Experience	Experience Range
Transportation			
Supervisory	100	12	2 - 38
Operators	298	11	1 - 38
Crafts			
Craft Supervisors	35	20	1 - 30
Craft Personnel	220	22	1 - 35
Craft Technical	32	19	1 - 30

NOTE: Maintenance members reflect a pool of personnel available to be assigned to perform maintenance in Zone 12.

References:

- Basis for Interim Operation for Pantex Plant, Amarillo, Texas, Rev. 3, Errata B, March 1996
- Critical Safety Systems Manual (CSSM), MNL 1101, Rev. 3C, December 1, 1995
- Department of Energy Plutonium ES&H Vulnerability Assessment, Pantex Site Assessment Team Report, July 29, 1994
- Final Safety Analysis Report, Building 12-84, March 1984
- Final Safety Analysis Report, Building 12-99, February 1988
- Final Safety Analysis Report, Building 12-104, January 1989
- Input Document General Use Nuclear Explosive Processing Facilities Master Study, 1993
- Nuclear Explosive Safety Studies, 1993

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4-16); 12-84 (Bays 1 - 20); 12-99 (Bays 1,3,5, 7, and 8); 12-104 (Bays 1-16) FUNCTION: Bays

Question 2: What barriers are used to protect workers, the public and environment from HEU?

Barrier Types

Worker Barrier	Public/Environmental Barrier	Criticality	Administrative Barrier
☐ Gloveboxes	☒ Facility/Building Boundary	☐ Containers	☒ Procedures: Operation, Maintenance
☐ Transfer System	☐ HVAC/Confinement	☐ Physical Dividers	☒ Material Limits
☐ Duct	☐ Liquid Containment/Dike	☐ Poisons	☒ Monitoring
☒ Filter	☒ Bays, Cells, Magazines	☐ Concentration Control	☒ Configuration Contro
☐ Vault	☐ Canyons	☐ Stirrers	☐ Quality Assurance
☐ Room	☐ Pads	☐ Volume Control	☒ Conduct of Operations
☐ Hot Cell/Canyon	☒ Site Boundary	☐ Double Contingency	☒ Authorization Basis
☐ Hood	☐ Trenches	☒ Other (listed below)	☒ Training
☐ Piping	☐ Storage Vault		☒ Organization
☐ Shielding	☒ Fire Suppression		☒ Lessons Learned
☐ Distance	☐ Alarm System		☐ Testing
☐ Respiratory Protection	☒ Other (listed below)		☐ Trending
☒ Protective Clothing			☐ Records
☐ Remote Handling			☒ Standards
☐ Confinement System			☐ External Regulatio
☐ Burial Ground			☒ Surveillance
☐ Tanks			☒ Personnel Reliabil Assurance Progra
☒ Alarm System			☒ Worker Access/ Occupancy Limit
☐ Temporary Barriers			☒ Emergency Resp
☒ Other (listed below)			☐ Other (specify)
☐ None			

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4-16); 12-84 (Bays 1 - 20); 12-99 (Bays 1,3,5, 7, and 8); 12-104 (Bays 1-16)
	FUNCTION: Bays

Other Worker Barriers:

Ventilation RAMS Interlock
Fire Suppression System
Uninterruptible Power Supply
Facility Construction/Blast Design
Blast Door Interlocks
Communications
Emergency Lights
Diesel Generator
Task Exhaust
Zone Access Control

Other Public And Environmental Barriers:

Zone Access Control

Note: A diagram showing Worker, Public, and Environment barriers is shown in Attachment "Bays - 19."

Worker Barriers:

HEPA Filters (intake and exhaust): (Except for 12-64)

Provide clean environment within facilities suitable for weapons quality work. The filters also provide limited defense-in-depth protection for personnel by mitigating the potential release of plutonium, and uranium, to the environment, through the ventilation duct work in the event of an operational accident. Supplemental accident analyses have been conducted for Building 12-64 concerning credible accidents resulting in the release of plutonium and uranium into bays (Reference; The Pantex Plant approved Critical Safety Systems Manual). The off-site consequences of these releases are negligible, therefore, HEPA filters are not required on the exhaust.

Protective Clothing:

Appropriate protective clothing is used to protect the worker from radioactive and hazardous substance contamination.

Alpha Alarm System :

Provides warning to personnel to allow prompt evacuation, in the event of release of release of radioactive materials.

Beta Alarm System :

Provides warning to personnel to allow prompt evacuation, in the event of an accidental release of radioactive materials.

SITE: Pants

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4-16); 12-84 (Bays 1 - 20); 12-99 (Bays 1,3,5, 7, and 8); 12-104 (Bays 1-16)
	FUNCTION: Bays

Worker Barriers, Continued:

Blast Door Interlocks (BDI):

Except for Building 12-64, the BDI System for the bays assures that at least one set of blast doors is closed at all times to mitigate the effect of a blast wave, a blast fragment from an external explosion, the impact of wind borne missiles, and the pressure effect of a tornado. For 12-64, the high explosive limit has been reduced to ensure the over pressure in the adjacent bays will be less than 15 psi.

Communications (Telephone and PA):

The basis for this system is to be able to notify personnel in the facility of an external explosion, earthquake, tornado, fire, or a release of radioactive materials that may require certain types of actions inside the facility or for a means of communicating with personnel.

Emergency Lights:

To provide the required illumination automatically in the event of any interruption of normal lighting. This lighting will allow safe shutdown of operations in and egress from the affected facility in the event of a loss of power.

Diesel Generator:

The diesel generator for the Auxiliary Power System will supply electrical power to a facility's uninterruptible power supply (UPS) in the event of a long term electrical power failure. The diesel generator is not relied upon to place the facility in a safe and stable configuration.

Task Exhaust: (Buildings 12-84, 12-99, and 12-104)

The task exhaust provides localized exhaust for the control of non-radioactive hazardous materials, toxic vapors, dust, or flammable solvents to prevent health hazards to personnel.

Zone Access Control:

Zone access control is maintained by zone security fences, security guards (gate access control), and security intrusion systems.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4-16); 12-84 (Bays 1 - 20); 12-9 (Bays 1,3,5, 7, and 8); 12-104 (Bays 1-16)
	FUNCTION: Bays

Public/Environmental Barriers:

Facility/Building Boundary:

The building structure for each of the four buildings is a safety-class structure. The bays in these buildings were designed as nuclear explosive facilities with the capability to process cased explosives and insensitive high explosive (IHE) with nuclear explosive components that contain plutonium and highly enriched uranium (HEU). The basis for the facility structure is to provide a significant barrier that prevents many types of accidents external to the structure and those caused by natural phenomena (e.g., earthquakes, tornados, external blasts, external fires, missiles, and credible aircraft crashes) from damaging the facility, and subsequently the facility's contents, and from releasing hazardous materials.

The design of Buildings 12-64, 12-99, and 12-104 incorporate a "separated bay" concept. In these buildings, the bays are approximately rectangular in shape and have reinforced concrete walls (1 1/2 ft) th are separated by more than 13 ft of earth or sand fill. In contrast, the bays in Building 12-84 are not separated by earth-fill, but have reinforced concrete walls (4 1/2 ft thick). Both approaches are effective protecting personnel from an explosion in a neighboring bay. The roofs of the bays are designed to relie the pressure load in the event of accidental explosives detonation in the bay.

Bays, Cells, Magazines:

Structure:

The entrance way to the bays is provided with blast-resistant doors at each end of the entrance passagev The blast doors are designed to ensure that personnel in occupied areas will not be exposed to maximu effective over-pressures from an adjacent bay explosion greater than 15 psig. An over-pressure of 15 p is an Explosive Safety Manual Class II Criterion limit (typically provided for workers in occupied area

All penetrations are sealed by an approved method to maintain confinement integrity.

Blast Door Interlocks:

Except for Building 12-64, a blast door interlock system serves to ensure that at least one set of blast is closed at all times to mitigate the impact of wind-borne missiles and the pressure effects of a torna an accidental high explosive (HE) detonation. For 12-64, the high explosive limit has been reduced ensure that the over pressure in the adjacent bays will be less than 15 psi.

Fire Suppression:

The basis for the fire suppression system (water delivery, heat detectors, normal power and fire pro batteries) is to detect and extinguish a fire that could potentially lead to an HE detonation. The fire suppression system, when actuated, will minimize the spread of a fire in order to give the Pantex F Department increased response time to the facility.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4-16); 12-84 (Bays 1 - 20); 12-99 (Bays 1,3,5, 7, and 8); 12-104 (Bays 1-16)
	FUNCTION: Bays

Public/Environmental Barriers, Continued:

Site Boundary:

The nearest major population area is Amarillo, Texas, which is located 17 miles Southwest of the Pantex site boundary. Within the perimeter of the site boundaries, the buildings with bays are located approximately 15,547 feet from the north-site boundary; 5,105 feet from the east-site boundary; 1,711 feet from the south-site boundary; and 9,450 feet from the west-site boundary.

Zone Access Control:

Zone access control is maintained by zone security fences, security guards (gate access control and guard towers) and security intrusion systems.

Criticality Barriers:

Criticality:

The Pantex Criticality Safety Program and Risk Management Department (RMD) personnel assure the double contingency principle is met by requiring that process designs incorporate sufficient factors of safety to require at least two unlikely, independent, and concurrent changes in process conditions must occur before a criticality accident is possible. Protection is required by either (1) the control of two independent process parameters; or (2) a system of multiple (at least two) controls on a single parameter. No single failure can result in a criticality accident. Administrative controls are in place to prevent submersion of HEU items in liquids, maintain planar array staging configurations for CSAs, and limit the mass of material not containerized at any time. The "Pantex Plant Criticality Safety Program Analysis" (U), February 28, 1996, Mason & Hanger RMD (secret restricted data document) demonstrates that a postulated critical excursion is not credible at the Pantex Plant.

Administrative Barriers:

Procedures: Operation, Maintenance:

Handling and movement of HEU and associated storage containers is performed in accordance with approved procedures.

Material Limits:

The material limits for these facilities are listed in the Basis for Interim Operation for the Pantex Plant (BIO) Table A-3, "Bays Administrative Limits." There are no specific limits on the quantity of CSA components that can be placed in the bays. However, there are limits on HEU when the bays are used strictly for staging operations.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4-16); 12-84 (Bays 1 - 20); 12-93 (Bays 1,3,5, 7, and 8); 12-104 (Bays 1-16)
	FUNCTION: Bays

Administrative Barriers, Continued:

Monitoring:

The overall performance of operations is monitored relative to the environment, safety, and productivity using performance indicators. These indicators track the trends and progress toward the goals and objectives of the Plant as established by the Plant General Manager, or as negotiated with DOE for Cost Plus Award Fees (CPAF) performance. These indicators serve as instruments in monitoring compliance with laws, regulations, and orders to ensure that organizations critically examine performance of activities/functions, and identify strengths and weaknesses and develop/implement effective corrective actions. (Reference: Pantex Plant Assessment Program, DIR-0106).

Configuration Control:

Configuration control exists for structures, systems, and components (SSCs) that are critical to safety. The Configuration Management Program is described in appendix G of the Basis for Interim Operation for the Pantex Plant.

Conduct of Operations:

Conduct of operations at the Pantex Plant is based on bench-marking and implementation of best practices The program is administered in accordance with the Pantex Plant Conduct of Operations Manual, MNL-00040.

Authorization Basis:

The authorization basis is defined through the existing Final Safety Analysis Reports, the Nuclear Explos Master Studies, and the Basis for Interim Operation in conjunction with the Critical Safety Systems Man until new FSARs are developed in accordance with DOE Order 5480.23.

Training:

The Pantex training program provides all personnel with appropriate education, training, and certificatio programs that promote an increased state of awareness of the responsibilities and operating practices at Pantex Plant.

Organization:

The operating organization is a network of management, technical, and support functions that is suffici to assure that hazards and safety issues are identified, communicated, evaluated, resolved, and docume

Lessons Learned:

Pantex Plant Standard STD-6216 establishes the process for reviewing and analyzing operational management experiences and translating these experiences into lessons learned.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4-16); 12-84 (Bays 1 - 20); 12-99 (Bays 1,3,5, 7, and 8); 12-104 (Bays 1-16)
	FUNCTION: Bays

Administrative Barriers, Continued:

Standards:

Plant Standards are management control documents that outline both specific management objectives and how processes and activities are to be accomplished and controlled. These standards are based on and developed from the Plant policy directives which are those management documents that provide direction, assign responsibilities, and define goals on a Plant-wide basis.

Surveillance:

Formal procedures and processes are in place to ensure that structures, systems, and components (SSCs) that are critical to safety will perform as intended.

Personnel Reliability Assurance Program:

This program establishes the requirements and responsibilities for screening, selecting, and continuously evaluating those employees assigned to or being considered for assignment to critical duties.

Worker Access/Occupancy Limits:

The Material Access Area (MAA) limits access to areas containing highly enriched uranium (HEU) components, with a security fence. The Limited Access Area is an additional security fence around the MAA with controlled access. Each bay has specific personnel limits that are administratively controlled.

Emergency Response:

Pantex has an emergency management program that includes the management, planning, preparedness, readiness assurance, response, and mitigation of emergency conditions.

FACILITY (Building or Location): Build
16); 12-84 (Bays 1 - 20); 12-99 (Bays
(Bays 1-16)

PARTITIONED AREA: Current Facility

nd how are they packaged?

	Packaging Types	Location	Age of Packaging (in years)
ultiple	55 gallon, DT Drums	Assembly/ Disassembly Bays	3-30
ms d Sub- tblies			

nd its intended protective function:

ers used by Pantex Plant in the bays include the DT-18, DT-20, DT-22,
f these containers are shown in Attachments "Bays - 20", "Bays - 21", "
ainers are drum type containers that meet Type B requirements of 10 C
nalysis Report for Packaging (SARP). The DT container includes an in
vessel that is hermetically sealed. The outer drum is made of stainless steel except for the DT-18,
of carbon steel. The drum sizes range from 55 to 212 gallons. Celotex inserts form the inner
drum. The inner containment vessels are made of stainless steel. Rubber inserts formed to dim
particular CSA are used inside the inner containment vessel. Additionally, a sling or holding
by the configuration may be in the inner containment vessel. The horizontal shipping containe
meet the requirements of 10 CFR 71, however, they are approved for off-site transportation by
Explosive Safety Division (NESD) DOE AL. These shipping containers are 48 inches wide b
and made of stainless steel. The interior inserts conform to the shape of the cased CSA and a
foam.

Additional CSA staging containers used at Pantex in the bays include Nuclear Assembly H-
and Drum Type), Wooden Boxes (8000 Series), and decertified DT containers (DT-3, DT-5,
containers do not meet the requirements of 10 CFR 71 and do not contain an inner containme
they are DOE approved for on-site transportation and staging of nuclear explosive component

The 8000 series boxes have a steel base. The base contains steel chocks and steel bands to se
place. The lid consists of a steel frame with wooden planks making up the sides and top. The
base using 6 to 8 bolts.

The MH2800 is a 146-gallon container with inserts and an inner containment vessel. It meets the
the Type B configuration; however, it is not authorized as a shipping container for CSAs other th
CSA. It is used to store other CSAs, based on size.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4-16); 12-84 (Bays 1 - 20); 12-99 (Bays 1,3,5, 7, and 8); 12-104 (Bays 1-16)
	PARTITIONED AREA: Current Facility

Packaging Narrative, Continued:

The modified MH2800 is a 146-gallon stainless steel drum with foam inserts. A diagram of this container is shown in Attachment "Bays - 24." This configuration does not meet the Type B container requirements. This configuration is used for on-Plant staging only.

All containers used at the Pantex Plant are designed to protect the contents from damage during transportation and staging, and provide for criticality safety (Pantex Plant Criticality Safety Program Analysis, February 28, 1996, and the DOE approved Basis for Interim Operation for the Pantex Plant). The approved shipping containers also provide an additional containment barrier for the contents (hermetically sealed inner containment vessel). Where required, the packaging consists of several receptacles, neutron absorbing materials, spacing for structural integrity, thermal insulation, radiation shielding, devices for absorbing mechanical shock, and sometimes the conveyance, tie-down system, and auxiliary equipment. These items are in place to protect the item inside the container.

Describe material at risk, which constitutes a source term.

The number of packages (inventory) and the associated material at risk per container is in the classified Appendix E to this document.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, a 16); 12-84 (Bays 1 - 20); 12-99 (Bays 1,3,5, 7, and 8); 12-104 (Bays 1-16)
	PARTITIONED AREA: Current Facility

Question 3: What are the HEU holdings and how are they packaged?

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Age of Packaging (in years)	Number of Packages	Ma
Weapon Components	Weapons	CSA; Multiple Nuclear Explosive Programs Canned Sub-Assemblies	55 gallon, DT Drums	Assembly/ Disassembly Bays	3-30	See Appendix E	See App

Description of the packaging and its intended protective function:

Packaging Narrative:

DT drum shipping containers used by Pantex Plant in the bays include the DT-18, DT-20, DT-22, DT-23 and HSC-2. A diagram of these containers are shown in Attachments "Bays - 20", "Bays - 21", "Bays - "Bays - 23." The DT containers are drum type containers that meet Type B requirements of 10 CFR 71 documented in a Safety Analysis Report for Packaging (SARP). The DT container includes an inner co vessel that is hermetically sealed. The outer drum is made of stainless steel except for the DT-18, which of carbon steel. The drum sizes range from 55 to 212 gallons. Celotex inserts form the inner barrier of drum. The inner containment vessels are made of stainless steel. Rubber inserts formed to dimensions particular CSA are used inside the inner containment vessel. Additionally, a sling or holding fixture as by the configuration may be in the inner containment vessel. The horizontal shipping containers (HSC meet the requirements of 10 CFR 71, however, they are approved for off-site transportation by the Nuc Explosive Safety Division (NESD) DOE AL. These shipping containers are 48 inches wide by 102.5 i and made of stainless steel. The interior inserts conform to the shape of the cased CSA and are made c foam.

Additional CSA staging containers used at Pantex in the bays include Nuclear Assembly H-Gear (Har and Drum Type), Wooden Boxes (8000 series), and decertified DT containers (DT-3, DT-5, DT-16, e containers do not meet the requirements of 10 CFR 71 and do not contain an inner containment vesse they are DOE approved for on-site transportation and staging of nuclear explosive components.

The 8000 series boxes have a steel base. The base contains steel chocks and steel bands to secure th place. The lid consists of a steel frame with wooden planks making up the sides and top. The lid is base using 6 to 8 bolts.

The MH2800 is a 146-gallon container with inserts and an inner containment vessel. It meets the re the Type B configuration; however, it is not authorized as a shipping container for CSAs other than CSA. It is used to store other CSAs, based on size.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4-16); 12-84 (Bays 1 - 20); 12-99 (Bays 1,3,5, 7, and 8); 12-104 (Bays 1-16)
	PARTITIONED AREA: Current Facility

Packaging Narrative, Continued:

The modified MH2800 is a 146-gallon stainless steel drum with foam inserts. A diagram of this container is shown in Attachment "Bays - 24." This configuration does not meet the Type B container requirements. This configuration is used for on-Plant staging only.

All containers used at the Pantex Plant are designed to protect the contents from damage during transportation and staging, and provide for criticality safety (Pantex Plant Criticality Safety Program Analysis, February 28, 1996, and the DOE approved Basis for Interim Operation for the Pantex Plant). The approved shipping containers also provide an additional containment barrier for the contents (hermetically sealed inner containment vessel). Where required, the packaging consists of several receptacles, neutron absorbing materials, spacing for structural integrity, thermal insulation, radiation shielding, devices for absorbing mechanical shock, and sometimes the conveyance, tie-down system, and auxiliary equipment. These items are in place to protect the item inside the container.

Describe material at risk, which constitutes a source term.

The number of packages (inventory) and the associated material at risk per container is in the classified Appendix E to this document.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4-16); 12-84 (Bays 1 - 20); 12-99 (Bays 1,3,5, 7, and 8); 12-104 (Bays 1-16) PARTITIONED AREA: Current Facility

Question 4: What are potential causes for the failure of materials, packages, and barriers?

Potential Causes

Facility	Material	External
☐ Process Material Transfers	☐ Aging	☐ Fire
☐ Inadvertent Transfers	☐ Container Seal Degradation	☒ Explosion
☐ Aging/Degradation	☐ Pressurization	☒ Earthquakes
☒ Equipment Failure	☐ Pyrophoricity	☐ Subsidence
☐ Change in Mission	☐ Radioactivity	☒ Winds
☒ Other Collocated Hazards	☐ Chemical Reactivity	☐ Floods
☐ Corrosion/Embrittlement	☐ Radiolysis	☐ Extreme Temperature
☐ Inadequate Configuration Knowledge	☐ Volumetric Expansion	☐ Snow
☒ Combustible Loading	☐ Oxidation	☐ Ash Loading
☐ Inadequate Seals	☐ Flammability	☒ Aircraft Crash
☐ Water Sources	☐ Toxicity	☐ Vehicle Accident
☐ Inadequate Drains	☐ Hydrolysis	☐ Onsite Transportation
☒ Preventive Maintenance Failure	☐ Crystalization	☐ Adjacent Facility Accident
☒ Administrative Controls	☐ Other (specify)	☐ Other (specify)
☒ Human Error		
☐ Chemical Reactions		
☐ Contamination		
☐ Inadequacy of Design Basis		
☐ Design Deficiency		
☐ Flooding		
☒ Fire		
☐ Other SAR Accidents (specify)		
☒ Other (listed below)		

Facility Causes:

Equipment Failure/Preventive Maintenance Failures:

Equipment failure and inadequate preventive maintenance of systems, structures and components (SSCs) could cause the failure of these SSCs to perform their safety related functions.

Other Collocated Hazards:

Collocated explosives could cause the explosive dispersal of highly enriched uranium (HEU).

Combustible Loadings:

Excessive combustible loadings could cause a reduction in the effectiveness of Fire Protection programs.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4-16); 12-84 (Bays 1 - 20); 12-99 (Bays 1,3,5, 7, and 8); 12-104 (Bays 1-16)
	PARTITIONED AREA: Current Facility

Administrative Controls:

Inadequate Nuclear Safety Management Programs could cause a reduction in the effectiveness of the ES&H program.

Human Error:

Non-compliance with human engineering principles, practices and requirements could cause human errors to occur. The occurrence of human errors could impact public, worker and environmental safety. The errors could be due to operator errors, testing and maintenance errors, or inadequate procedures.

Fire:

A fire in a bay could cause: (1) heating high explosives (HE) above its critical temperature; (2) burning and ignition of HE or insensitive high explosives (IHE); and (3) the heating and melting of HEU.

Other:

Dropping uncased HE could cause the detonation of the explosives.

External Causes:

Explosion:

Explosion external to the bay could cause excessive blast over-pressure in the bays.

Earthquake:

Flooding concurrent with earthquake damage could cause criticality.

Winds/Tornado:

Winds/Tornado debris could cause the breach of the facility structure, and possible breach of the highly enriched uranium (HEU) container, with possible dispersal of HEU.

Aircraft Crash:

Aircraft crash could cause the breach of the facility structure, and possible breach of the HEU container, with possible dispersal of HEU.

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4-16); 12-84 (Bays 1 - 20); 12-99 (Bays 1,3,5, 7, and 8); 12-104 (Bays 1-16) PARTITIONED AREA: Current Facility

Question 5: What are potential effects from the causes identified?

Potential Effects

Facility	External
☒ Fire ☒ Explosion ☐ Contamination ☒ Criticality ☐ Leakage/Spills ☐ Other Accidents (specify) ☐ Structural Failure ☒ Equipment Failure ☐ Material Release ☐ Increased Radioactivity Level ☐ Other (specify)	☐ Loss of Site Integrity ☒ Loss of Building Integrity ☐ Release of Materials ☐ Radiation and Releases from Criticality
Material ☐ Criticality ☐ Material Release ☐ Breach of Packaging ☐ Fire ☐ Other (specify)	

SITE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4-16); 12-84 (Bays 1 - 20); 12-99 (Bays 1,3.5, 7, and 8); 12-104 (Bays 1-16)
	PARTITIONED AREA: Current Facility

Facility Effects:

Fire:

A fire would directly damage the exposed bay contents, and smoke and water would damage the contents of the assembly bay entry corridor. The fire would also effect the quality of all nuclear explosive components within the assembly bay. In a fully involved fire, a potential exists for involvement of a nuclear component containing radioactive materials. The principal concern for a fire in a bay is the potential for ignition and detonation of high explosives (HE), resulting in the dispersal of highly enriched uranium (HEU) as well as failure of the containment function of the bay. Also of concern is the possibility of a fire resulting in melted HEU within a container.

Explosion:

The principal effects of an accidental detonation are blast over-pressure, fragments generated by the explosion, and the shock loads produced by the shock wave through the air or on the ground. These effects can cause damage to structures, systems and components (SSCs) within the bay, injury or death to the workers in the bay of the incident and to collocated workers, also the explosion could cause radioactive material release to the environment.

Criticality:

The principal effects of a criticality event include a radiation burst which could be harmful or fatal.

Equipment Failure:

A number of scenarios can cause the non-availability or inadequacy of structures, systems and components (SSCs) important to ES&H. These include: (1) inadequate operability surveillances; (2) inadequate maintenance; (3) inadequate post maintenance testing; and (4) aging.

External Effects:

Loss of Building Integrity:

Natural phenomena events can cause damage to structures, systems, and components important to Environmental, Safety and Health (ES&H). An aircraft crash event can cause damage to systems, structures and components (SSCs) within the bay, injury or death to workers in the bay of the incident and collocated workers. Natural events that could affect ES&H are: earthquake damage, wind/tornado damage and flood damage.

TE: Pantex Plant	FACILITY (Building or Location): Buildings 12-64 (Bays 1, and 4-16); 12-84 (Bays 1 - 20); 12-99 (Bays 1,3,5, 7, and 8); 12-104 (Bays 1-16)
	PARTITIONED AREA: Current Facility

Equipment Failure:

The consequences of equipment failure is the non-availability of critical structures, systems and components (SSCs) that are needed to prevent and mitigate the consequences that could effect ES&H. The availability of Critical SSCs to ensure bay integrity, is assured by an effective Preventive Maintenance Program, surveillance testing, and systems operability requirements. Workers are trained to stop work when critical safety systems are inoperative.

Loss of Building Integrity/Aircraft Crash:

This vulnerability is addressed in Vulnerability Assessment Form number "SAT/01."

Applicable References:

- Basis for Interim Operation for the Pantex Plant, Amarillo, Texas, Rev. 3 Errata B, March 1996
- Final Safety Analysis Report, Building 12-84, 03/28/84
- Final Safety Analysis Report, Building 12-84A, 03/26/86
- Final Safety Analysis Report, Building 12-99, 02/26/88
- Final Safety Analysis Report, Building 12-104, 01/31/89

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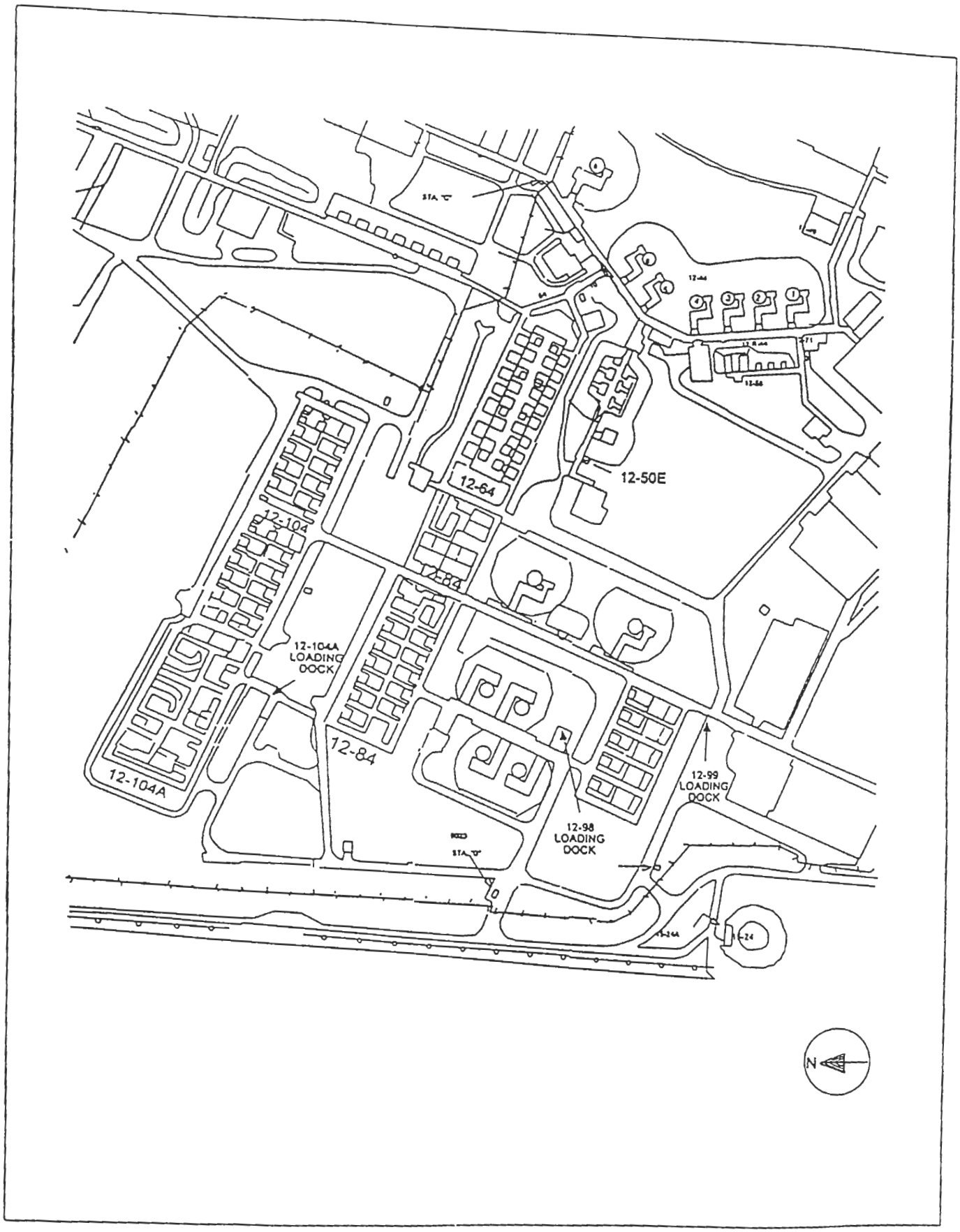
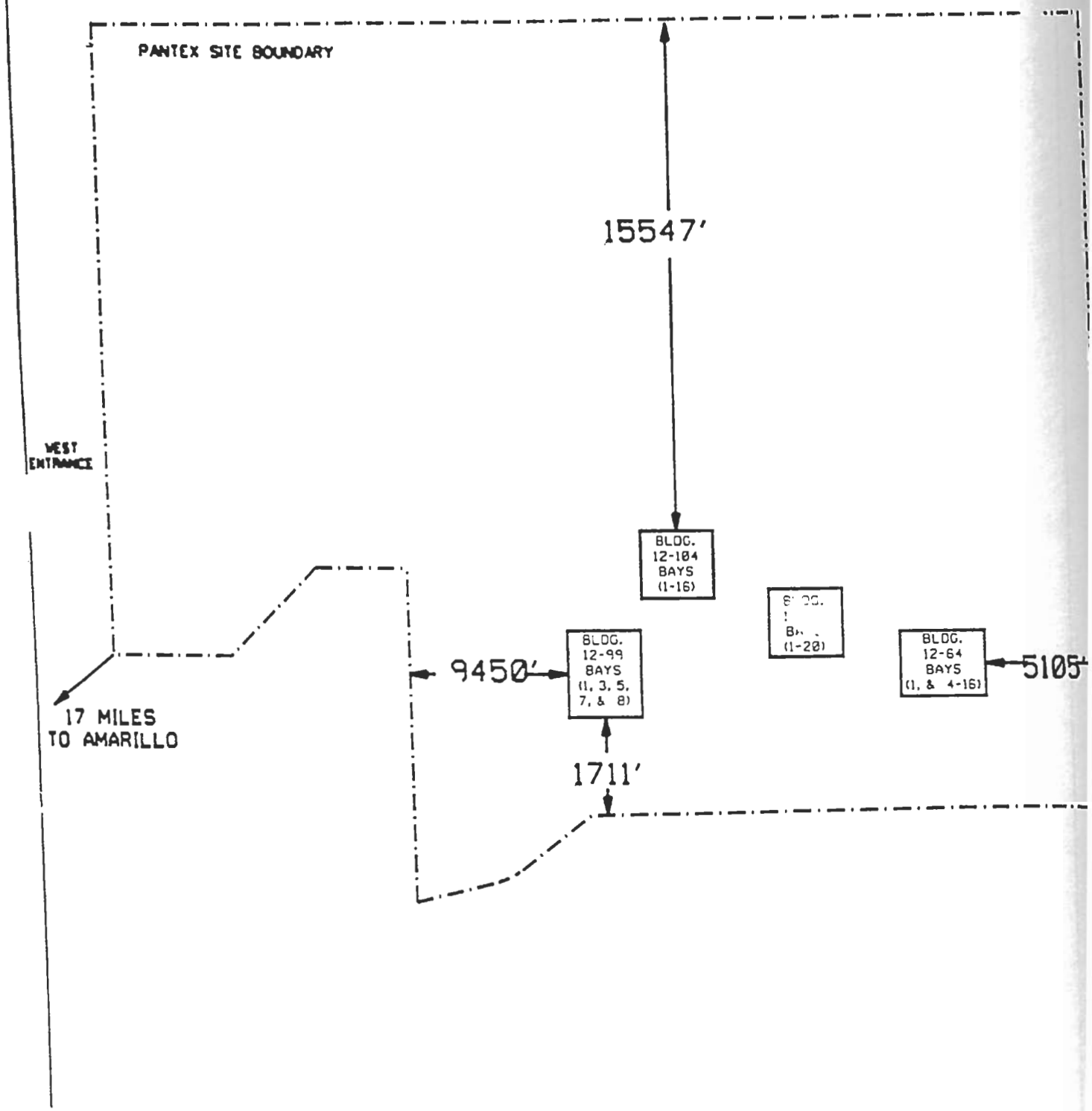
PANTEX PLANT



Buildings 12-64, 12-84, 12-99, And 12-104 and Neighboring Facilities

Attachment "Bays - 1"

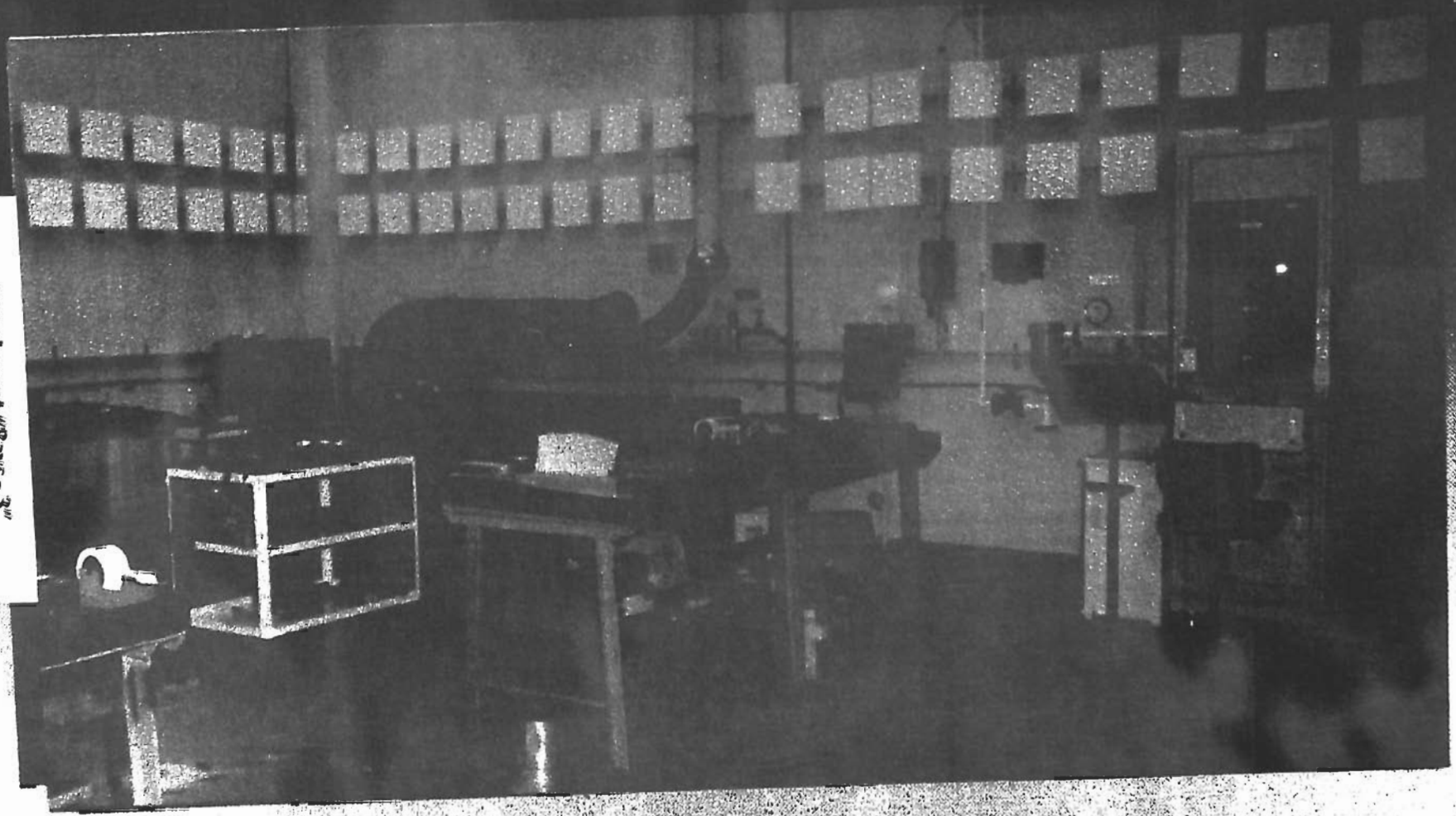
PANTEX PLANT
HEU FACILITY LOCATION SKETCH



BUILDINGS 12-64, 12-84, 12-99 & 12-104

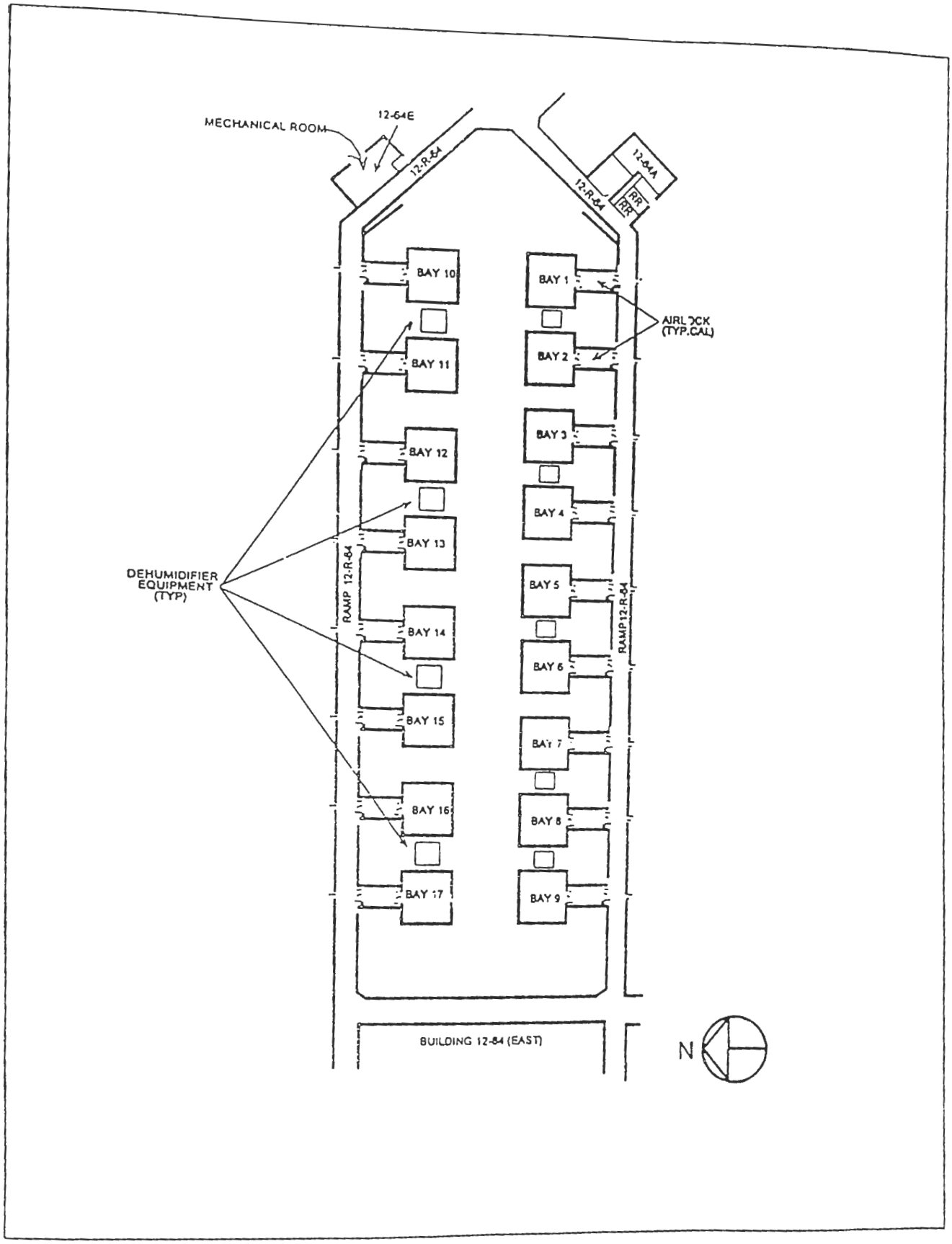
Attachment "Bays - 2"

Bays



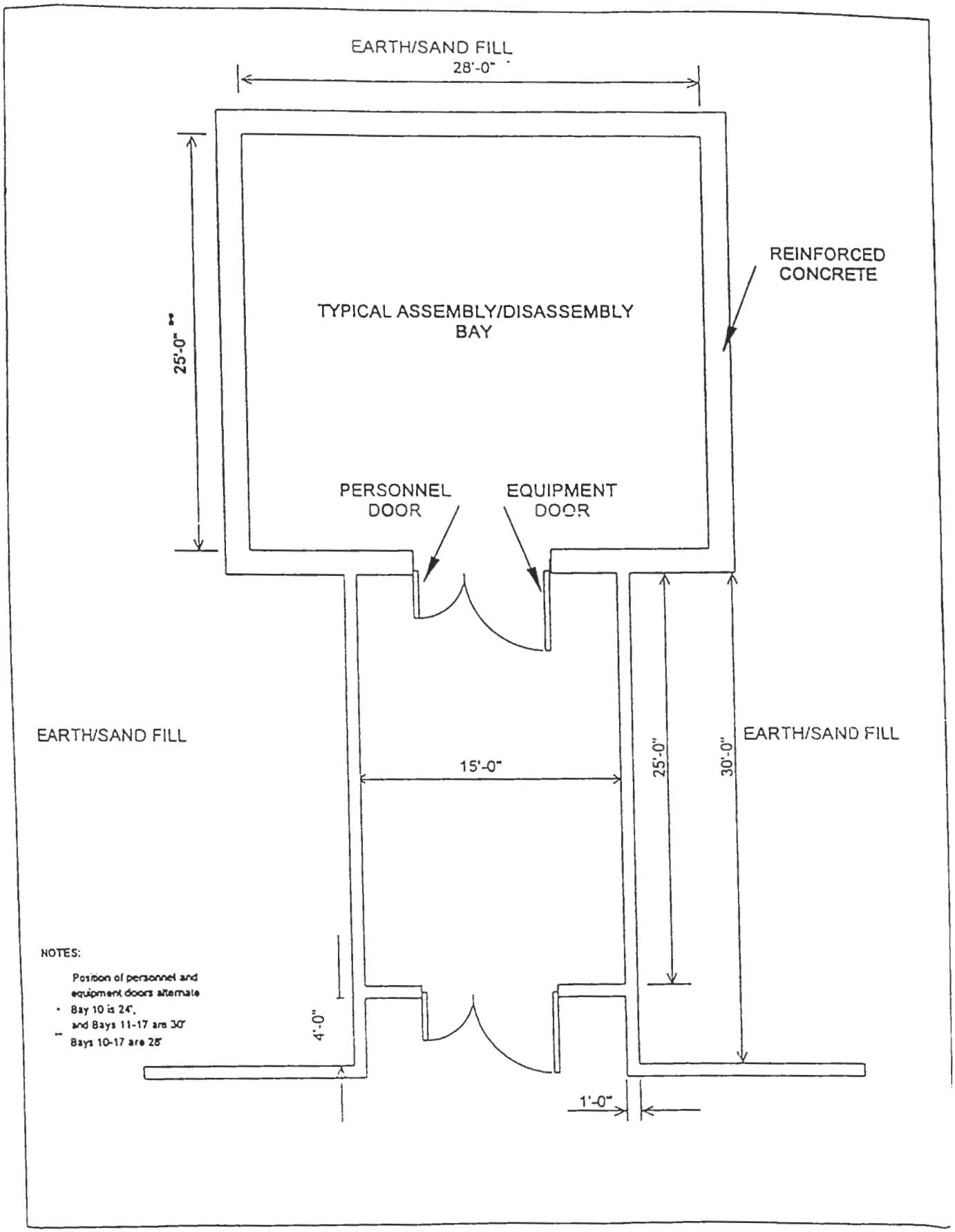
Attachment "Bays - 3"

PANTEX PLANT



Building 12-64 Floor Plan

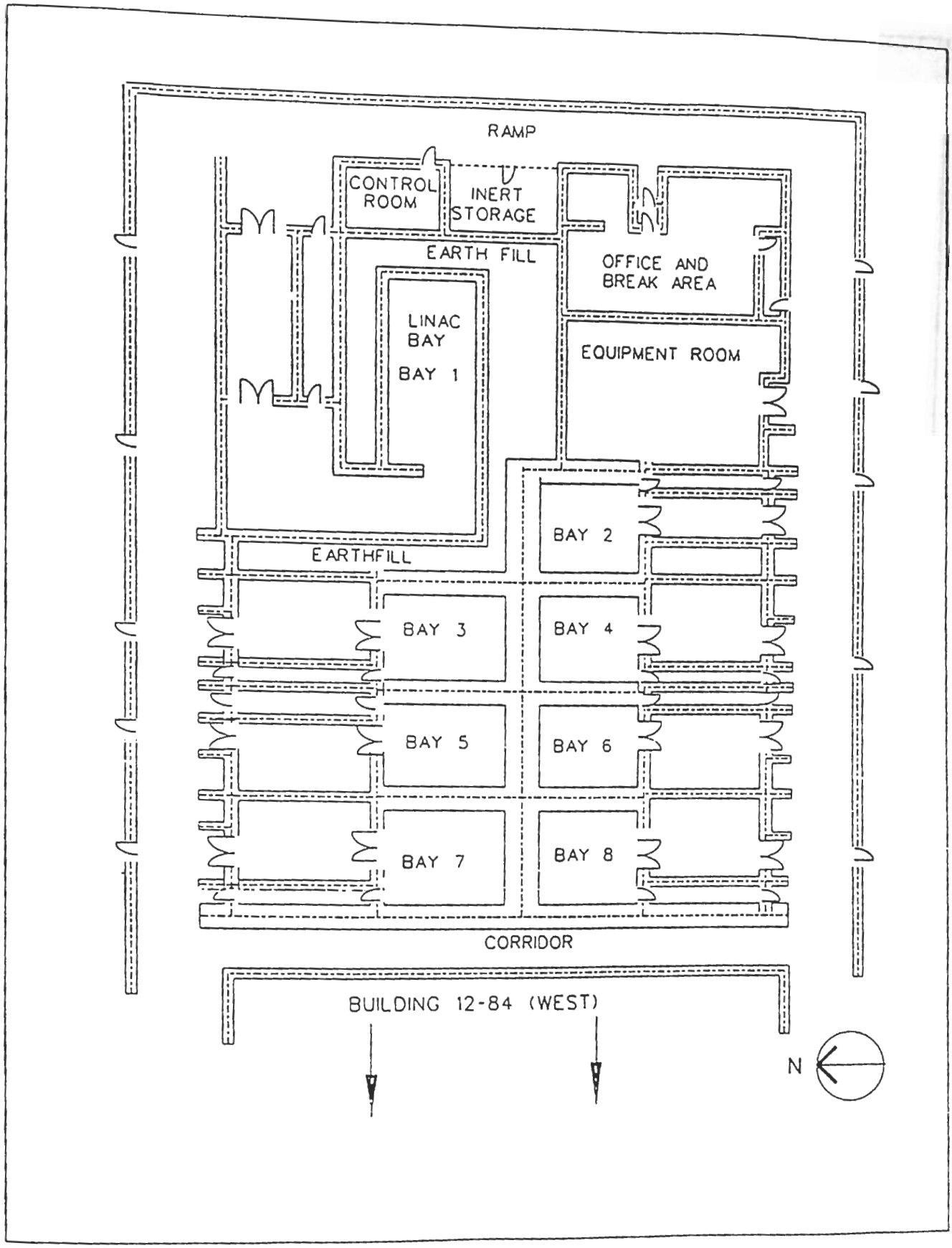
Attachment "Bays - 4"



Building 12-64 Assembly Bay Floor Plan

Attachment "Bays - 5"

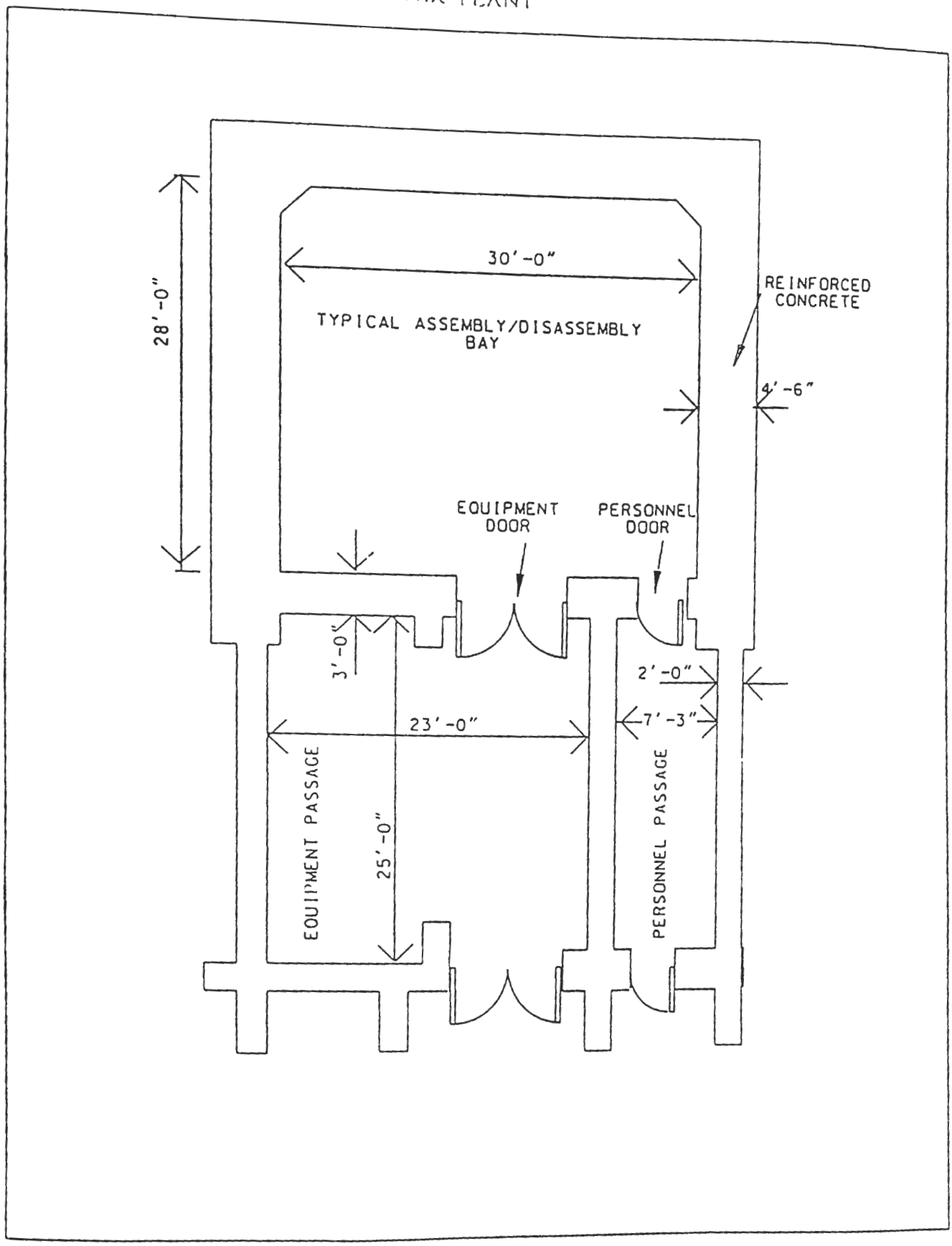
PANTEX PLANT



Bulding 12-84 (East) Floor Plan

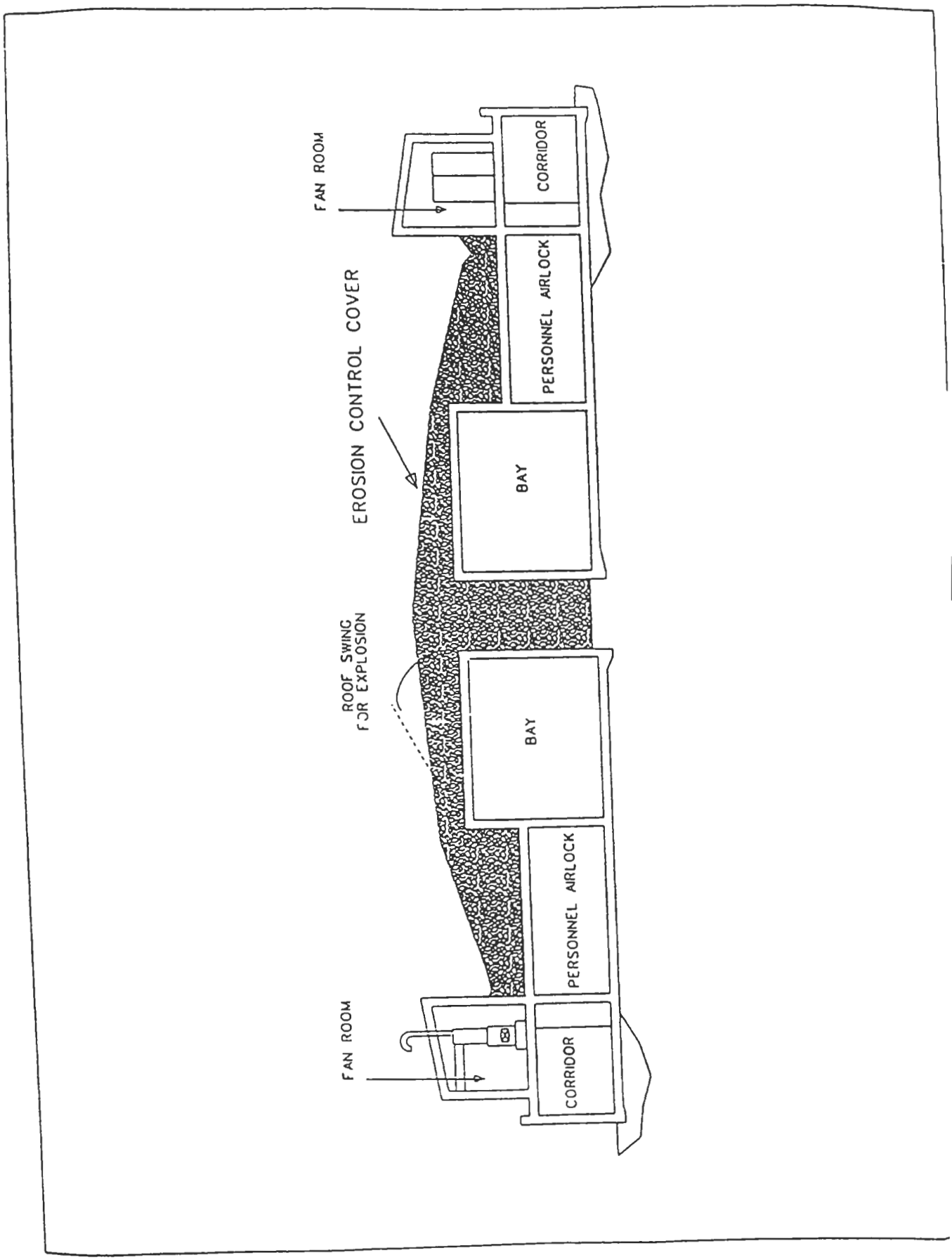
Attachment "Bays - 8"

PANTEX PLANT



Building 12-84 (East) Assembly Bay Floor Plan

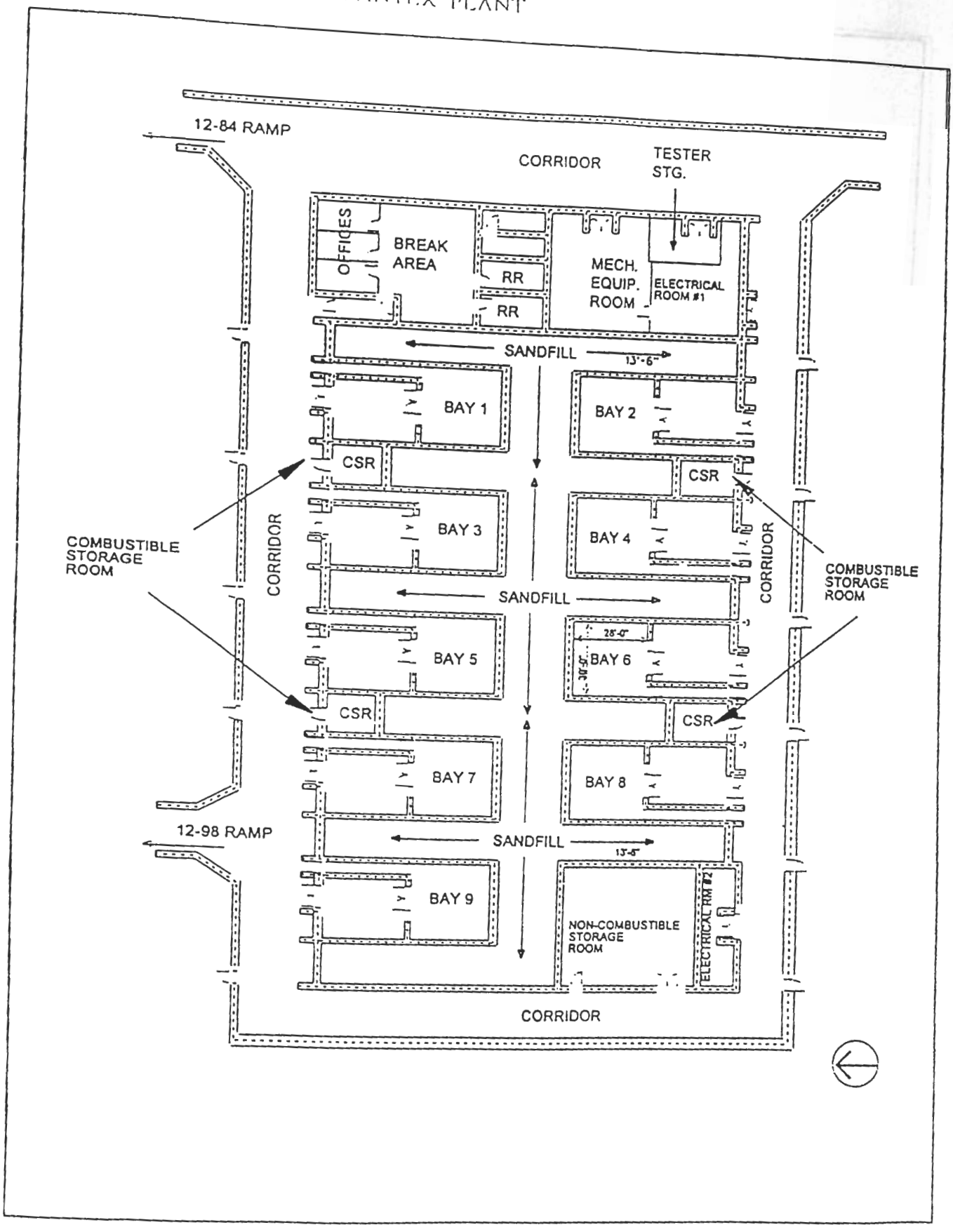
Attachment "Bays - 10"



Building 12-84 (West) Vertical Section

Attachment "Bays - 11"

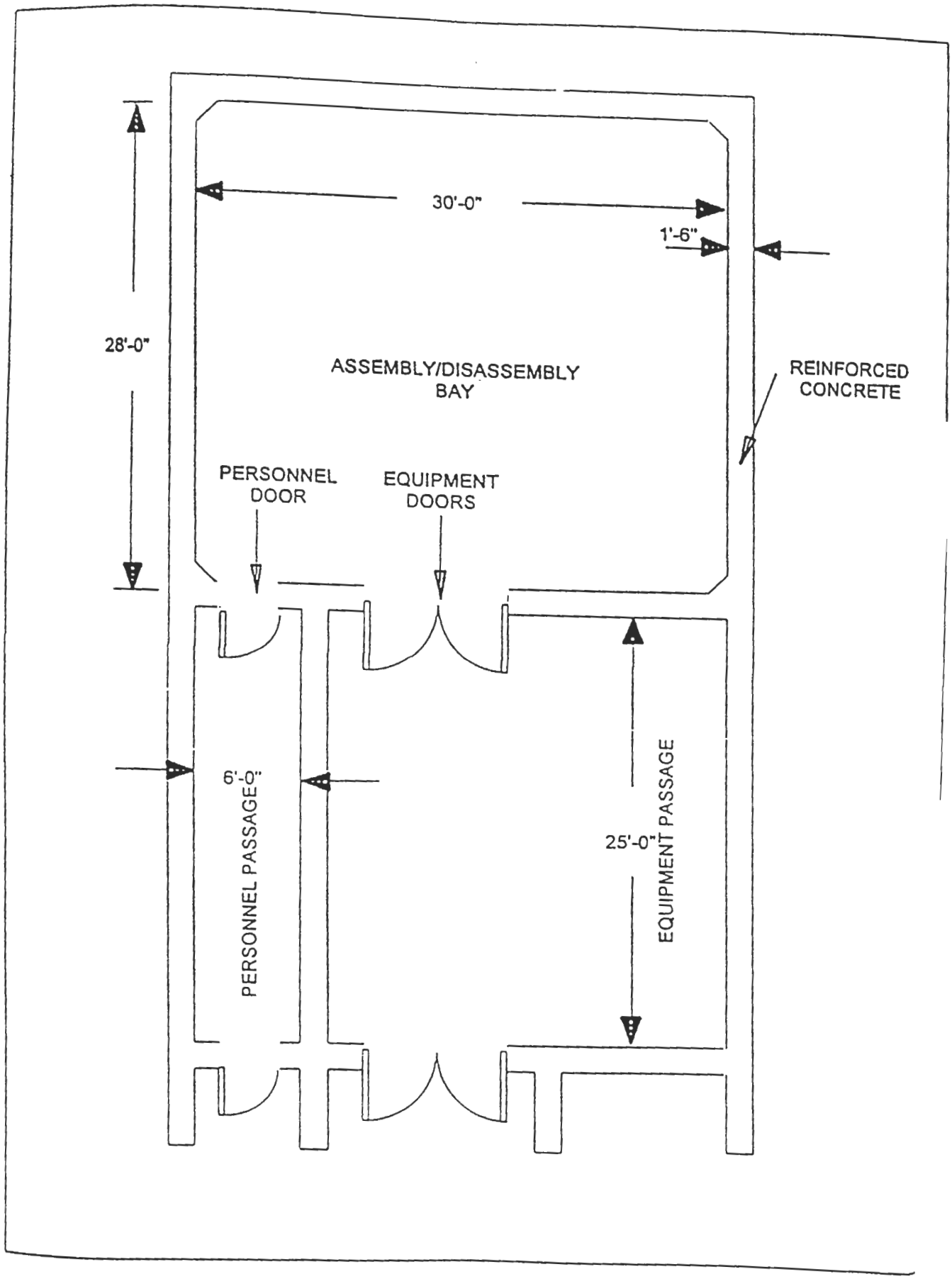
PANTEX PLANT



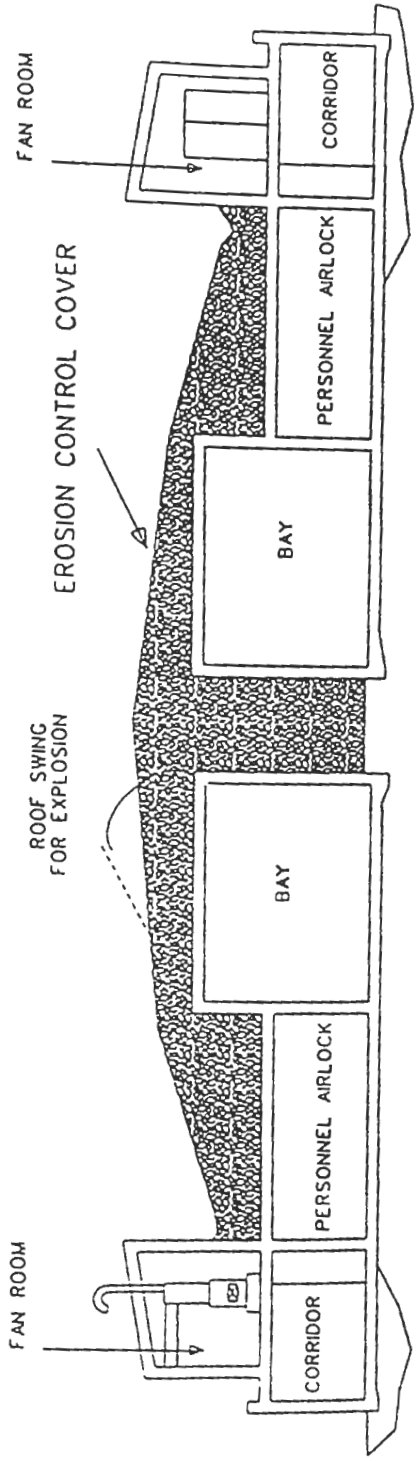
Building 12-99 Floor Plan

Attachment "Bays - 12"

PANTEX PLANT



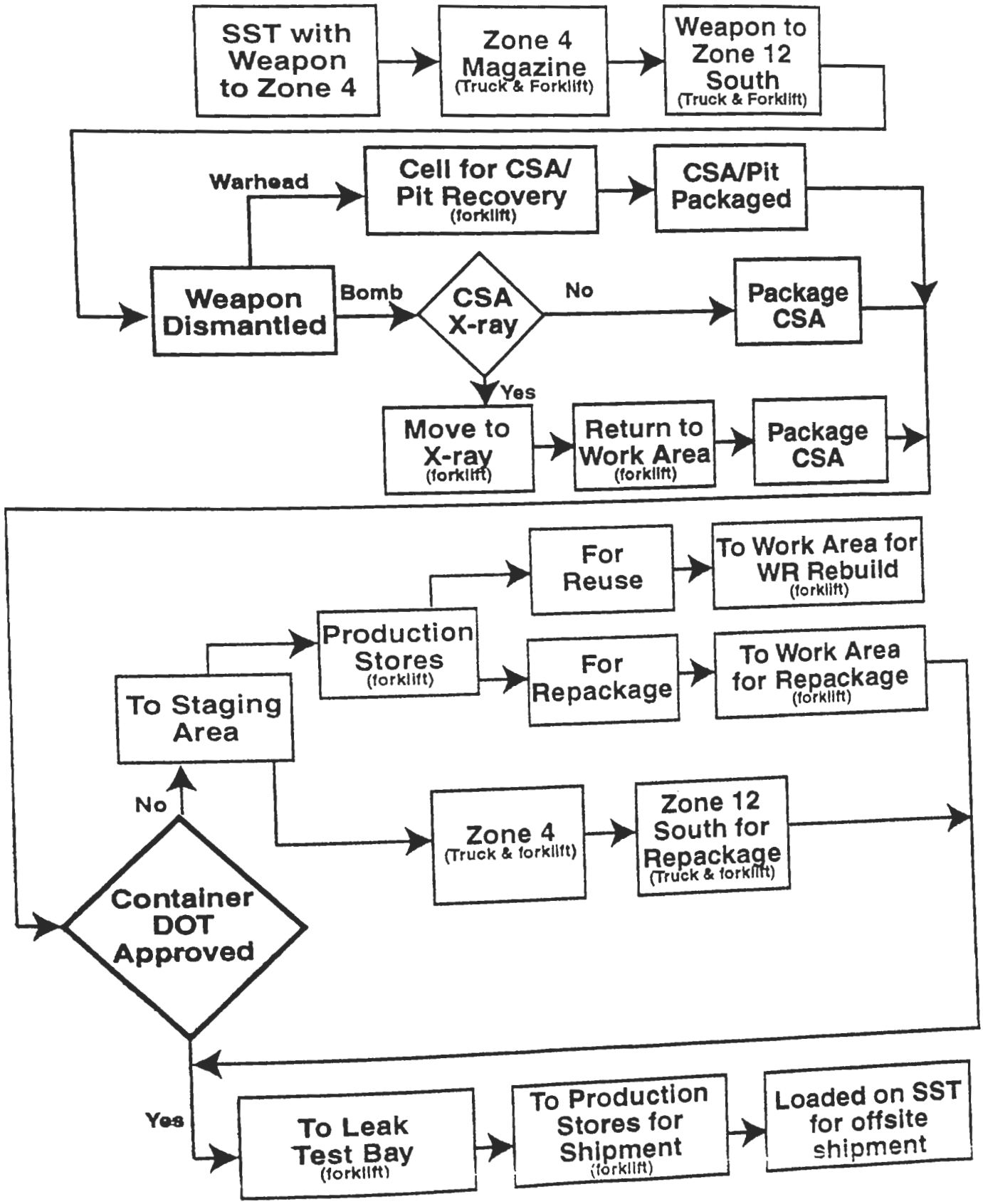
Building 12-99 Assembly Bay Floor Plan

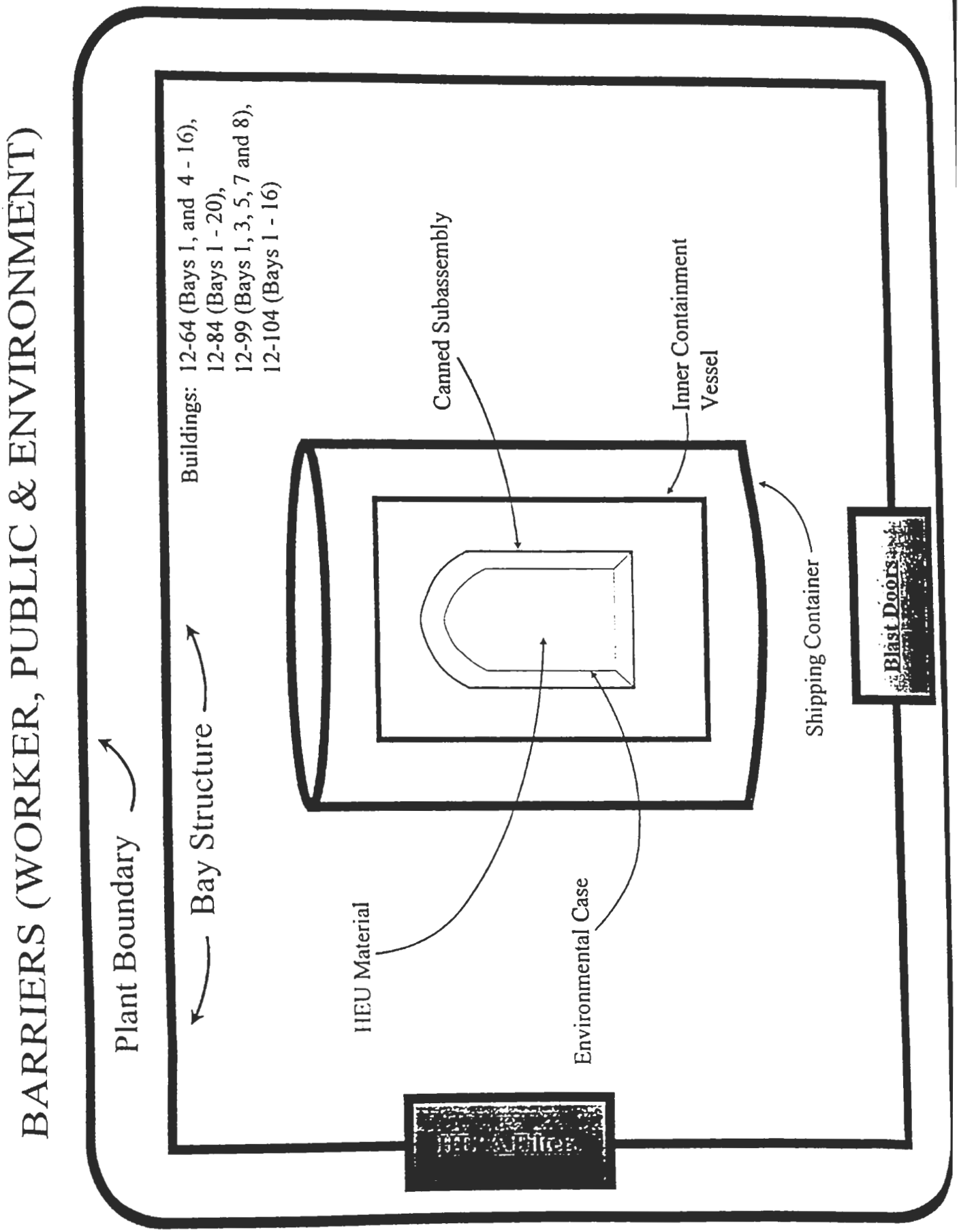


Buiding 12-99 Vertical Section

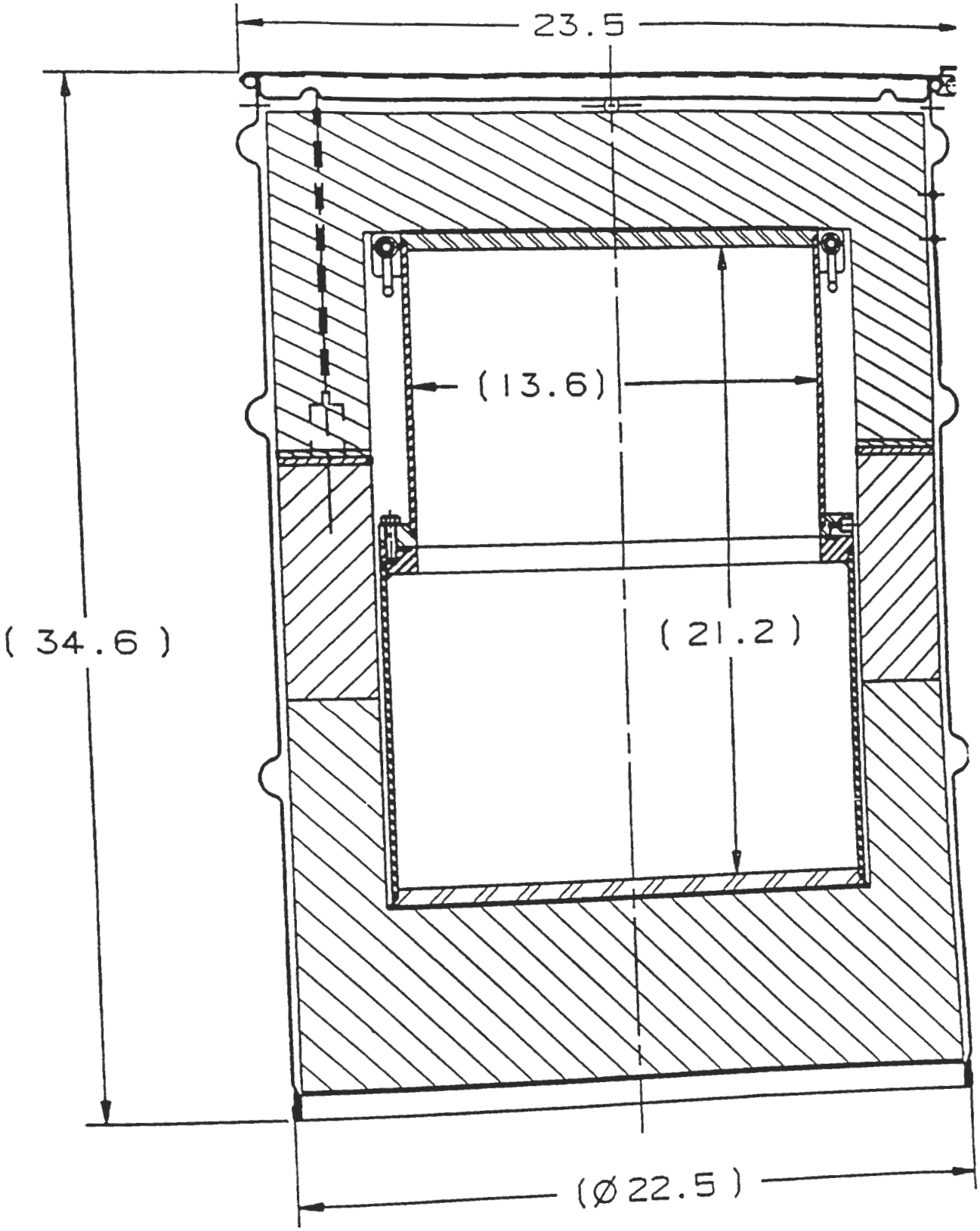
Attachment "Bays - 14"

PANTEX PLANT HEU MOVEMENTS





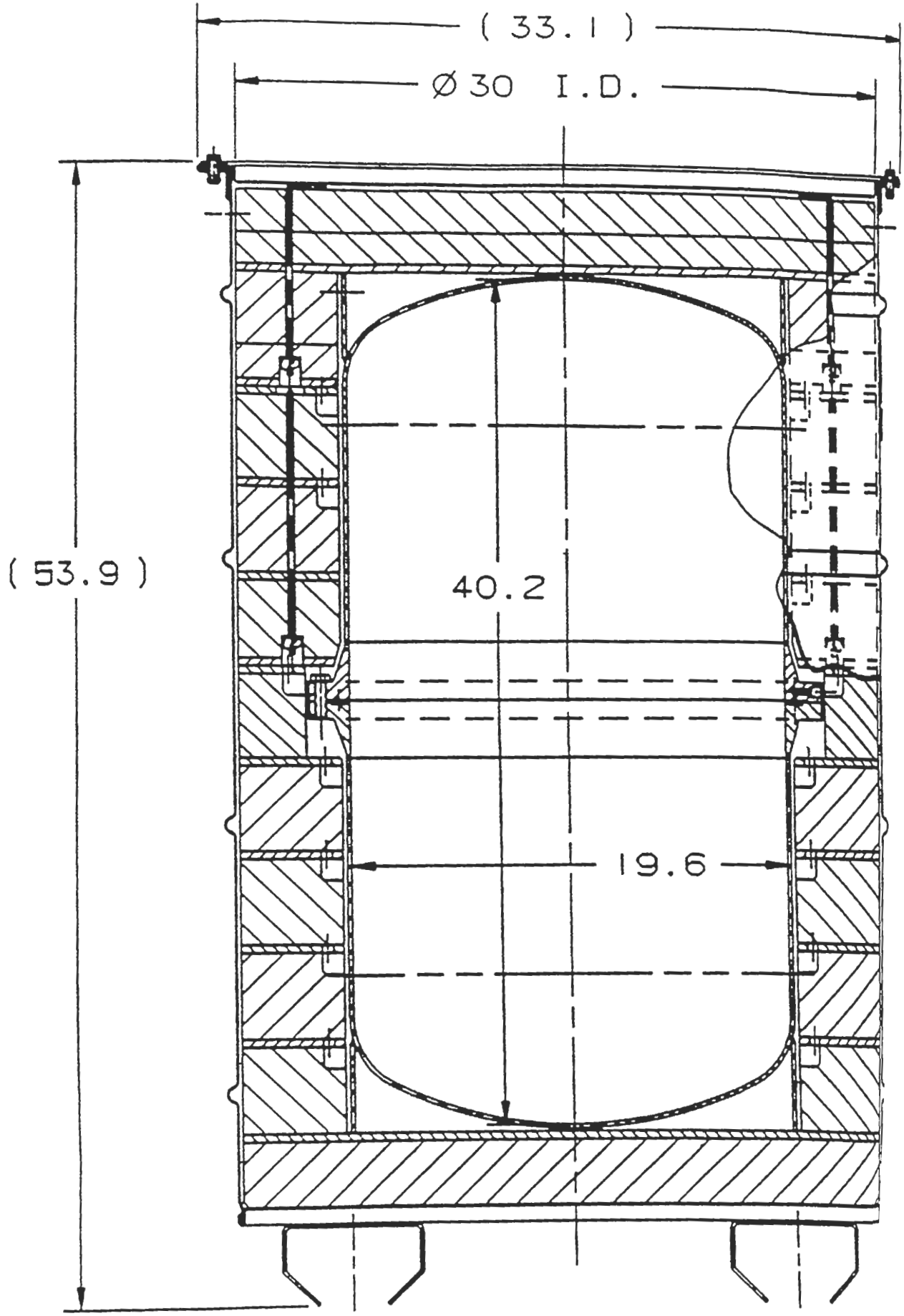
Assembly Bays HEU Barriers



DT18

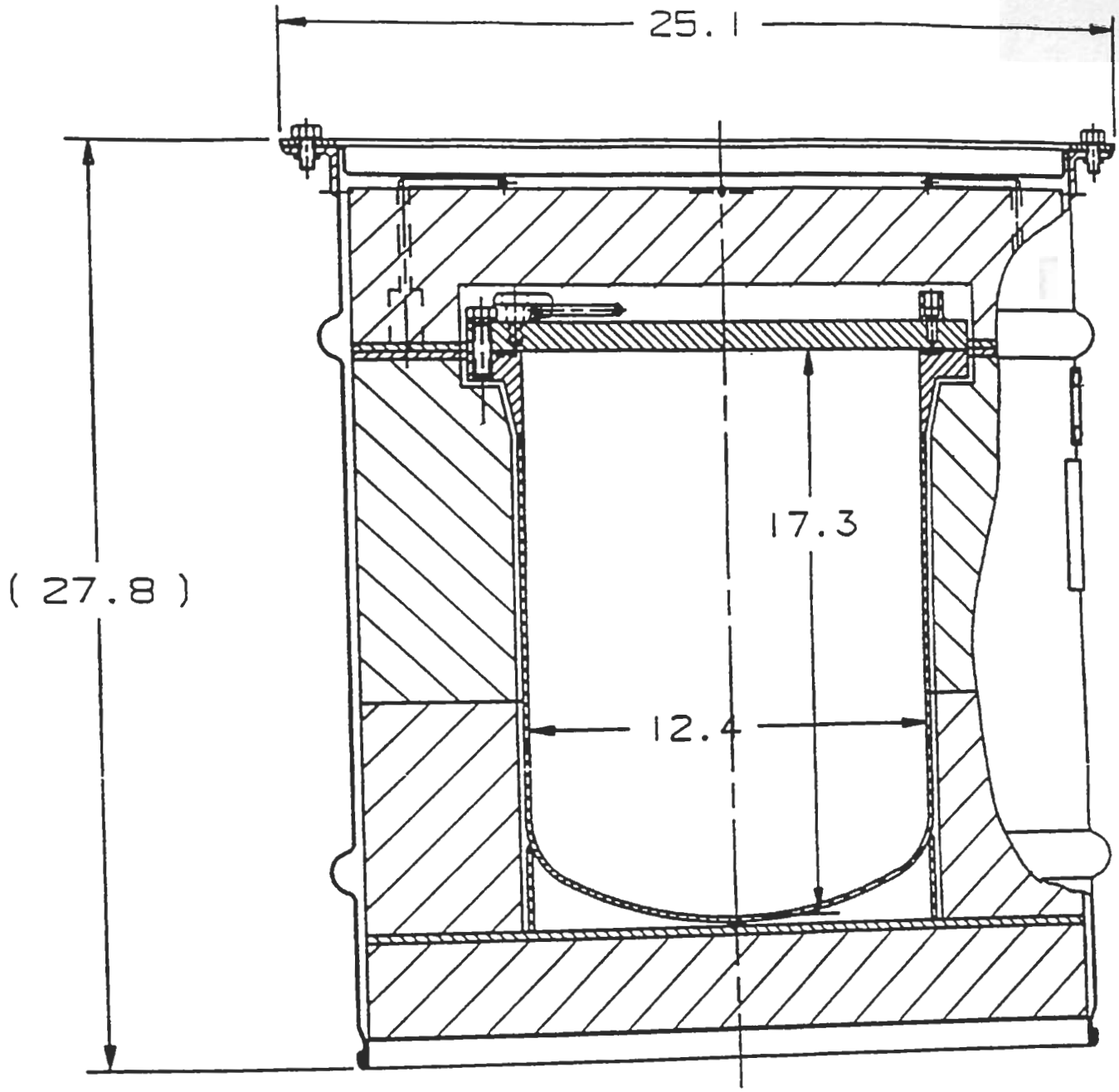
MAX GROSS WEIGHT 500 LBS

Attachment "Bays - 20"



DT20

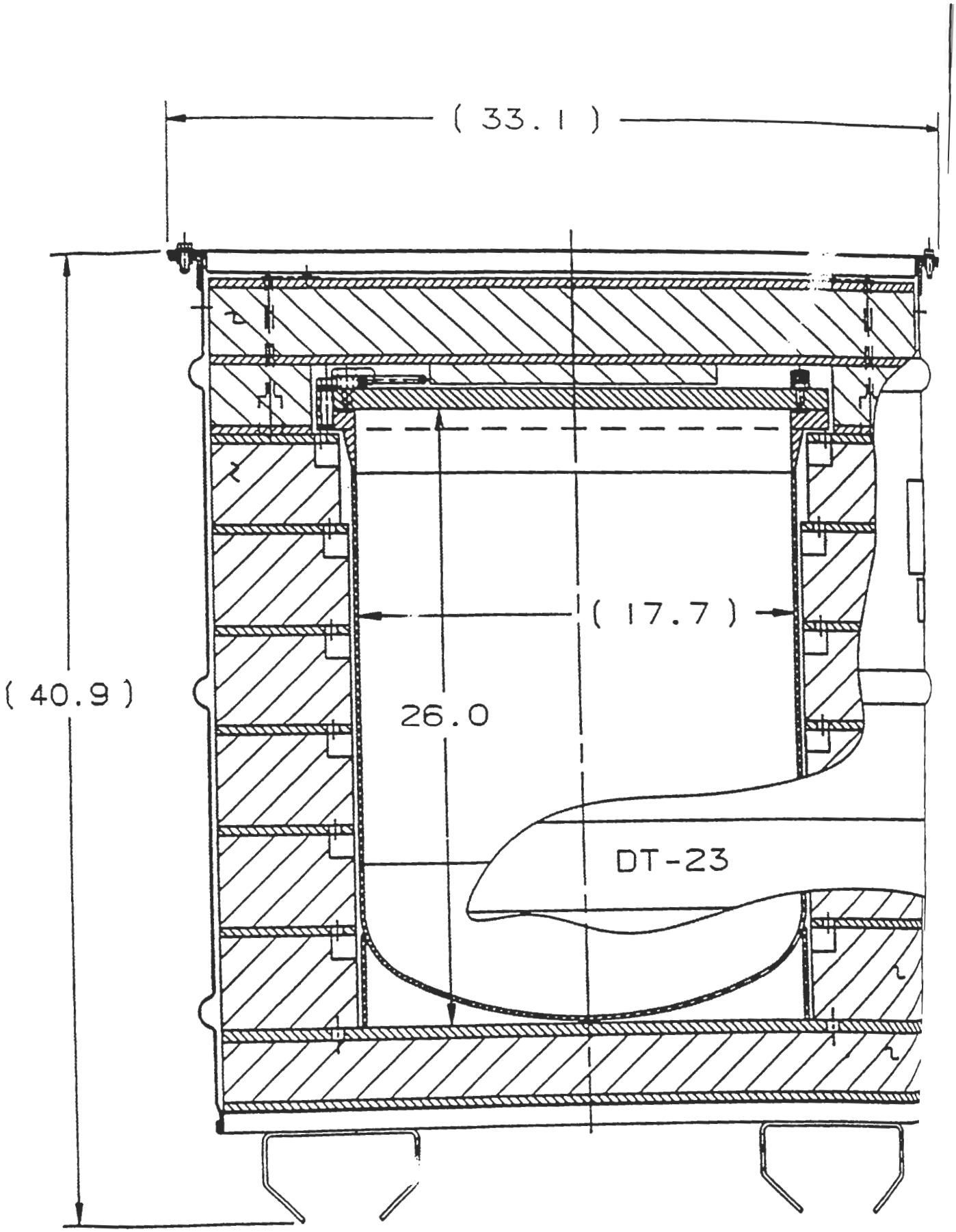
MAX GROSS WEIGHT 1084



DT22

MAX GROSS WEIGHT 385 LBS

Attachment "Bays - 22"

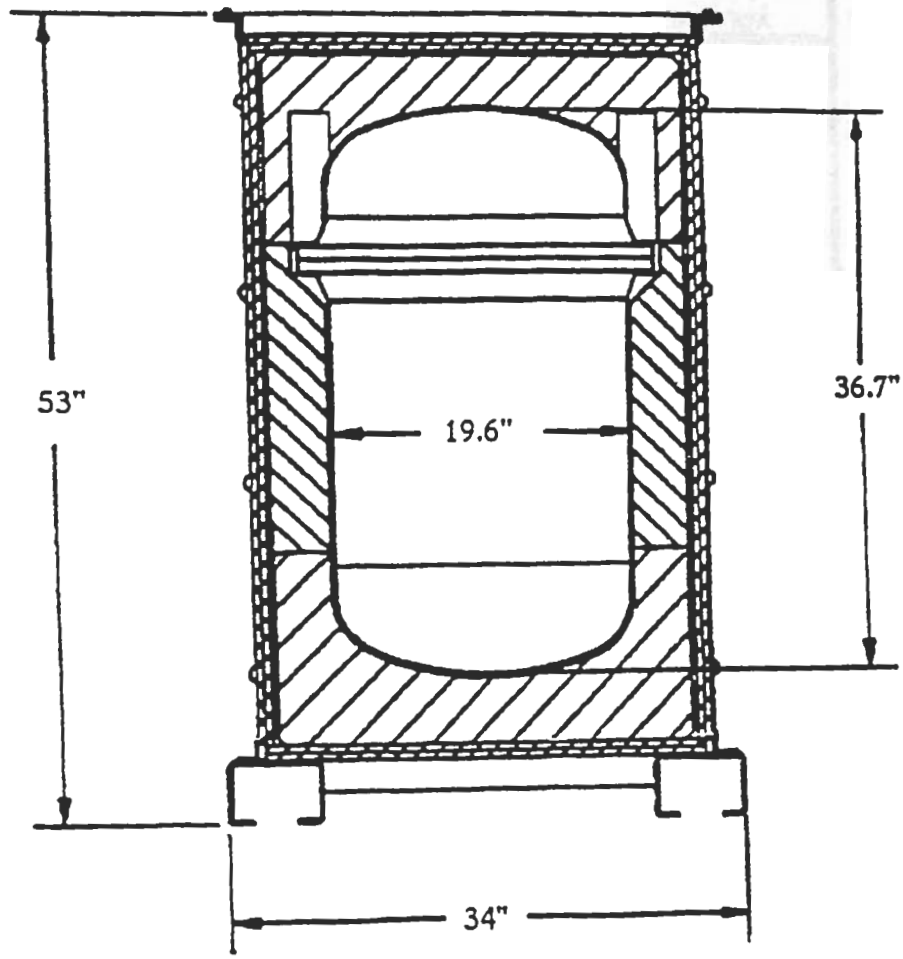


DT23

MAX GROSS WEIGHT 800 LBS

MH2800

Max. Gross Weight = 1320 lbs



SITE: Pantex Plant	FACILITY (Building or Location): Intra-Plant Transportation
	FUNCTION: Transportation

DOE HEADQUARTERS FACILITY LANDLORD DOE/DP-1

DOE HEADQUARTERS PROGRAM SPONSOR DOE/DP-24

FACILITY AGE N/A DESIGN LIFE N/A

Question 1: What facilities are used for processing, handling, and storing HEU?

Summary description of the facility:

- The location of the facility on the site and the distance to the site boundary.

  Intra-Plant Transportation is within the Zone 12 South material access area (MAA), Zone 4 MAA, and designated connecting routes in between these areas. The locations of these Zones within the Pantex Site perimeter are shown in Attachment "Trans - 1." Nuclear explosive component loading dock locations are shown in Attachment "Trans - 2." The distances from the docks to the site boundaries are approximately: 5,599 feet to the east-site boundary; 1,247 feet to the south-site boundary; 9,327 feet to the west-site boundary; and 16,277 feet to the north-site boundary (see Attachment "Trans - 3").

- The design mission, interim mission, current use, and operational status.

  The transportation of nuclear explosives and Canned Sub-assemblies (CSAs) containing highly enriched uranium (HEU) components from one Plant location to another for staging or assembly/disassembly work. Movement routes are shown in Attachment "Trans - 1."

- Operational Status.

  Currently in use.

SITE: Pantex Plant	FACILITY (Building or Location): Intra-Plant Transportation
	FUNCTION: Transportation

- Historical information on Occurrence Reports (including occupational safety incidents), unreviewed safety questions, Defense Nuclear Facilities Safety Board concerns, and other regulatory concerns.

Unusual Occurrence Reports:

None

Completed Unreviewed Safety Question Determinations:

None

Pending Unreviewed Safety Question Determinations:

PX-USQD-95-17 Zone 4, Staging Tritium in Utility Trailers

DNFSB Concerns:

DNFSB Recommendation 95-2 (10/11/95): Standards/Requirements Implementation Documents (S/RIDS).

NOTE: This DNFSB recommendation concerns the entire DOE complex. S/RIDS are currently under development at the Pantex Plant.

- The authorization basis.
  - Basis for Interim Operation (BIO) for the Pantex Plant, Amarillo, Texas, Rev. 3, Errata B, March 1996
  - Final Environmental Impact Statement, Pantex Plant Site, DOE/EIS-0098, October 1983
  - Input Documents for the Nuclear Explosives Safety Master Studies, 1993
  - Nuclear Explosive Safety Master Studies, 1993

Other Pertinent ES&H Documentation:

None

SITE: Pantex Plant	FACILITY (Building or Location): Intra-Plant Transportation
	FUNCTION: Transportation

- Important or unique facility design features.

Design Features:

Hardened trailers start as basic, dry-freight, 12.20 meter (40 foot) commercial trailers that are armor plated with steel-tread plating over hardwood flooring. Landing gear consists of metal posts mounted on the front of the trailer that are lowered to the ground to support the trailer when parked. They are also commonly referred to as Utility Trailers (Utility is the name of the trailer company). The sides and top of the trailers consist of a stainless steel alloy, lined with exterior grade plywood and armor plating. The empty weight of the trailer is approximately 16,330 kg (36,000 pounds). The trailers have three tie-down tracks (right, left, and center). Tie-down chain assemblies with adapters are used to secure cargo in these trailers.

Safe secure trailers (SSTs) are similar to hardened trailers. They have landing gears, five tie-down tracks, and standard aluminum budd wheels with special brake systems. SSTs are designed for off-site transportation and therefore contain safety and security features not found on the hardened trailers. SSTs are normally used only for off-site shipments; however, they can be used for on-site transportation as well.

Flatbed trailers are basic 12.20 meters (40 foot) commercial trailers with the same bed heights as the hardened trailers and SSTs. They are used as loading platforms during hardened trailer or SST loading or unloading operations. Flatbed trailers are pulled by safety-approved tractors. During loading and unloading operations, a personnel ladder is used to climb to and from the trailer. Side boards are installed to prevent the load from sliding off the trailer bed.

Electric forklifts are used for the transportation of nuclear explosives, nuclear components, and hazardous materials within Zone 4 and Zone 12.

Diesel forklifts are used only in Zone 4 for the handling of the magazine concrete security barriers.

Transportation carts are used to transport fully-assembled nuclear explosives or sub-assemblies in various stages of assembly or disassembly between bays, cells, and Zone 12 staging locations. Nuclear explosives and sub-assemblies are loaded and unloaded on the carts using appropriate lifting fixtures, slings, or the bay hoist/crane. Carts may be designed for movement by forklift or hand pushing.

Pallet jacks are hand-operated, powerless devices used to move materials short distances or in spaces where forklifts cannot be employed. They are used in Zones 4 and 12 as required, for processing in bay and cell operations and for staging in magazines. The wheeled forks of a pallet jack will fit between the top and bottom boards of a double-faced pallet. The wheels lower into spaces between the bottom boards to raise the pallet off the floor for transporting. Pallet jacks also are used in the forklift channels designed into DT containers. The physical design of a pallet jack limits it to lifting its load only a few inches off the floor.

SITE: Pantex Plant	FACILITY (Building or Location): Intra-Plant Transportation
	FUNCTION: Transportation

Design Features, Continued:

Loading docks:

- Loading Dock 12-98 is located in the area between Buildings 12-98 and 12-99. (See Attachment "Trans - 2.")
- Loading Dock 12-99 is located southeast of Building 12-99. (See Attachment "Trans - 2.")
- Loading Dock 12-79 is located in an extension on the south end of Building 12-82. (See Attachment "Trans - 2.")

Covered Ramps:

- Intra-connect Zone 12 MAA facilities.

Structural Design:

Not Applicable

Weaknesses in the Design Basis:

None Identified

Description of Partitioned Areas:

These facilities are not partitioned.

- Amounts and locations of hazardous materials collocated or commingled with HEU.

  The HEU is located in Canned Sub-assemblies (CSAs) and containers for transportation. The amount of HEU in each container is contingent upon the particular nuclear explosive system component. There are no mass limits for transportation. Limits are dependent upon the number of containers that can physically fit within the transportation vehicle. For quantities of HEU currently staged in the buildings, see Appendix E of this document.

SITE: Pantex Plant	FACILITY (Building or Location): Intra-Plant Transportation
	FUNCTION: Transportation

- Process Material Transfers:

Material transfers at Pantex consist of containerized nuclear explosives and nuclear components throughout the Plant (Refer to Attachment "Trans - 4"), and from Pantex to Department of Defense (DOD) and other DOE complex facilities and visa-versa. Off-site shipments of nuclear explosives and CSA components use the Safe Secure Trailers (SST) and are received at, or depart from Zone 4. Normally, nuclear explosives and CSA components are unloaded (from the hardened trailers and SSTs) on the roadways in front of the Zone 4 magazines in which they are to be staged. Attachment "Trans - 5" shows a DT-23 container being moved by forklift. The loading or unloading process requires the use of electric forklifts and flatbed trailers. The docks are suitable for loading and unloading nuclear explosives and containerized CSAs containing HEU components.

Intra-plant transportation of nuclear explosives and Canned Sub-assembly (CSA) components between Zone 12 material access area (MAA) and Zone 4 MAA at the Pantex Plant is performed using the hardened trailer or the safe secured trailer (SST) by the Transportation Department, in coordination with the Control Center and the Pantex Security Force. (Refer to Attachment "Trans - 1" for interzone transfer routes).

Nuclear explosives or CSA components being transported between Zone 4 and Zone 12 South are received at Loading Docks 12-79, 12-98 and the dock in 12-99 (Refer to Attachment "Trans - 2"). Electric forklifts are used for loading or unloading of nuclear explosives or CSA components. Loading Docks 12-79, 12-98 and 12-99 are connected by corridors or ramps. Covered ramps 12-R-44, 12-R-64, 12-R-84, 12-R-98 and 12-R-104 connect bay and cell facilities in the area. Loading Dock 12-98 is located in the area between Buildings 12-98 and 12-99. Loading Dock 12-79 is located in an extension on the South end of Building 12-82. Loading Dock 12-99 is located Southeast of Building 12-99 (Refer to Attachment "Trans - 2"). The loading docks, ramps, and corridors are used for the movement of nuclear explosives, CSA components, equipment, and materials. Metal personnel doors on both sides of the ramp are located at regular intervals. Overhead doors are located at exterior roadbed intersections for vehicle access. Personnel may travel within the ramps on foot, bicycle, pedacycle, or in small electric personnel carts.

Pallet jacks, electric forklifts, and transport carts are used for movements between buildings, and packaging or unpackaging operations. Nuclear explosives are transported in H-gear (Handling gear). CSAs containing HEU are transported on site in DOE-approved shipping containers or alternate containers (not approved for off-site shipping) for loading or unloading and packaging or unpackaging operations. Transport carts are used to move CSA components or nuclear subassemblies to staging and packaging or unpackaging operations. The loading docks, vehicles, or handling equipment have not been included in a draft or approved Safety Analysis Review (SAR), but they have been analyzed in Nuclear Explosive Safety Studies (NESSs).

CSA components and nuclear explosives are not transported during severe weather conditions. Weather conditions for the general area are tracked by meteorologists in Amarillo with state-of-the-art equipment. Pantex Plant also has out-lying lightning monitors that measure static conditions. If the transportation of a CSA is underway when a warning is issued, the convoy will continue to its destination where the truck will be parked and operations discontinued until the all clear is given.

SITE: Pantex Plant	FACILITY (Building or Location): Intra-Plant Transportation
	FUNCTION: Transportation

- On-site transportation and its interfaces with the facility or partitioned area.
  - Hardened Trailers
  - Safe Secure Trailers (SSTs)
  - Electric Forklifts
  - Flatbed Trailers
  - Pallet Jacks
  - Transportation Carts

- Staffing levels and staff experience (in years).

	Number of Employees	Average Facility Experience	Experience Range
Transportation			
Supervisory	13	16	1 - 31
Operators	57	14	1 - 37
Crafts			
Craft Supervisors	5	24	5 - 38
Craft Technicians	33	20	5 - 45

NOTE: Maintenance members reflect a pool of personnel available to be assigned to perform maintenance in Zone 12.

SITE: Pantex Plant	FACILITY (Building or Location): Intra-Plant Transportation
	FUNCTION: Transportation

References:

- Basis for Interim Operation for Pantex Plant, Amarillo, Texas, Rev. 3, Errata B, March 1996
- Critical Safety Systems Manual, MNL 1101, Revision 3C, December 1995
- Department of Energy Plutonium ES&H Vulnerability Assessment, Pantex Site Assessment Team Report, July 29, 1994
- Final Environmental Impact Statement, Pantex Plant Site, DOE/EIS-0098, October 1983
- Input Document General Use Nuclear Explosives Processing Facilities Master Study, July 1993
- Nuclear Explosive Safety Master Studies, 1993
- Safety Information Document, October 1995

Transportation Procedures:

- Pantex Plant Standard 7-5080, On-site Transportation of Chemical Explosives, Nuclear Explosives, and Weapon Components
- Pantex Plant Standard 7-5626, Specific Safety Requirements for Building 4-26
- Pantex Plant Standard 7-5638.1, General Safety Requirements for Handling and Transporting Nuclear Explosives and NELAs
- Pantex Plant Standard 7-5644, Decontamination of Transport Vehicles
- Pantex Plant Standard 7-5650, General Safety Requirements for Zone 4
- Transportation Safety Analysis Report, Draft B

SITE: Pantex Plant	FACILITY (Building or Location): Intra-Plant Transportation
	FUNCTION: Transportation

Question 2: What barriers are used to protect workers, the public and environment from HEU?

Barrier Types

Worker Barrier	Public/Environmental Barrier	Criticality	Administrative Barrier
☐ Gloveboxes	☒ Facility/Building Boundary	☐ Containers	☒ Procedures: Operation, Maintenance
☐ Transfer System	☐ HVAC/Confinement	☐ Physical Dividers	☒ Material Limits
☐ Duct	☐ Liquid Containment/Dike	☐ Poisons	☐ Monitoring
☐ Filter	☐ Bays, Cells, Magazines	☐ Concentration Control	☒ Configuration Control
☐ Vault	☐ Canyons	☐ Stirrers	☒ Quality Assurance
☐ Room	☐ Pads	☐ Volume Control	☒ Conduct of Operations
☐ Hot Cell/Canyon	☒ Site Boundary	☐ Double Contingency	☒ Authorization Basis
☐ Hood	☐ Trenches	☒ Other (Criticality)	☒ Training
☐ Piping	☐ Storage Vault		☒ Organization
☐ Shielding	☐ Fire Suppression		☒ Lessons Learned
☐ Distance	☐ Alarm System		☐ Testing
☐ Respiratory Protection	☒ Other (listed below)		☐ Trending
☐ Protective Clothing			☒ Records
☐ Remote Handling			☒ Standards
☐ Confinement System			☒ External Regulation
☐ Burial Ground			☐ Surveillance
☐ Tanks			☒ Personnel Reliability Assurance Program
☐ Alarm System			☒ Worker Access/ Occupancy Limits
☐ Temporary Barriers			☒ Emergency Response
☒ Other (listed below)			☐ Other (specify)

SITE: Pantex Plant	FACILITY (Building or Location): Intra-Plant Transportation
	FUNCTION: Transportation

Other Worker Barriers:

Forklift/Truck Speed Limit
Walker/Spotter
Containers
Personnel Limits

Other Public/Evironmental Barriers:

Hardened Trailer
Safe and Secure Trailer

Note: Worker, Public, and Environmental barriers are shown in Attachment "Trans - 6."

Worker Barriers:

Forklift/Truck Speed Limit:

The speed limit for forklifts traveling in the ramps is 5 mph. Adherence to the forklift speed limit is ensured by the "walker-spotter" program since a "walker-spotter" must walk at a reasonable pace in front of the vehicles.

The speed limit for tractor-trailers transporting nuclear explosives or nuclear components on roads at Pantex Plant is 20 mph.

Walker/Spotter:

A "walker-spotter" walks in front of the forklift and directs all traffic, including foot traffic, to stop until the vehicle carrying the nuclear material passes. Traffic is not permitted to pass a forklift transporting such materials, unless directed by the "walker-spotter." The "walker-spotter" is used in Zone 12 only.

SITE: Pantex Plant	FACILITY (Building or Location): Intra-Plant Transportation
	FUNCTION: Transportation

Worker Barriers, Continued:

Containers:

Several types of containers are used as packages for nuclear material components. These containers provide protection of their contents from damage during a transportation accident, contribute to criticality safety, and provide additional protection from fires and flooding during staging.

Personnel Limits:

Limits on personnel numbers have been established for operations on loading docks. Personnel performing nuclear explosive and nuclear material loading or unloading operations are protected by limiting traffic through the dock ramp way, and controlling the number of personnel allowed in the area of the loading

SITE: Pantex Plant	FACILITY (Building or Location): Intra-Plant Transportation
	FUNCTION: Transportation

Administrative Barriers, Continued:

Conduct of Operations:

Formality in the conduct of operations at Pantex is based on bench marking and implementation of best practices into the program. The program is administered in accordance with the Pantex Plant Conduct of Operations Manual, MNL-00040.

Authorization Basis:

The authorization basis is defined through the existing Final Safety Analysis Reports (FSARs), the Nuclear Explosive Master Studies, and the Basis for Interim Operation in conjunction with the Critical Safety System Manual until new FSARs are developed in accordance with DOE Order 5480.23.

Training:

The Pantex training program provides personnel with appropriate education, training, and certification programs that promote an increased state of awareness of the responsibilities and operating practices at the Plant.

Organization:

The operating organization is part of a network of supporting management, technical, and support functions that is sufficient to ensure that hazards and safety issues are identified, communicated, evaluated, resolved, and documented.

Lessons Learned:

Pantex Plant Standard STD-6216 establishes a process for reviewing and analyzing operational management experiences and translating these experiences into lessons learned.

Records:

Records are maintained by the Nuclear Material Control Center (NMCC) of the nuclear explosive and Canned Sub-assembly (CSA) movements and locations.

Standards:

Plant O&I Standard 7-5638.1 for the transportation of the nuclear explosives and CSAs between Zone 4 and Zone 12, Plant O&I Standard 7-5080 is used for the movement of the nuclear explosives and CSAs in Zone 12 ramps and loading docks, and Plant Standard STD-3470 provides the responsibilities and guidance for the on-site movement of hazardous materials.

Plant Standards are management control documents that outline both specific management objectives and how process and activities are to be accomplished and controlled. These standards are based on and developed from the Plant policy directives, which are those management documents that provide direction, assign responsibilities, and define goals on a Plant-wide basis.

SITE: Pantex Plant	FACILITY (Building or Location): Intra-Plant Transportation
	FUNCTION: Transportation

Administrative Barriers, Continued:

External Regulations:

The Code of Federal Regulations, Safety Analysis Reports, Safety Analysis Reports for Packaging and TP45-51 are incorporated into Plant Standards, process standards, the Basis for Interim Operation, Draft Safety Analysis Report, and Draft Nuclear Explosive Safety Study.

Personnel Reliability Assurance Program:

This program establishes the requirements and responsibilities for screening, selecting, and continuously evaluating those employees being assigned to or considered for assignment to critical duties.

Worker Access/Occupancy Limits:

The Material Access Area (MAA) limits access with a security fence to areas containing HEU components. The Limited Access Area is an additional security fence around the MAA with controlled access.

Emergency Response:

Pantex has an effective emergency response program that includes the management, planning, preparedness, readiness assurance, response, and mitigation of emergency conditions.

SITE: Pantex Plant	FACILITY (Building or Location): Intra-Plant Transportation
	PARTITIONED AREAS: Current Facility

Question 3: What are the HEU holdings and how are they packaged?

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Age of Packaging (in years)	Number of Packages	Mass (kg)
Weapon Components	Weapons	Pits; HEU pits hermetically sealed within stainless steel cladding	55 gallon, DT Drum	Zone 12 MAA, Zone 4 MAA, and designated connecting routes between these areas	12-40	See Appendix E	See Appendix E
Weapon Components	Weapons	CSA; Multiple Nuclear Explosive Programs Canned Sub-Assemblies	55-212 Gallon DT Drums; Shipping Containers Overpacks; Other; H-Gear	12 MAA, Zone 4 MAA, and designated connecting routes between these areas	3-40	See Appendix E	See Appendix E

Description of packaging and its intended protective function:

Packaging Narrative, Weapons Components, Pits:

Uranium pits at Pantex are normally packaged in the DT-9 container. A sketch of the DT-9 container is shown in Attachment "Trans - 7." The DT-9 does not meet the Type B requirements of 10 CFR 71 and therefore can only be used for on-site transportation and staging. The DT-9 is a 55 gallon drum container made of carbon steel. It does not have an inner containment vessel, however, celotex inserts form the inner barrier of the outer drum. The pit is placed in a sling or lifting/holding fixture and this assembly is placed into the container outer drum. A Tamper Indicating Device (TID) security seal is then attached.

The packaging consists of several receptacles, neutron absorbing materials, spacing for structural integrity, thermal insulation, radiation shielding, devices for absorbing mechanical shock, and sometimes the conveyance, tie-down system, and auxiliary equipment. The DT-9 container protects the items inside from physical damage during transportation and storage. The container itself is not hermetically sealed and therefore does not provide for total environmental containment.

Packaging Narrative, Weapons Components, CSA:

Nuclear Assembly H-Gear (Hand Trucks and Drum Type) is the original container built to transport the nuclear explosive as a complete unit between DOE and DOD. When the nuclear explosive components are removed for disassembly and inspection, some sub-components are staged in the H-Gear. The H-Gear is in three configurations: (1) hand truck; (2) hand trucks with covers; and (3) drum type containers. An example of an H-Gear container is shown in Attachment "Trans - 8," which is located in the classified Appendix E.

SITE: Pantex Plant	FACILITY (Building or Location): Intra-Plant Transportation
	PARTITIONED AREAS: Current Facility

Packaging Narrative, Weapons Components, CSA, Continued:

DT drum shipping containers used by the Pantex Plant include the DT-18, DT-20, DT-22, DT-23, HSC-1, and HSC-2; container diagrams or pictures are shown in Attachments "Trans - 9," "Trans - 10," "Trans - 11," "Trans - 12," "Trans - 13," and "Trans - 14." The DT containers are drum type containers that meet Type B requirements of 10 CFR 71 which is documented in a Safety Analysis Report for Packaging (SARP). The DT container includes an inner containment vessel which is hermetically sealed. The outer drum is made of stainless steel except for the DT-18 which is made of carbon steel. The drum sizes range from 55 to 212 gallons. Celotex inserts form the inner barrier of the outer drum. An inner containment vessel is made of stainless steel. Rubber inserts formed to dimensions of each particular Canned Sub-assembly (CSA) are used inside the inner containment vessel. Additionally, a sling or holding fixture as required by the configuration may be in the inner containment vessel. The horizontal shipping containers (HSC) shown in Attachment "Trans - 14," do not meet the requirements of 10 CFR 71; however, they are approved for off-site transportation by the Nuclear Explosive Safety Division (NESD) DOE AL. These shipping containers are 48 inches wide by 102.5 inches long and made of stainless steel. The interior inserts conform to the shape of the cased CSA and are made of 30 pound foam.

Additional CSA staging containers utilized at Pantex include nuclear assembly H-Gear (Hand Trucks and Drum Type), Wooden Boxes (8000 series), and decertified DT containers (DT-3, DT-5, DT-16, etc). These containers do not meet the requirements of 10 CFR 71 and do not contain an inner containment vessel, however, they are DOE authorized for on site transportation and staging of nuclear explosive components.

The 8000 series boxes have a steel base. The base contains steel chocks and steel bands to secure CSAs in place. The lid consists of a steel frame with wooden planks making up the sides and top. The lid is secured to the base using 6 to 8 bolts.

The MH2800 is a 146-gallon container with inserts and an inner containment vessel (See Attachment "Trans - 15"). It meets the requirements of the Type B configuration; however, it is not authorized as a shipping container for CSAs other than one type of CSA. It is used to store other CSAs based on size.

The modified MH2800s have had the inner containment vessel removed. What remains is the 146-gallon stainless steel drum and foam inserts. This configuration does not meet the Type B container requirements. This configuration is used for on-plant staging only.

All containers used at the Pantex Plant are designed to protect the contents from damage during transportation and staging, and provide for criticality safety (Pantex Plant Criticality Safety Program Analysis, February 28, 1996, and the DOE approved Basis for Interim Operation for the Pantex Plant). The approved shipping containers also provide an additional containment barrier for the contents (hermetically sealed inner containment vessel). Where required, the packaging consists of several receptacles, neutron absorbing materials, spacing for structural integrity, thermal insulation, radiation shielding, devices for absorbing mechanical shock, and sometimes the conveyance, tie-down system, and auxiliary equipment. These items are in place to protect the item inside the container.

Describe material at risk, which constitutes a source term.

Weapons Components, Pits and CSAs

The number of packages (inventory) and the associated material at risk per container is in the classified Appendix E to this document.

	FACILITY (Building or Location): Intra-Plant Transportation
	PARTITIONED AREA: Current Facility

ential causes for the failure of materials, packages, and barriers?

	Potential Causes	
	Material	External
fers	☐ Aging ☐ Container Seal Degradation ☐ Pressurization ☐ Pyrophoricity ☐ Radioactivity	☒ Fire ☐ Explosion ☐ Earthquakes ☐ Subsidence ☒ Winds
rds ent ion Knowledge	☐ Chemical Reactivity ☐ Radiolysis ☐ Volumetric Expansion ☐ Oxidation ☐ Flammability	☐ Floods ☐ Extreme Temperature ☐ Snow ☐ Ash Loading
ice Failure ols	☐ Toxicity ☐ Hydrolysis ☐ Crystalization ☒ Other (listed below)	☒ Aircraft Crash ☒ Vehicle Accident ☐ Onsite Transportation ☐ Adjacent Facility Accident ☐ Other (specify)
n Basis		
s (specify)		

SITE: Pantex Plant	FACILITY (Building or Location): Intra-Plant Transportation
	PARTITIONED AREA: Current Facility

Facility Causes:

Aging/Degradation:

Aging/Degradation of the hardened trailers could lead to the trailer failing as a barrier.

Combustible Loadings:

The transportation vehicles and loading docks contain a minimal amount of combustible loading. Loading docks may contain stacked wooden pallets and wooden blocks that in a fire could cause failure of a barrier.

Other Collocated Hazards:

Detonation of collocated explosives could result in the trailer and container failing as barriers.

Human Error:

Human errors during loading and unloading procedures, or a transportation vehicle accident, could cause a failure of a highly enriched uranium (HEU) component container or the trailer as barriers.

External Causes:

Aircraft Crash:

Large cargo planes, Air Force bomber and fighter aircraft, and commercial aircraft directly impacting the trailers are a potential cause for the failure of multiple barriers, (e.g., containers and trailers), resulting in the dispersal of HEU.

Vehicle Accident:

Accidents during transportation between Zone 4 and Zone 12, as well as within the Zones, could breach the hardened trailer, causing container barrier failure.

Fire:

Diesel/gasoline fire directly impacting the trailers is a potential cause for failure of multiple barriers, (e.g., trailer and container).

Wind/Tornados:

Winds/Tornados have the potential for causing the collapse of the ramp structure with associated impact loads on the materials in the ramp. Also, a transportation vehicle could be overturned as a result of winds/tornado.

SITE: Pantex Plant	FACILITY (Building or Location): Intra-Plant Transportation
	PARTITIONED AREA: Current Facility

Question 5: What are potential effects from the causes identified?

Potential Effects

Facility	External
☒ Fire ☐ Explosion ☐ Contamination ☐ Criticality ☐ Leakage/Spills ☐ Other Accidents (specify) ☐ Structural Failure ☐ Equipment Failure ☐ Material Release ☐ Increased Radioactivity Level ☐ Other (specify)	☐ Loss of Site Integrity ☐ Loss of Building Integrity ☐ Release of Materials ☐ Radiation and Releases from Criticality ☒ Other (listed below)
Material ☐ Criticality ☒ Material Release ☐ Breach of Packaging ☐ Fire ☐ Other (specify)	

Facility Effects:

Fire:

A fire could cause damage to the tractor/trailer or loading docks.

Material Effects:

Material Release:

Failure of a Canned Sub-assembly (CSA), caused by an impact with a forklift tine, can result in the release of radioactive material.

External Effects:

Aircraft Crash:

An aircraft crash could cause the loss of container barrier integrity during intra-plant transfer of highly enriched uranium (HEU) components.

E: Pantex Plant	FACILITY (Building or Location): Intra-Plant Transportation
	PARTITIONED AREA: Current Facility

estion 6: What are the potential consequences from the effects identified?

ect	WORKER			ENVIRONMENT			PUBLIC		
	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
:e	N	N	N	N	N	N	N	N	N
aterial elease	N	N	N	N	N	N	N	N	N
ircraft Crash	Y	Y	Y	Y	Y	Y	Y	Y	Y

Explanation:

Fire:

The consequences of fire are the dispersal of highly enriched uranium (HEU) at a level that could potentially affect workers, public and the environment. The estimated frequency of this event is in the range of 1×10^{-4} (unlikely) to 1×10^{-6} events per year (extremely unlikely) depending upon the specific event scenario considered. Overall the fire is assumed to propagate 10 percent of the time that a forklift or tractor/trailer catches fire. The preventive measures are: (1) administrative controls for the movement of Canned Sub-assemblies (CSAs) with a forklift or tractor/trailer restricting their speed, personnel and vehicle requirements when approaching or following a movement, and inclement weather requirements; (2) personnel training programs; and (3) plant safety requirements.

Material Release:

The consequences of material release are the dispersal of HEU at a level that could potentially effect workers, public, and the environment. The estimated frequency of this event is in the range of 1×10^{-4} (unlikely) to 1×10^{-6} events per year (extremely unlikely) depending upon the specific event scenario considered. Material release can result from a vehicle accident, fire or natural occurrence. The preventive measures are: (1) administrative controls for the movement of CSAs with a forklift or tractor/trailer restricting their speed, personnel and vehicle requirements when approaching or following a movement, and inclement weather requirements; (2) personnel training programs; and (3) plant safety requirements.

Aircraft Crash:

This vulnerability is addressed by Vulnerability Assessment Form number "SAT/01."

Applicable References:

None

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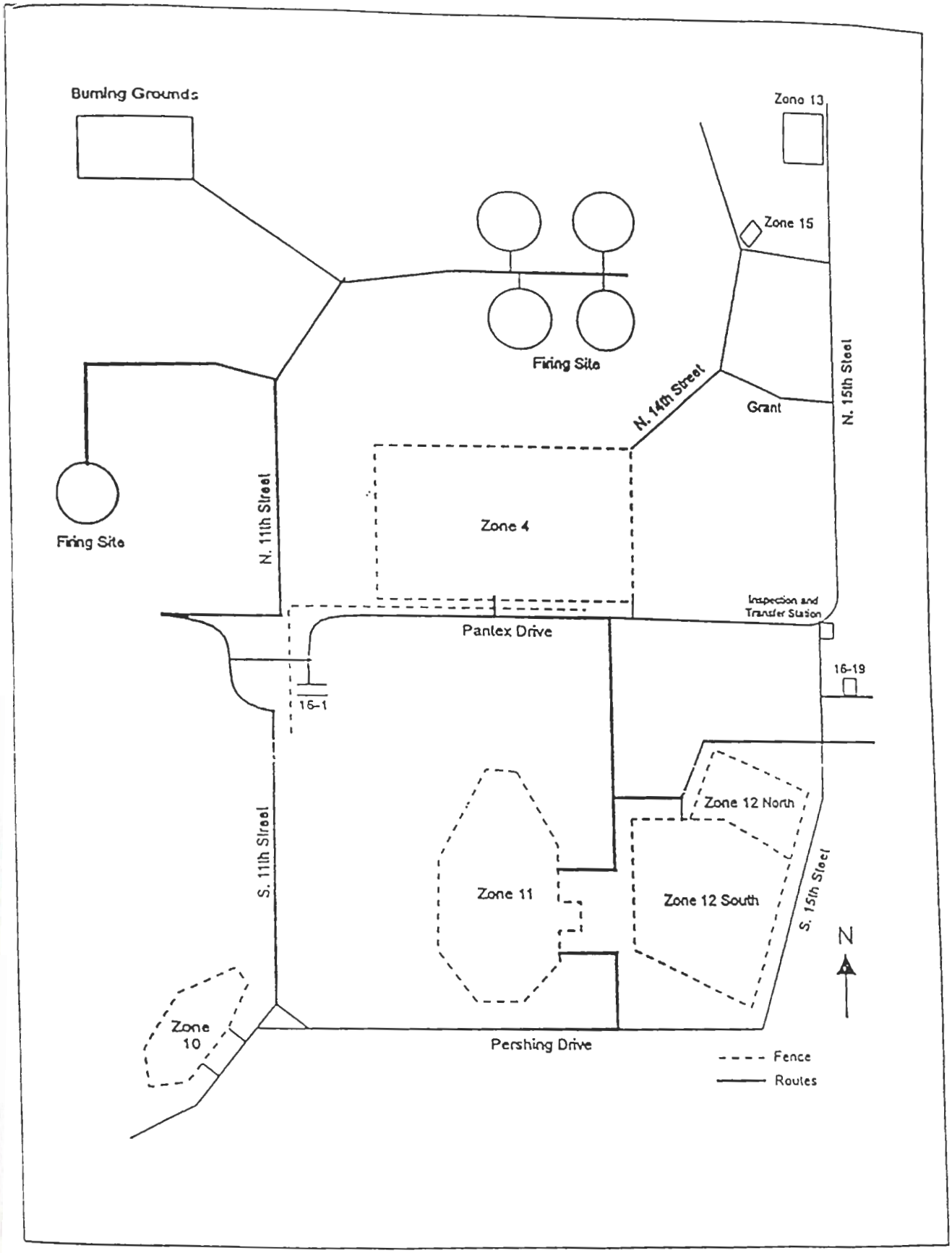
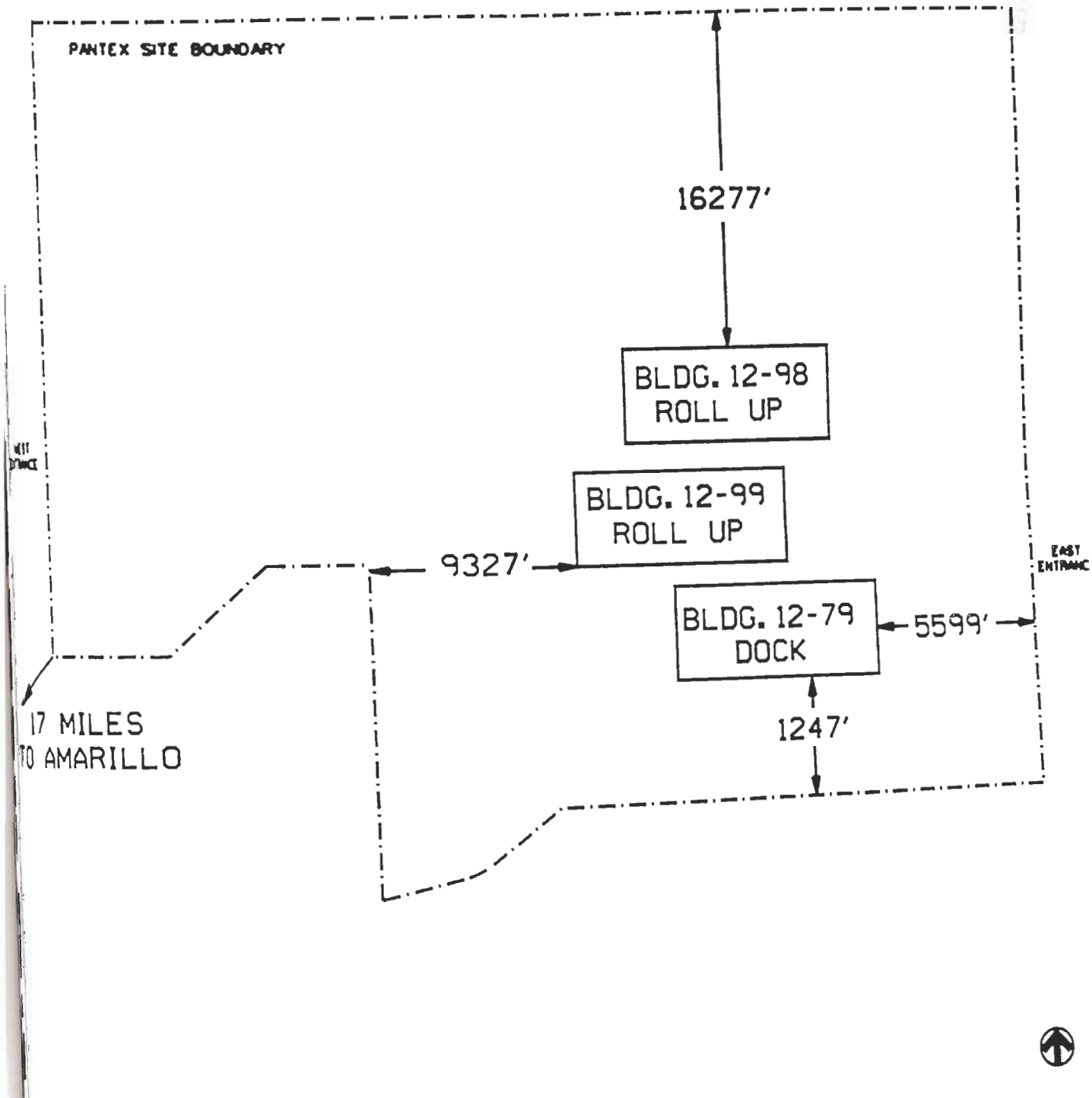
PANTEX PLANT



Interzone Transfer Routes

Attachment "Trans - 1"

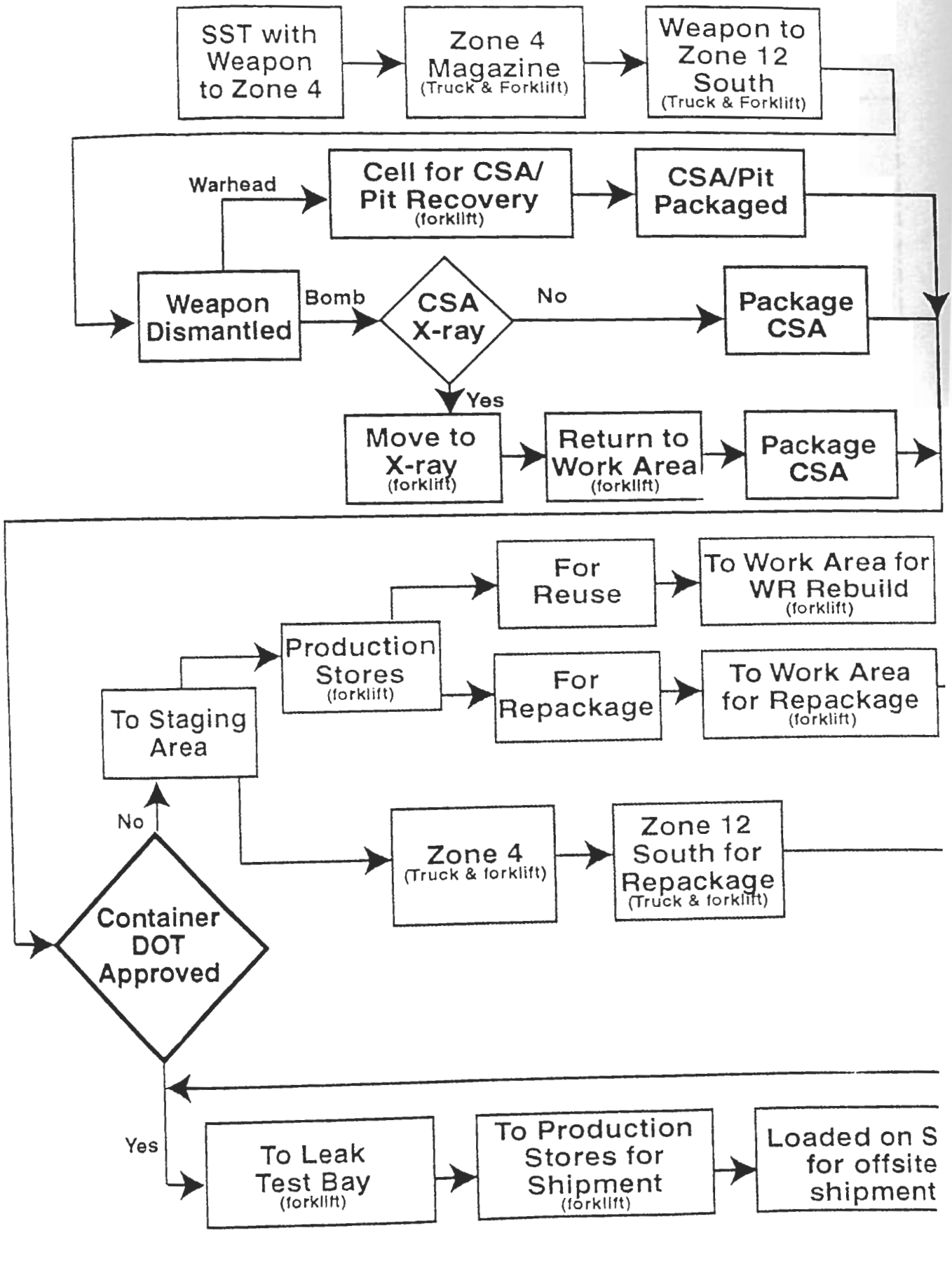
PANTEX PLANT
HEU FACILITY LOCATION SKETCH



BUILDINGS 12-79, 12-98 & 12-99

Attachment "Trans - 3"

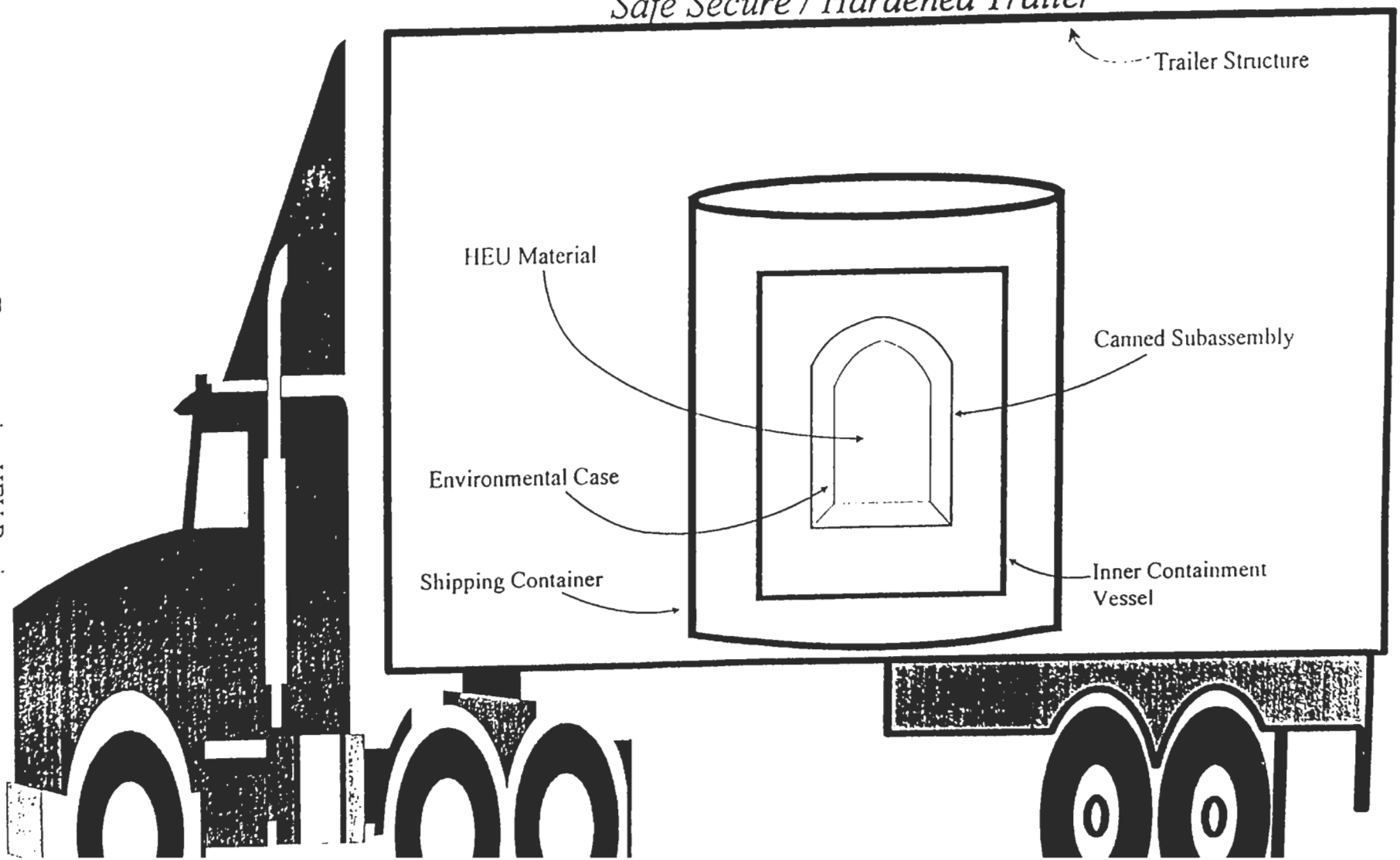
PANTEX PLANT HEU MOVEMENTS



Typical shipping container

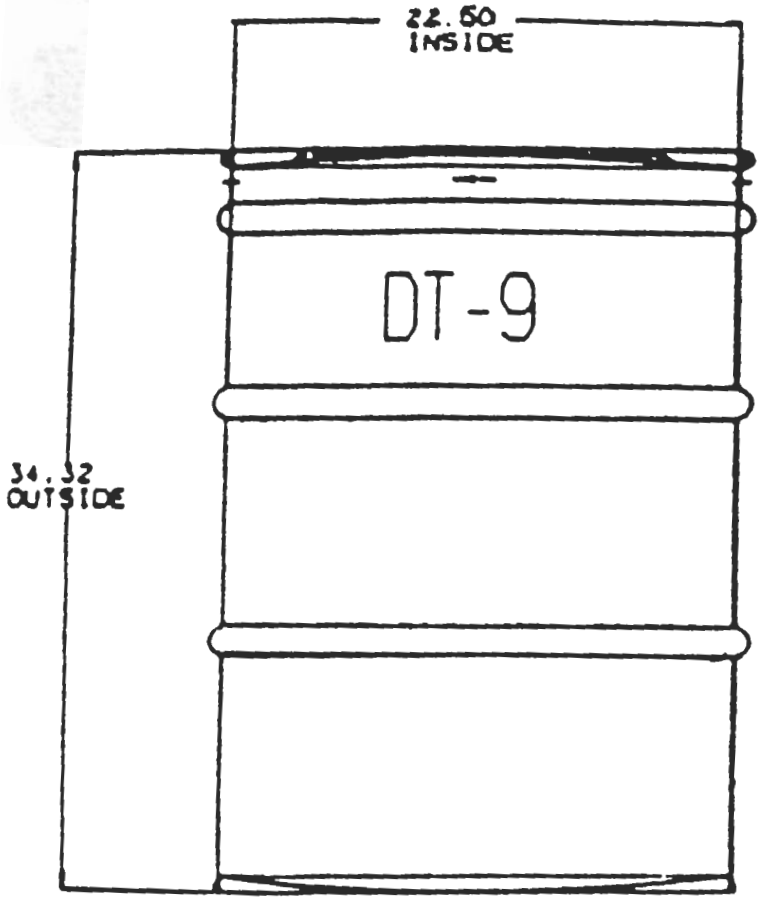
BARRIERS (WORKER, PUBLIC & ENVIRONMENT)

Safe Secure / Hardened Trailer

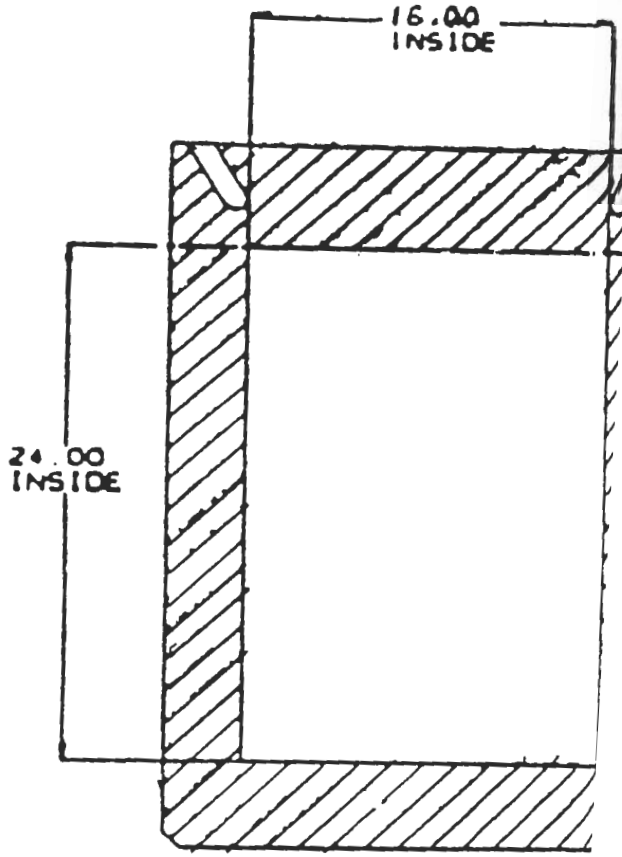


Transportation HEU Barriers

Pantex Plant



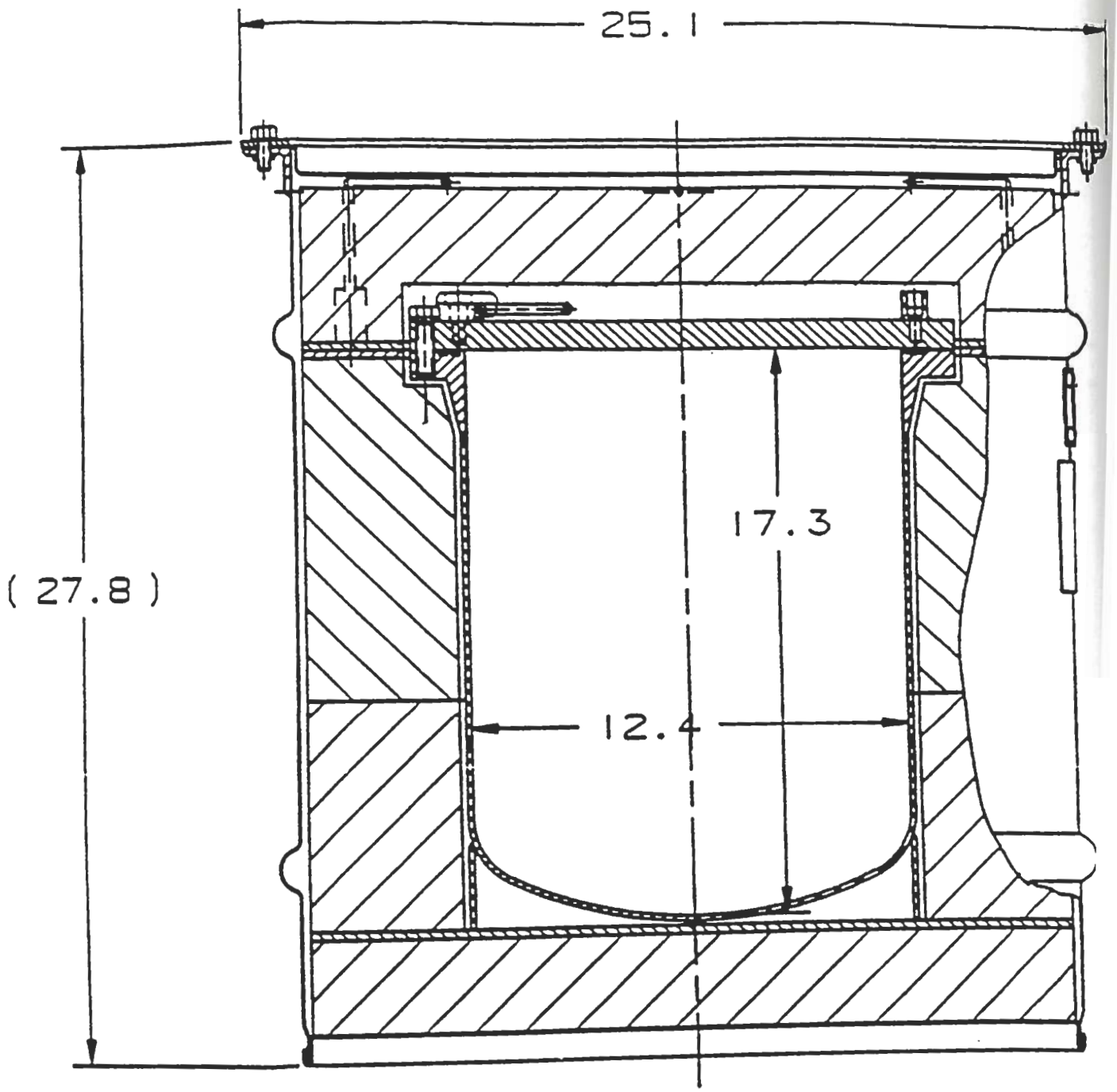
DT-9
DRUM 17-H 55 GAL.



CELOTEX
INSERT

Attachment "Trans - 8"

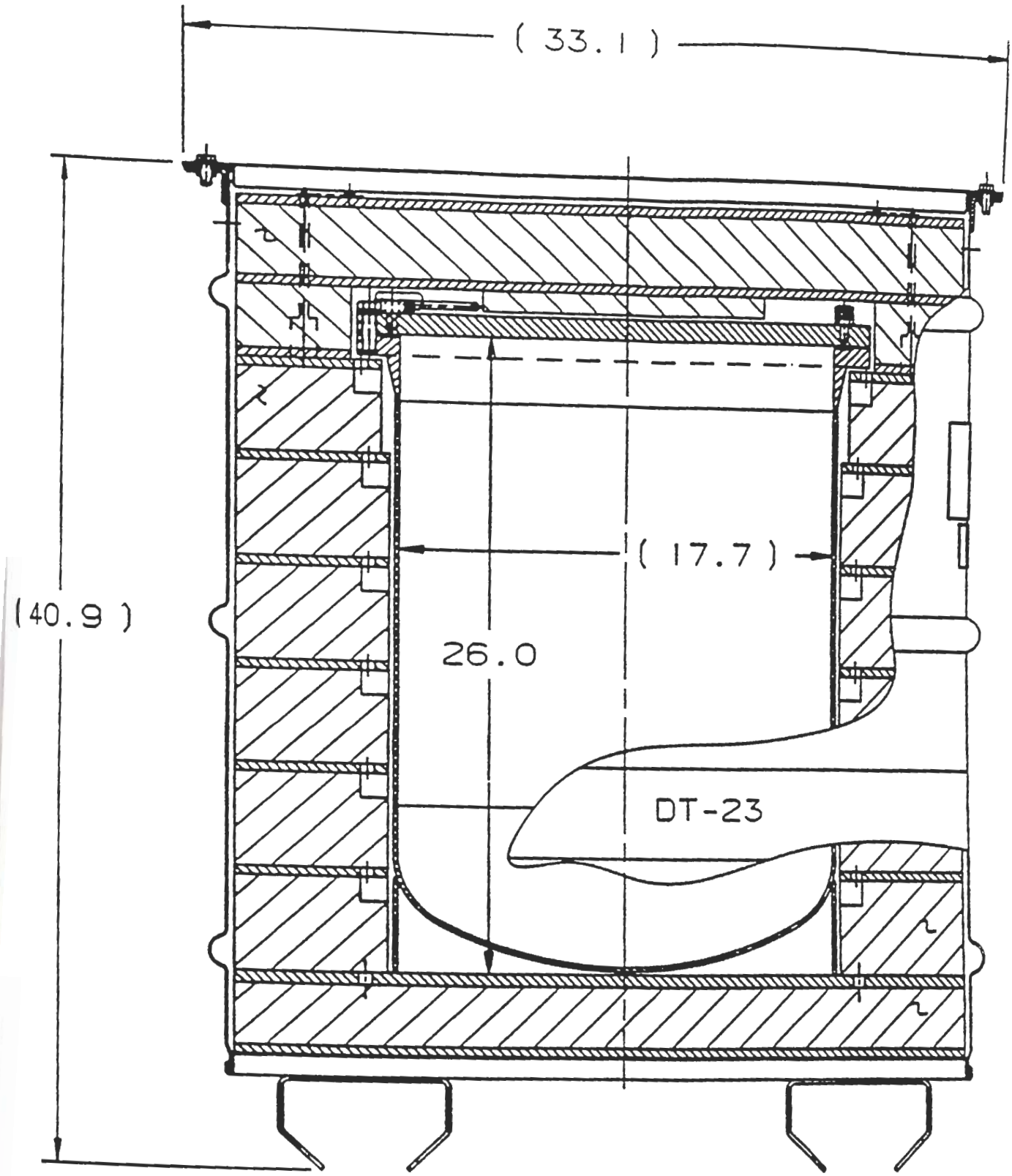
See Classified Appendix E



DT22

MAX GROSS WEIGHT 385 LBS

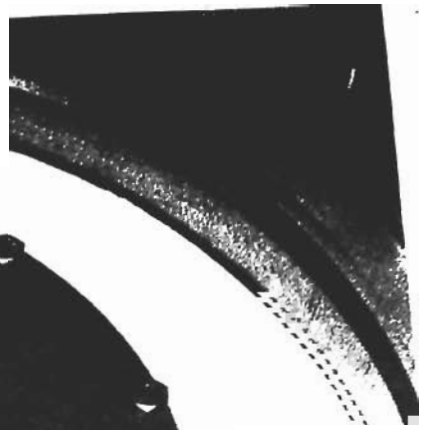
Attachment "Trans - 11"

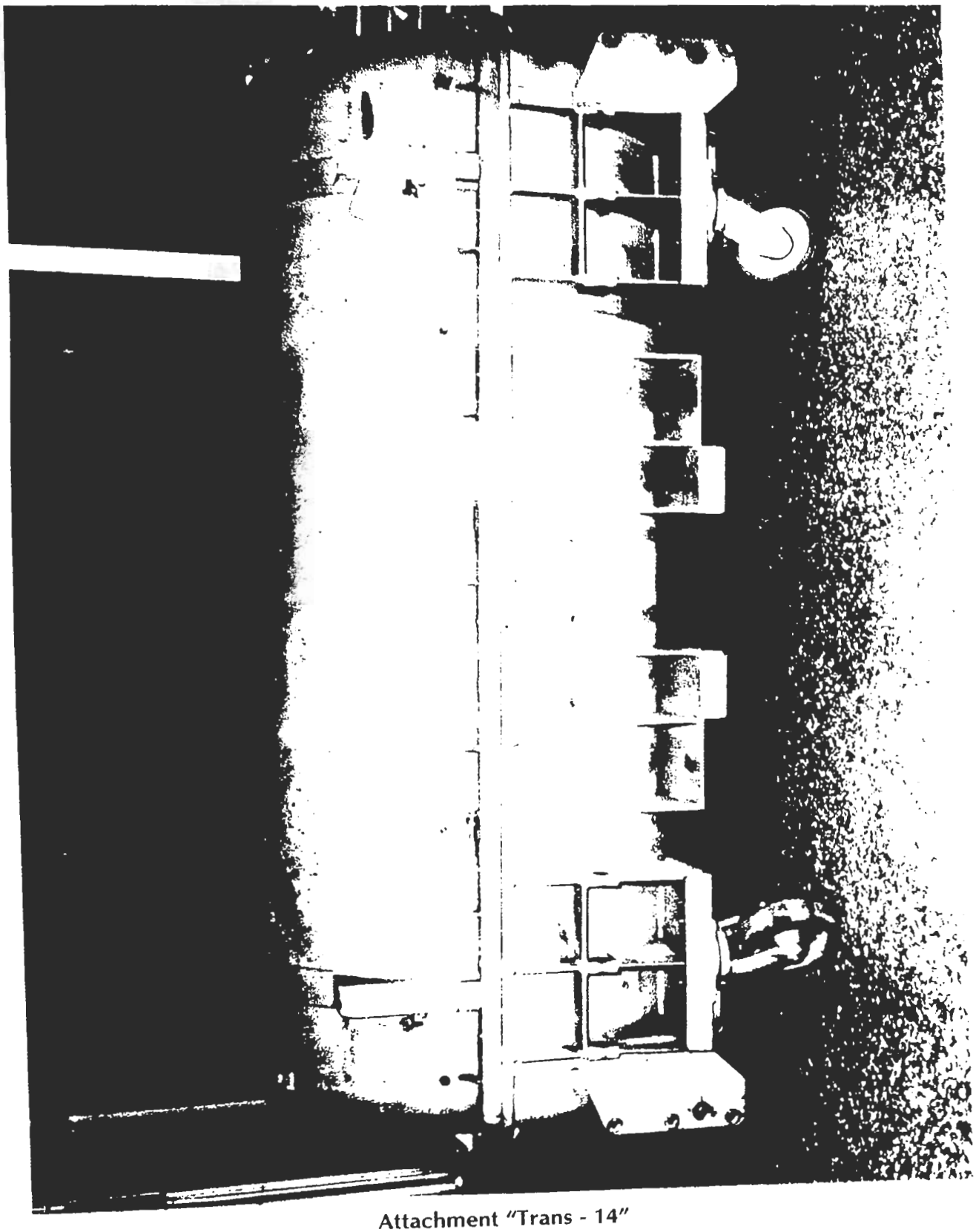


DT23

MAX GROSS WEIGHT 800 LBS

Attachment "Trans - 12"



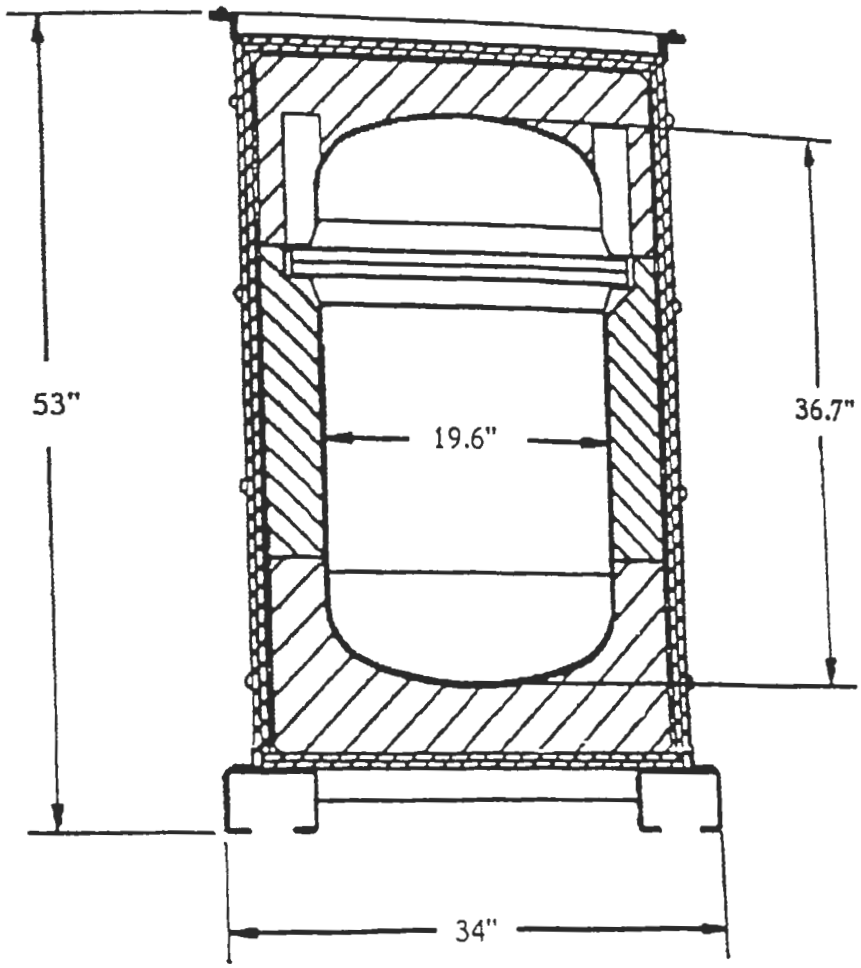


Attachment "Trans - 14"

PANTEX _ Shipping container

MH2800

Max. Gross Weight = 1320 lbs



Attachment "Trans - 15"

SITE: Pantex Plant	FACILITY (Building or Location): Building 12-2, Source Room
	FUNCTION: Sources Storage

- The authorization basis.

  - Pantex Plant Safety Analysis Report General Information Document, June 1995

  Other Pertinent ES&H Documentation:

  - Pantex Plant Standard STD-3211 (Control of Non-Weapon Radioactive Material Sources)
  - Pantex Plant Radiation Safety Internal Operating Procedure, IOP-05242 (Sealed Radioactive Source Control)
  - DOE N5400.13 (Sealed Radioactive Sources Accountability)

- Important or unique facility design features.

  Design Features:

  Sources are stored in a locked cabinet and a locked room, which is access controlled. The room and cabinet are appropriately posted. The locked access door and locked cabinet are shown in Attachments "Sources - 2" and "Sources - 3."

  Structural Design:

  Brick/Cement Blocks

  Weaknesses:

  None Identified

  Description of Partitioned Areas:

  These facilities are not partitioned. The source storage area is a dedicated room with controlled access.

- Amounts and locations of hazardous materials collocated or commingled with HEU.

  None

- Process material transfers within the facility.

  Normal operations that involve HEU sources do not require the transfer of materials; however, during inventory, the sources, or their containers, are swiped as part of the source integrity test to determine if a source is leaking. If a source is found to be leaking, a Radiation Safety Technician places the source in double plastic bags to prevent spread of contamination. This is the only "material transfer" associated with these HEU sources since they are staged in a storage condition.

SITE: Pantex Plant	FACILITY (Building or Location): Building 12-2, Source Room
	FUNCTION: Sources Storage

- On-site transportation and its interfaces with the facility or partitioned area.

  HEU sources are not used at the Pantex Plant. All are in excess of requirements, awaiting disposal.

- Staffing levels and staff experience (in years).

	Number of Employees	Average Facility Experience	Experience Range
Supervisory	1	7	7
Rad. Technicians	2	3	3

References:

- Basis for Interim Operation for Pantex Plant, Amarillo, Texas, Rev. 3, Errata B, March 1996
- DOE N5400.13 (Sealed Radioactive Sources Accountability)
- Pantex Plant Safety Analysis Report General Information Document, June 1995
- Pantex Plant Standard STD-3211 (Control of Non-Weapon Radioactive Material Sources)
- Pantex Plant Radiation Safety Internal Operating Procedures, IOP-05242 (Sealed Radioactive Source Control)

SITE: Pantex Plant	FACILITY (Building or Location): Building 12-2, Source Room
	FUNCTION: Sources Storage

Question 2: What barriers are used to protect workers, the public and environment from HEU?

Barrier Types

Worker Barrier	Public/Environmental Barrier	Criticality	Administrative Barrier
☐ Gloveboxes	☒ Facility/Building Boundary	☐ Containers	☒ Procedures: Operation, Maintenance
☐ Transfer System	☐ HVAC/Confinement	☐ Physical Dividers	☐ Material Limits
☐ Duct	☐ Liquid Containment/Dike	☐ Poisons	☐ Monitoring
☐ Filter	☐ Bays, Cells, Magazines	☐ Concentration Control	☐ Configuration Control
☐ Vault	☐ Canyons	☐ Stirrers	☐ Quality Assurance
☒ Room	☐ Pads	☐ Volume Control	☐ Conduct of Operations
☐ Hot Cell/Canyon	☒ Site Boundary	☐ Double Contingency	☐ Authorization Basis
☐ Hood	☐ Trenches	☒ Other (Not Applicable)	☒ Training
☐ Piping	☐ Storage Vault		☐ Organization
☐ Shielding	☐ Fire Suppression		☐ Lessons Learned
☐ Distance	☐ Alarm System		☐ Testing
☐ Respiratory Protection	☐ Other (specify)		☐ Trending
☐ Protective Clothing			☒ Records Standards
☐ Remote Handling			☐ External Regulation
☐ Confinement System			☐ Surveillance
☐ Burial Ground			☐ Personnel Reliability Assurance Program
☐ Tanks			☒ Worker Access/ Occupancy Limits
☐ Alarm System			☐ Emergency Response
☐ Temporary Barriers			☐ Other (specify)
☒ Other (locked file cabinet)			
☐ None			

SITE: Pantex Plant	FACILITY (Building or Location): Building 12-2, Source Room
	FUNCTION: Sources Storage

Note: Worker, Public, and Environment barriers are shown in Attachment "Sources - 4."

Worker Barriers:

Room (Controlled Access) and Locked File Cabinet:

Sources are located in a locked file cabinet inside a locked room that is access controlled. The room and the cabinet are appropriately posted as radiological areas.

Locked File Cabinet:

This is a five-drawer steel filing cabinet that has a flat steel locking device that runs the length of the cabinet and is locked with a combination lock at the top of the cabinet. (Refer to Attachment "Sources - 3.") The Source Registrar controls the combination to this lock.

Public/Environmental Barrier:

Facility/Building Boundary:

The facility is located within a limited access area. Access to this area is controlled for security purposes and therefore the public is denied unescorted access.

Site Boundary:

The distance between the site boundary and Building 12-2 precludes public access to the building.

Administrative Barriers:

Procedures:

Handling and movement of HEU sources, if required, are performed in accordance with approved procedures.

Training:

All personnel who handle or have custody of the HEU sources are trained Radiological Workers or Radiation Safety Technicians. Personnel training is consistent with required DOE Core training.

Records:

The Radiation Safety Department manages the Sealed Radioactive Source Control program for the Pantex Plant. Plant Standard STD-3211, "Control of Non-Weapon Radioactive Material Sources," and internal operating procedure (IOP)-D5242, "Sealed Radioactive Source Control," provide the procedures that are used to manage this program in accordance with DOE N5400.13. (Note: DOE N5400.13 is an extension of DOE N5400.9, "Sealed Radioactive Sources Accountability"). Records are maintained in accordance with IOP-D5242.

SITE: Pantex Plant	FACILITY (Building or Location): Building 12-2, Source Room
	FUNCTION: Sources Storage

Public/Environmental Barrier Continued:

Worker Access/Occupancy Limits:

Access to the 12-2 Source Room is limited to Radiation Safety Department personnel and those personnel that might be escorted.

SITE: Pantex Plant	FACILITY (Building or Location): Building 12-2, Source Room PARTITIONED AREA: Current Facility

Question 3: What are the HEU holdings and how are they packaged?

Material Form	Grade of HEU	Material Form Description	Packaging Types	Location	Age of Packaging (in years)	Number of Packages	Mass (kg)
Oxide	Very Highly Enriched Uranium	Pure Oxides	Glass vial inside a Wooden Box in a Plastic Bag	Five Drawer Filing Cabinet	9	1	<0.001
Source	Enriched Uranium	Sealed Source	Standard Commercial Sample Holder in a Plastic Bag	Five Drawer Filing Cabinet	6	1	<0.001
Sources, Samples ...	Very Highly Enriched Uranium	Powder	Scintillation Vial with a Screw on Plastic Lid Inside a Plastic Bag	Five Drawer Filing Cabinet	9	1	<0.001
Sources, Samples ...	Very Highly Enriched Uranium	Cork Wafers	Petri Dish inside a Plastic Bag	Five Drawer Filing Cabinet	6	4	<0.001
Sources, Samples ...	Weapons	Damaged Sealed Source	Doubled Bagged in Plastic	Five Drawer Filing Cabinet	16	1	<0.00
Sources, Samples ...	Weapons	Sealed Sources	Clear Plastic Source Holder inside a Plastic Bag	Five Drawer Filing Cabinet	16	1	<0.0(
Cum. Inven. Differences	None						

SITE: Pantex Plant	FACILITY (Building or Location): Building 12-2, Source Room
	PARTITIONED AREA: Current Facility

Description of the packaging and its intended protective function.

Note: All HEU sources are shown in Attachment "Sources - 5."

Packaging Narrative:

Oxides

The oxide is first contained in a glass vial (½ oz bottle) which is approximately 1½ inches tall, ¾ inches in diameter, and ⅛ inch thick. This is capped with a plastic, screw-on lid. This vial is then placed inside a cardboard cylinder within which it fits snugly. Then, both these items are within a plastic bag to contain the oxide if either the primary or secondary containers are breached.

Sources & Samples - Sealed Sources

This sealed source is packaged in a wooden box which is a standard commercial sample holder. This box measures approximately 3 x 3 x 1½ inches deep. This wooden box is then placed inside a plastic bag.

Sources & Samples - Powder

This powder is contained within a liquid scintillation vial with a screw on plastic lid. The vial measures approximately 3 inches high by 1 inch in diameter. This vial is then placed inside a plastic bag which is sealed.

Sources & Samples - Cork Wafers

These sources appear to be "homemade" and their origin is unknown. They are cork wafers impregnated with HEU. The sources are themselves approximately 1-¼ inches in diameter by ¼ inch thick wafers and are kept in a 1-½ inch diameter by ⅜ inch Petri dish. This Petri dish is then placed inside a plastic bag.

Sources & Samples - Damaged Sealed Source

This is a damaged source. It is doubled bagged in plastic and taped shut to prevent the spread of contamination.

Sources & Samples - Sealed Sources

This source is contained in a "homemade" source holder. This source holder is clear plastic inside a frame. It measures approximately 4 x 4 inches. This holder is then placed inside a plastic bag that is sealed.

TE: Pantex Plant	FACILITY (Building or Location): Building 12-2, Source Room
	PARTITIONED AREA: Current Facility

escribe material at risk, which constitutes a source term.

Oxides

<1 gram.

Sources & Samples - Sealed Sources

<1 gram.

Sources & Samples - Powder

<1 gram.

Sources & Samples - Cork Wafers

<1 gram.

Sources & Samples - Damaged Sealed Source

<1 gram.

Sources & Samples - Sealed Sources

<1 gram.

SITE: Pantex Plant	FACILITY (Building or Location): Building 12-2, Source Room PARTITIONED AREA: Current Facility

Question 5: What are potential effects from the causes identified?

Potential Effects

Facility	External
☐ Fire ☐ Explosion ☐ Contamination ☐ Criticality ☐ Leakage/Spills ☐ Other Accidents (specify) ☐ Structural Failure ☐ Equipment Failure ☐ Material Release ☐ Increased Radioactivity Level ☐ Other (Specify) Material ☐ Criticality ☐ Material Release ☐ Breach of Packaging ☐ Fire ☒ Other (listed below)	☐ Loss of Site Integrity ☐ Loss of Building Integrity ☐ Release of Materials ☐ Radiation and Releases from Criticality ☐ Other (Specify)

Material Effects:

Material Release:

Radioactive material could be released.

Breach of Packaging:

This could result in localized contamination of the Source Room and workers.

Lost Source:

This could result in possible radiation exposure to workers and the public.

SITE: Pantex Plant	FACILITY (Building or Location): Building 12-2, Source Room
	PARTITIONED AREA: Current Facility

Question 6: What are the potential consequences from the effects identified?

	WORKER			ENVIRONMENT			PUBLIC		
Effect	Contamination	Exposure	Injury	Ground	Water	Air	Contamination	Exposure	Injury
Material Release	N	N	N	N	N	N	N	N	N
Breach of Packaging	N	N	N	N	N	N	N	N	N
Lost Source	N	N	N	N	N	N	N	N	N

Explanation:

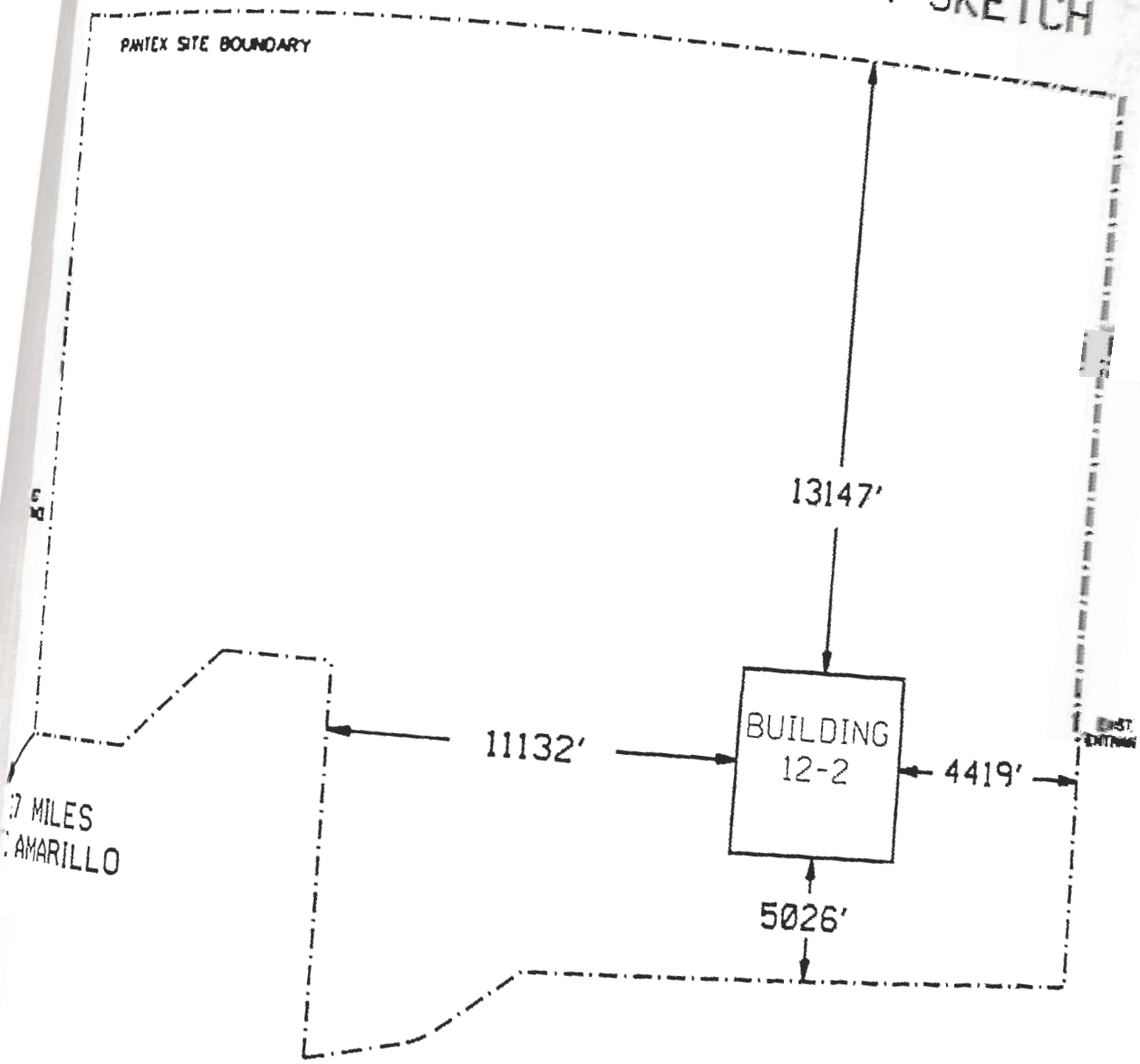
Material Release/Breach of Packaging/Lost Source:

These events are judged by the SAT to be extremely unlikely to occur. Mitigative and preventive measures include: (1) administrative controls; (2) limited access to locked Source Storage Room and locked cabinet; (3) the sources are not in use; and (4) plans are being developed to dispose of the sources.

Applicable References:

- Pantex Plant Standard STD-3211, Control of Non-Weapon Radioactive Material Sources

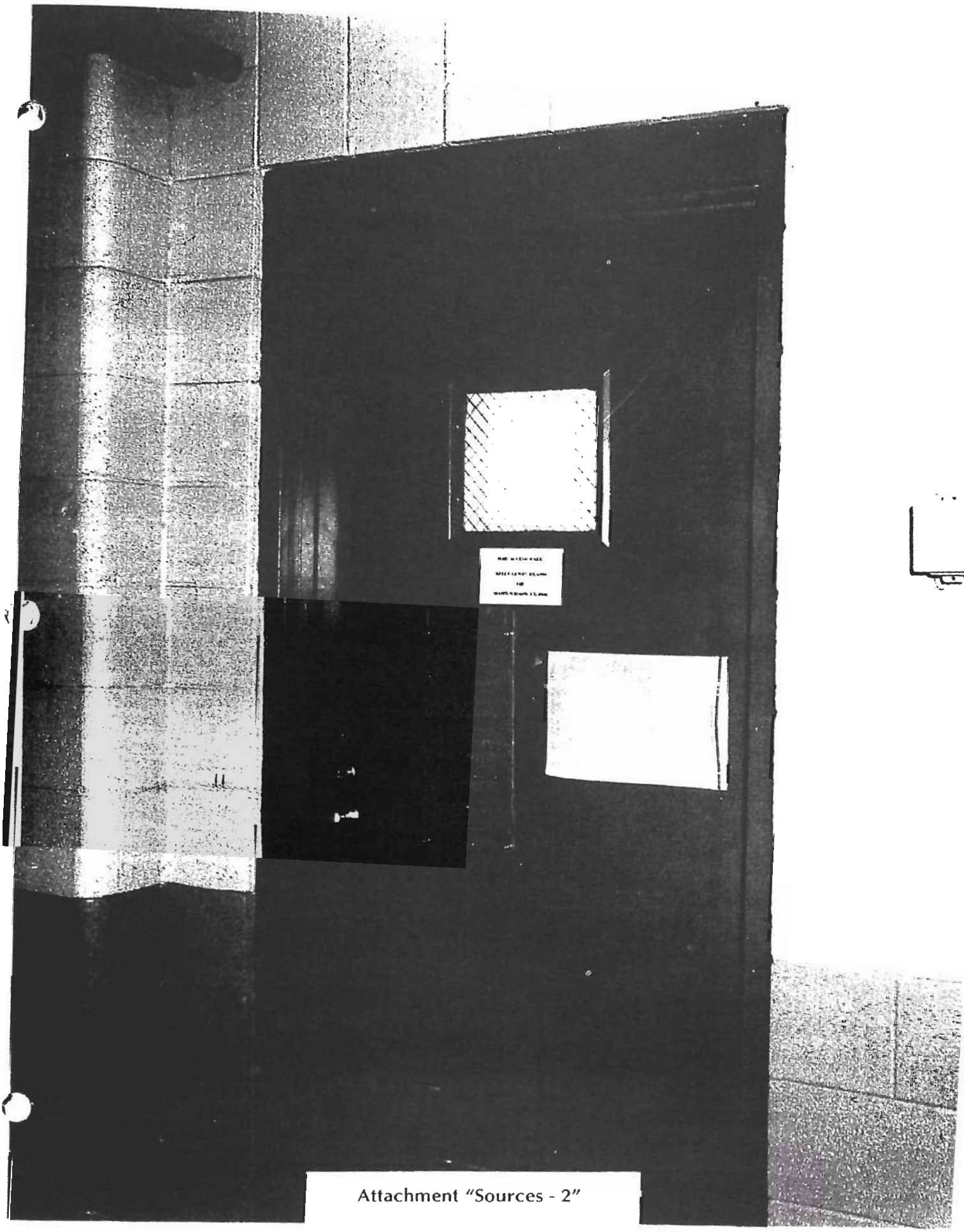
PANTEX PLANT
HEU FACILITY LOCATION SKETCH



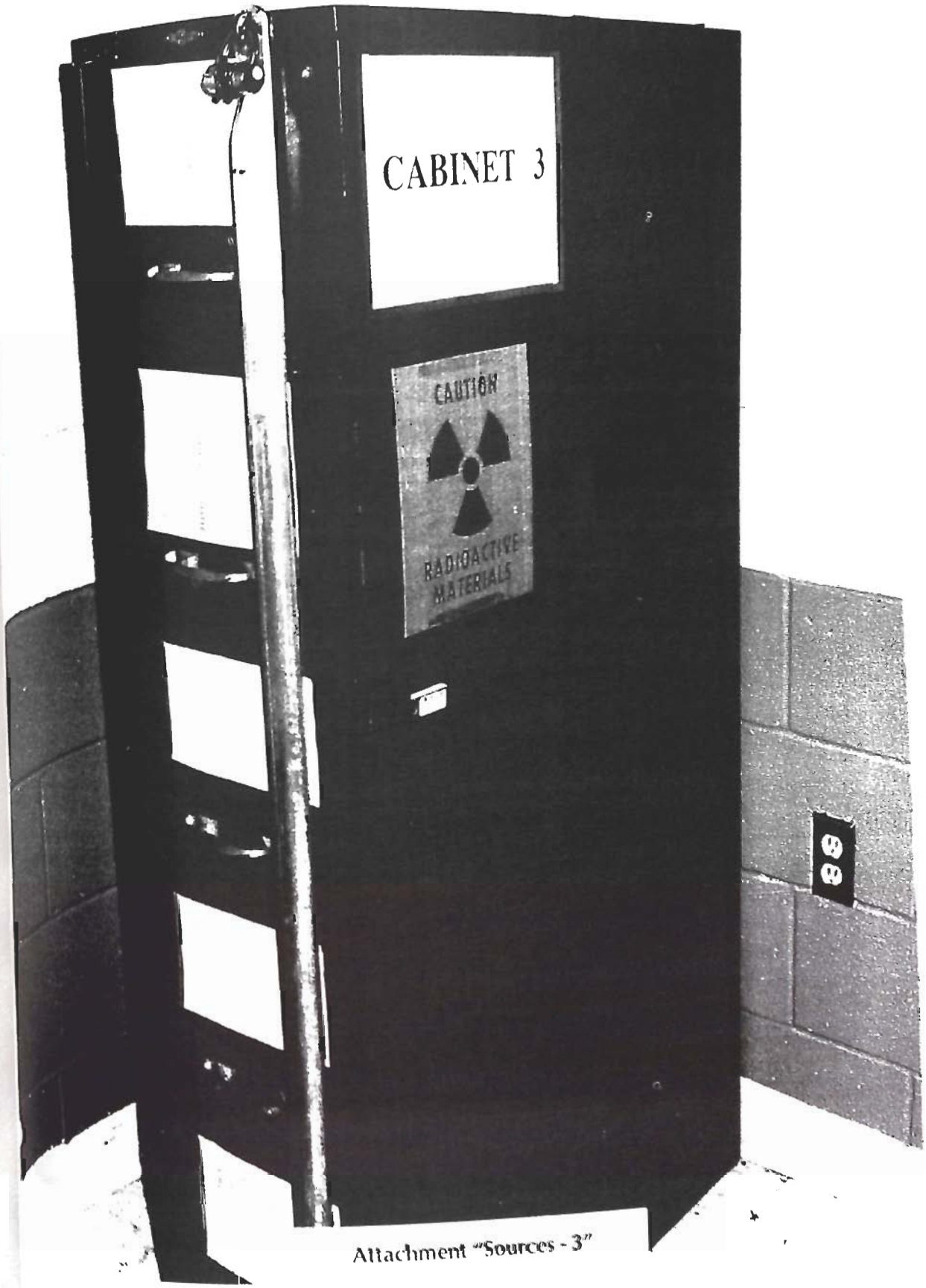
HEU SOURCES BUILDING 12-2

NOT TO SC

Attachment "Sources - 1"

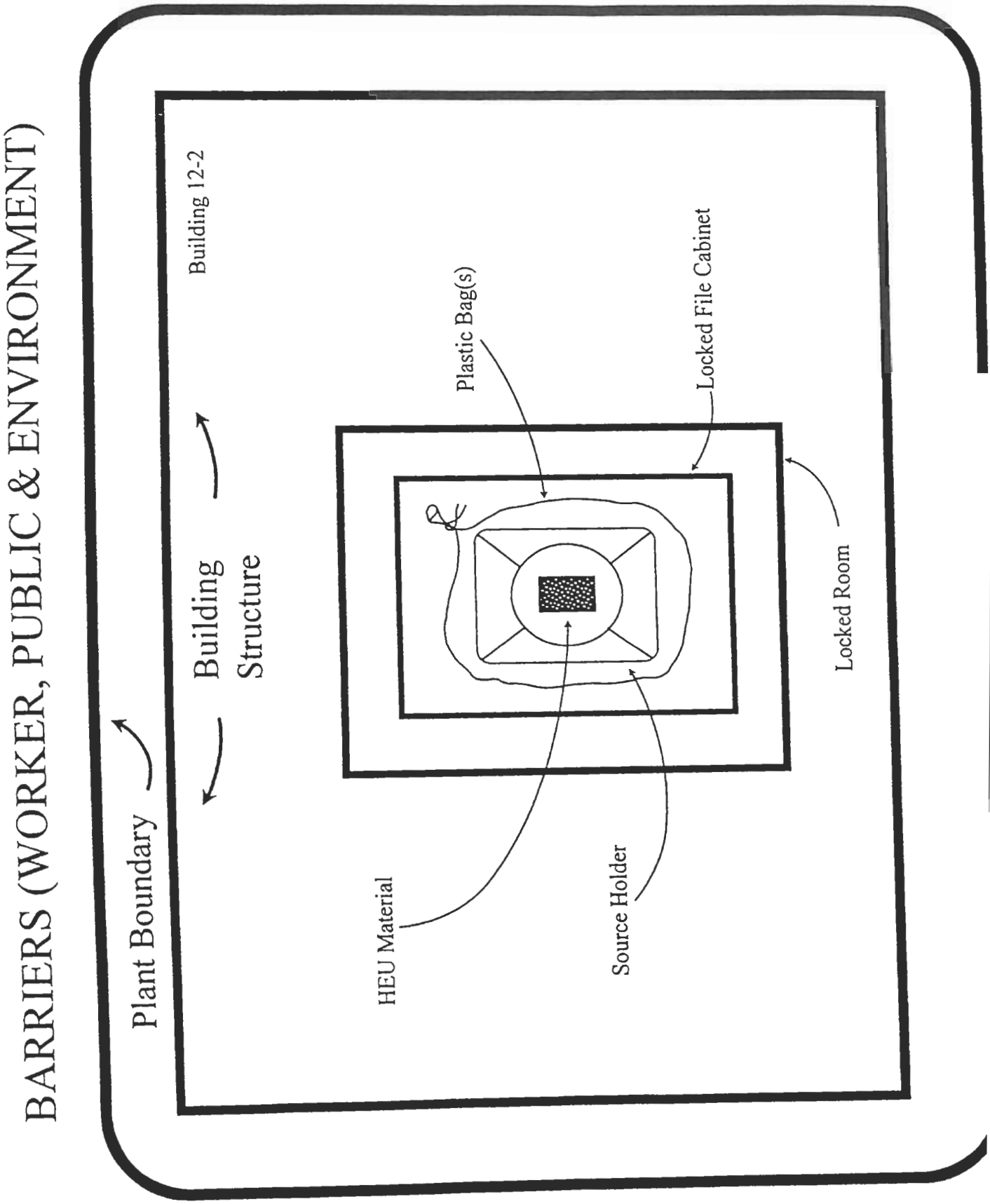


Attachment "Sources - 2"



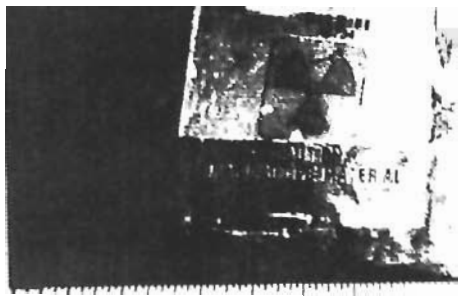
Attachment "Sources - 3"

Pantex Plant



Source HEU Barriers

Attachment "Sources - 4"



SITE: Pantex Plant

Question 7: *The overall assessment summary:*

The SAT identified two vulnerabilities associated with HEU at Pantex Plant. These vulnerabilities are primarily related to plutonium handling in the respective facilities because plutonium represents the greatest hazard on site. The vulnerabilities are: (1) "An aircraft crash in Zone 4 or Zone 12;" and (2) "Potential for higher release consequences due to increased leakage paths and greater understanding of dispersal mechanics from an explosion." Since these issues represent only minor ES&H concerns related to handling HEU at Pantex, they are not addressed further in this question. These two vulnerabilities are described in detail on the Vulnerability Assessment Forms; Pantex/Site/SAT/001 & /002.

The following issues, although not related to any vulnerabilities on site, represent the Site Assessment Team's evaluation of the site's most important ES&H concerns related to HEU, those that pose the highest risk, currently planned activities to minimize those, and the noteworthy programs and practices at Pantex.

- The Pantex site's most important ES&H issues related to HEU storage, handling, processing, or shipping are as follows:

  (1) The Pantex Plant has limited storage capacity for the nuclear explosive components containing HEU. Recent changes to the DOE approved "Basis for Interim Operations for the Pantex Plant," that allows for the staging of HEU components in Bays and Cells, have provided some temporary relief. Additional relief will be available in the near future when Building 12-66, which is currently undergoing a Readiness Assessment, is placed in service. Building 12-66 will be a general storage warehouse for non-fissile inert weapon components and a staging warehouse for packaged Canned Sub-assemblies (CSAs).

  (2) HEU sources which are located on site and no longer used. Currently there is not an established waste stream available for disposal of these items.

  (3) The case joint of a CSA that is currently staged in an MH2800 container is out of tolerance and cannot be shipped offsite as it is currently packaged. It requires development of special packaging and shipping requirements. This work is in progress.

  (4) Shipping of a specific type of CSA currently staged in a bay is pending resolution of safety issues, including obtaining a certified shipping container. Discussions are continuing between the DOE and Mason & Hanger as to resolution of these issues. Details are listed in classified Appendix E.

  (5) Reducing the inventory of one specific type of HEU component is delayed due to the lack of shipping containers. Only two certified containers are available for these components, and additional shipments cannot be made until the containers are emptied at the receiving DOE site and returned to Pantex. Three containers are in the fabrication process and are scheduled to be available for service in the October 1996 time frame.

- Although low in risk, the Pantex HEU activity that poses the highest risk to the environment, workers, and the public is as follows:

  (1) Operations involving one specific type of HEU component discussed in (3), (4), and (5) above.

SITE: Pantex Plant

- The current and planned actions to minimize worker exposure, reduce environmental risks, and protect the public at and near the Pantex site are as follows:

  (1) For the inventory of HEU sources, Pantex Plant Waste Operations and Waste Management are developing a waste stream for disposal of these items.

  (2) The DOE has contracted to have additional shipping containers built for some items, to increase the ability to ship HEU components offsite.

  (3) The normal radiation exposure due to handling HEU components is low. The Pantex programmatic Radiation Protection Program is functioning and maintaining radiation exposure "As Low As Reasonably Achievable" (ALARA).

- The most noteworthy programs or practices related to HEU storage, handling, processes, or shipping at Pantex are as follows:

  (1) Programs are in place to provide a trained and qualified staff performing oversight and technical support for line operations to ensure full compliance with DOE requirements, Packing Safety Analysis Reports and Plant Procedures for on-site handling of HEU components and compliance with Department of Defense and Code of Federal Regulation requirements, for off-site shipment of HEU components.

  (2) Pantex has in place a well documented ALARA program which keeps worker exposures below administrative control levels.

  (3) Pantex maintenance program provides well documented preventive and corrective activities for critical safety systems for structures, system and component reliability.

  (4) The safety of Pantex Plant operations are enhanced through the effective implementation and use of Formality of Operations and Conduct of Operations concepts.

  (5) The Pantex Plant has an approved "Basis for Interim Operations for the Pantex Plant"; a "Critical Systems Safety Manual" that identifies operational safety requirements; and a Unreviewed Safety Question determination program.

Note: *Additional information to clarify certain items in this summary of the assessment is located in the classified Appendix E.*

ES&H Vulnerability Assessment Form

Vulnerability # Pantex/Site/SAT/001

Block 1: *Title of the Vulnerability.*

Aircraft Crash into Zone 4 or Zone 12.

Block 2: *Executive Summary.*

The crash of an aircraft into Zone 4 or Zone 12 could result in the detonation of the conventional high explosives (HE) in a weapon, or of HE removed from a weapon that had been recently dismantled. In addition, the potential for a fuel fire following an aircraft crash could also cause a release. Subsequent to the detonation of the HE or the fuel fire, there is the potential for dispersal of highly enriched uranium (HEU).

Block 3: *Description of the condition or weakness, including the material, material form, quantity (if unclassified), packaging type and number of packages, and facility and other barriers that contribute to the vulnerability.*

Vulnerability Description/Information	
Material and material form	Encapsulated HEU.
Material at risk (approximate mass [kg] and composition of material which may participate in the release—not necessarily the inventory of material at a given location)	The amount of material at risk during an aircraft crash is dependent on the facility impacted and its current inventory.
Packaging type and number of packages	The packaging type (pits and Canned Sub-Assemblies) is primarily dependent upon the program specific shipping/staging container. In the case of Canned Sub-Assemblies, the material will be encased in its own case and possibly in an approved shipping container (if going off-site) or an approved container for staging (on-site). The number of packages will be dependent on the footprint of the facility and the size of the containers staged within the facility. This number changes daily at Pantex consistent with the safety basis and operating limits expressed in the DOE approved BIO.
Facility and other barriers	Facility structure, access denial barriers (Zone 4), blast doors (Zone 12), release path restrictions, staging/shipping containers, encapsulation, and admin controls.

ES&H Vulnerability Assessment Form	
Vulnerability #	Pantex/Site/SAT/001
Condition or weakness	Review of old analyses resulted in finding errors in previous aircraft crash probabilities for Zone 4. The most recent analysis indicates a probability of an aircraft crash into Zone 4 is approximately 2.9×10^{-5} events/year and for Zone 12, it is approximately 2.4×10^{-5} events/year.

Block 4: *Potential causes and effects of barrier failure that contribute to the vulnerability.*

Cause: An aircraft crash into a magazine in Zone 4, or a building in Zone 12 containing HEU with resulting explosion or fire could release radioactive material to the environment.

Effects: A release of radioactive material from the contained area to the environment via explosive dispersal or aerosolization by fire.

Block 5: *Compensatory measures that reduce the severity of the vulnerability.*

A Justification for Continued Operations (PX-JCO-94-003) was prepared to provide the basis for continued staging operations until the aircraft crash analysis is updated or a new analysis is completed as part of the Sitewide Environmental Impact Statement (SEIS). In conjunction with the JCO, a project was undertaken (and has been completed) to record aircraft operations in the vicinity of Pantex Plant for a one year period. This data is being reduced and interpreted to understand the actual air traffic in the area. Secondly, the DOE has developed, and is ready to publish, a standard on how to calculate the probability of an aircraft crash into a critical facility. This document is the "how to" manual to enable the new aircraft crash analysis to be completed.

The major benefit from continuing operations is that continuing the dismantlement effort reduces the stockpile in accordance with arms control agreements. The Zone 4 magazines must be available to receive the special nuclear materials resulting from this program. The increase in risk shown by the current analysis does not warrant slowing down actual risk reduction realized through continued dismantlements. The public as well as the DOE benefits from continuing the operations in Zone 4 and Zone 12.

The compensatory measures in place are described below in Block 8.

Block 6: *Possible consequences of the vulnerability.*

An increased potential for release of radioactive material resulting in exposure (dose) of the workers, collocated workers, the public and the environment.

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ES&H Vulnerability Assessment Form

Vulnerability # Pantex/Site/SAT/001

Block 9: *Database information.*

Radionuclide Source Parameters

Isotope	Physical Form	Chemical Form	MAR_i (g)
U-235	Solid	Metal	Unknown

Collocated Chemicals and Release Products

Chemical		Release Product	
Name	Mass (g)	Name	Mass (g)
See Block 10.			

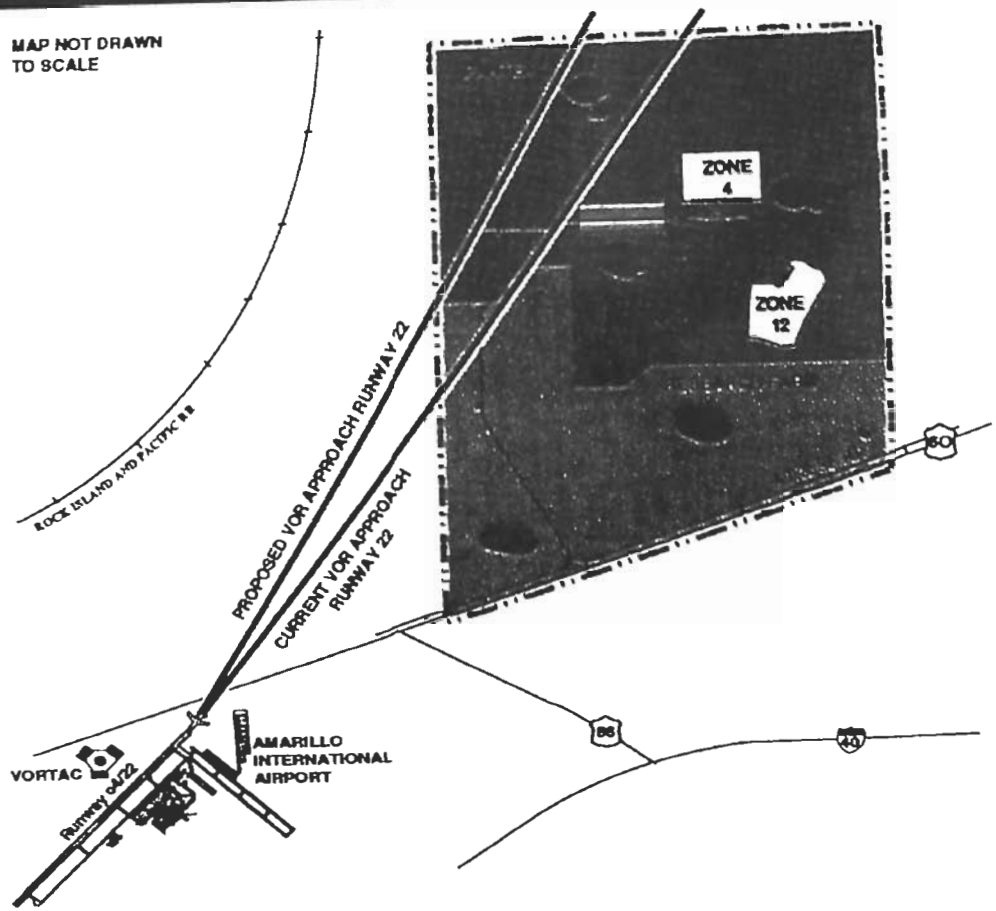
Release Path Parameters[1]

Chemical Form and Release Products	DR_i	ARF_i	RF_i	LPF_i
See Block 10.				

Exposure Parameters[1]

Chemical Form and Release Products	V (meter^3)	t (minutes)	ΔT (minutes)	X/Q	
				Ex-facility	Public
See Block 10.					

Proposed VOR Approach Change



PANTEX - Airport Landing Map

Attachment "VAF/001 - 1"

ES&H Vulnerability Assessment Form

Vulnerability # Pantex/Site/SAT/001

Block 10: *Comments and references for parameter selection.*

The various parameters for Block 9 cannot be completed due to unavailability of the required information. Risk Analysts are currently researching methods to analytically determine the consequences for this accident scenario using a Pu source term. This information, when it becomes available, would be directly applicable to this vulnerability.

References: Basis for Interim Operation, Rev. 3, Errata B, for the Pantex Plant, Amarillo, Texas; March 1996 (page B-17, table B-2).

Pantex Plant Justification for Continued Operation (JCO) PX-JCO-94-003, "Justification for Continued Operation of Zone 4, Operations with Increased Probability for an Aircraft Crash," December 22, 1995.

William S Harris	June 25, 1996
Signature, Team Member	Date
[illegible]	6/25/96
Signature, Team Leader	Date

[1] Described in the Assessment Plan.

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Vulnerability t

Block 1: Title

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ES&H Vulnerability Assessment Form	
Vulnerability #	Pantex/Cells/SAT/002
Condition or weakness	Recent analyses for plutonium dispersal events from a cell indicate that the closer the HE/Pu ratio is to unity, the higher the aerosolization and resulting dispersal will be, resulting in higher offsite consequences.

Block 4: *Potential causes and effects of barrier failure that contribute to the vulnerability.*

Cause: The primary cause of the failure is HE detonation.

Effects: As the HE amounts get so low that the cell "Gravel Gertie" roof does not exercise and perform its filtering of dispersed material. A different "leakage path" for the radioactive material to reach the environment results. The consequence is the potential for a greater dose to the workers, the public and the environment (less filtration of the material).

Block 5: *Compensatory measures that reduce the severity of the vulnerability.*

Reduction of the source term during operations.

Reduction of the actual leakage paths around the cell blast and personnel doors. Photographs of the blast and personnel doors are provided as Attachments "VAF/002 - 1" and "VAF/002 - 2," respectively.

Gained a better understanding of the explosion physics so as to better characterize the release and consequences.

Block 6: *Possible consequences of the vulnerability.*

A higher release of radioactive material resulting in greater exposure (higher dose) to the workers, collocated workers, the public and the environment.

Block 7: *Time period in which the consequences of the vulnerability might occur.*

The event is considered to be "extremely unlikely," approximately one chance in a million per year (1×10^{-6}). It is not expected to occur in the lifetime of the facility.

ES&H Vul

Assessment Form

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Pantex/Cells/SAT/002

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ES&H Vulnerability Assessment Form	
Vulnerability #	Pantex/Cells/SAT/002

Block 9: *Database information.*

Radionuclide Source Parameters

Isotope	Physical Form	Chemical Form	MAR_i (g)
U-235	Solid	Metal	Unknown

Collocated Chemicals and Release Products

Chemical		Release Product	
Name	Mass (g)	Name	Mass (g)
See Block 10.			

Release Path Parameters[1]

Chemical Form and Release Products	DR_i	ARF_i	RF_i	LPF_i
See Block 10.				

Exposure Parameters[1]

Chemical Form and Release Products	V (meter^3)	t (minutes)	ΔT (minutes)	X/Q	
				Ex-facility	Public
See Block 10.					

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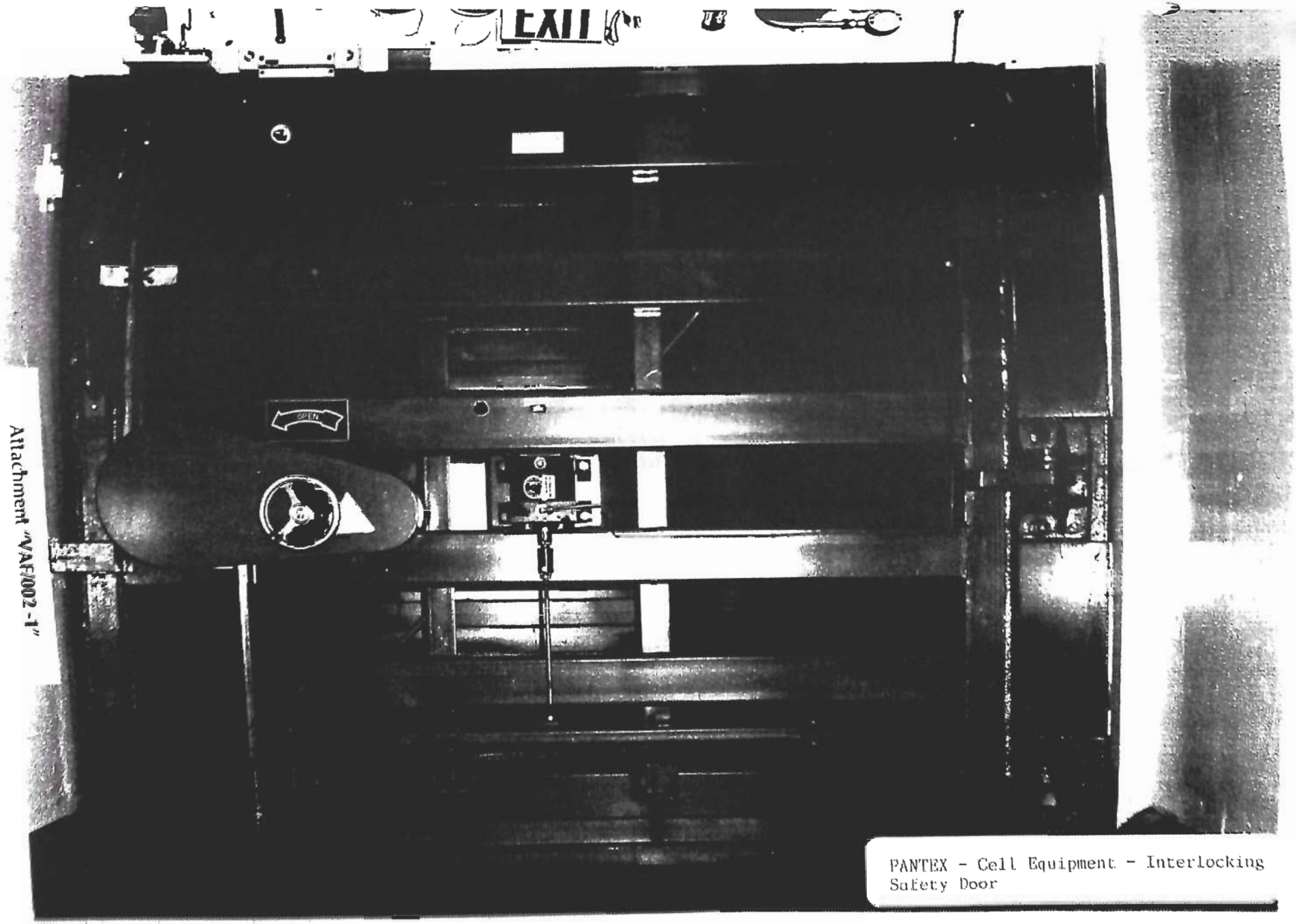
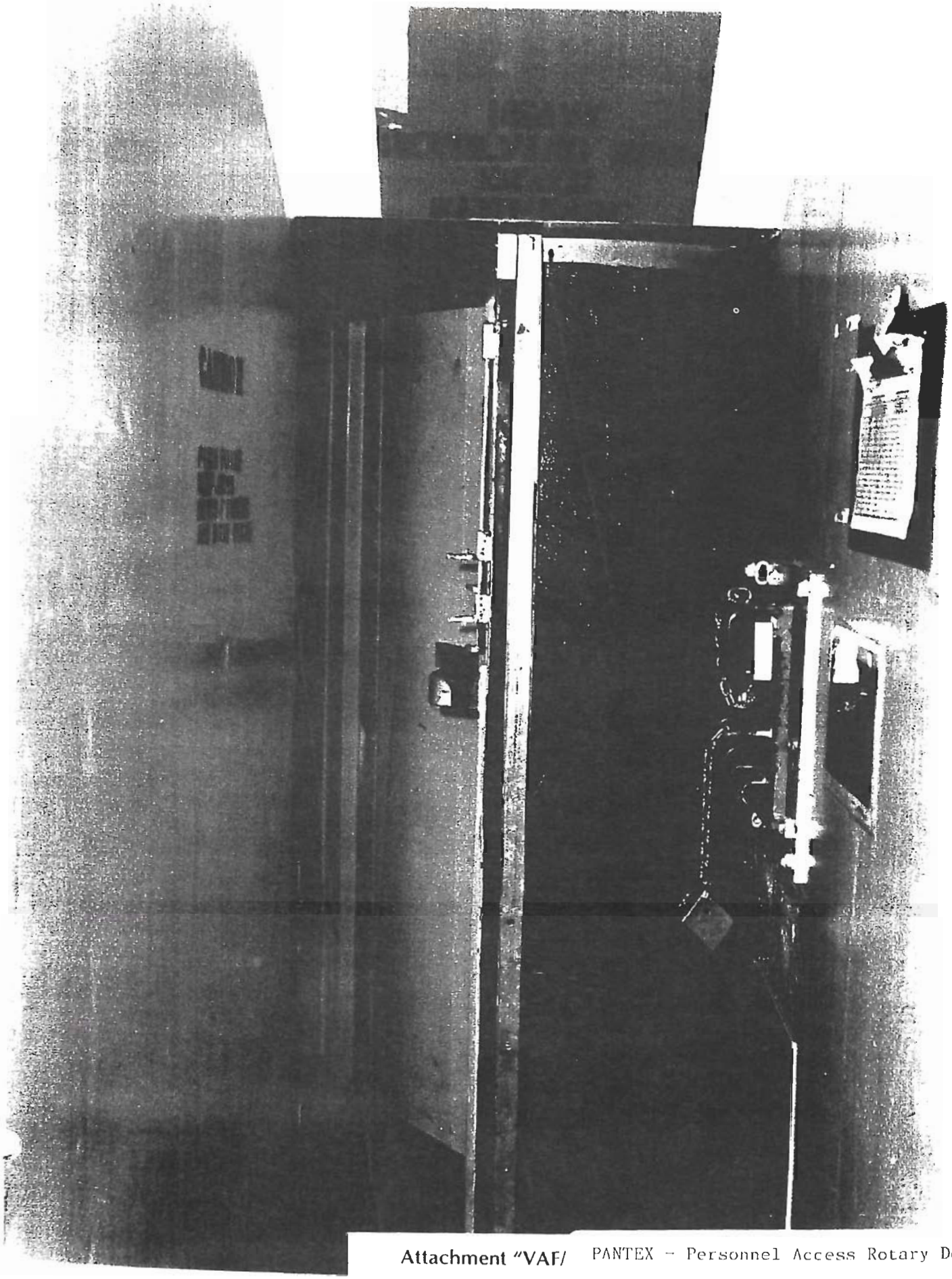


PANTEX - Cell Equipment - Interlocking Safety Door

Attachment "VAF/002 -1"



Attachment "VAF/ PANTEX - Personnel Access Rotary Door

APPENDIX D

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