

# **HE Machining Complex & Support Buildings Deactivation and Decommissioning Project at the Pantex Plant**

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## **ABSTRACT**

This paper describes the issues related to the deactivation and decommissioning of a very unique building at the Department of Energy's Pantex Plant located in Amarillo, TX. Building 12-24 was unique in the fact that it had a number of obstacles that have not been previously addressed in the deactivation and decommissioning (D&D) of a single structure such as asbestos, beryllium, possible radionuclide contamination, lead paint, heavily reinforced concrete walls, and high explosive (HE) contamination inside and out. To date, the building has been razed and the majority of all equipment has been disposed of. Remaining work includes concrete and soil debris removal, earthen barricade removal, and site leveling.

## **SUMMARY**

### **Pantex Site Summary**

Pantex Plant is America's only nuclear weapons assembly and disassembly facility. Located on the High Plains of the Texas Panhandle, 17 miles northeast of Amarillo, Pantex is centered on a 16,000-acre site just north of U. S. Highway 60 in Carson County. The Pantex Plant industrial operations are conducted for the DOE by a management and operating contractor (BWXT Pantex), and Sandia National Laboratory.

DOE owns approximately 9,100 acres at the Pantex Plant. Just over 2,000 acres of the DOE-owned property are used for industrial operations at Pantex Plant excluding the burning ground, firing sites and other outlying areas. The burning ground and firing sites occupy approximately 489 acres. Remaining DOE-owned land serves DOE safety and security purposes. DOE also owns Pantex Lake, a detached piece of property approximately 4 km (2.5 mi) northeast of the main Plant site that comprises 1,077 acres; the playa lakebed itself occupying approximately 800 acres. Currently no government industrial operations are conducted at the Pantex Lake property. Seventy-six kilometers (47 mi) of roads exist within the Pantex Plant boundaries.

### **Project Summary**

Facilities are deactivated and decommissioned (D&D) when there is no longer a mission for them or they have been replaced by other facilities. D&D is a series of actions that bring a facility from its condition and status at the time operations ceased, to demolition or conversion to another use. The structures associated with the High Explosive (HE) Machining Complex (HEMC) had been removed from service and selected for demolition. The Department of Energy has implemented a “One up, One down” policy in which older, unusable buildings must be removed prior to the construction of new facilities. This concept ensures that the footprint of the DOE complex does not increase; therefore, reducing current maintenance costs in addition to reducing the backlog of deferred maintenance.

This specific project included the demolition of 5 buildings, 3 ramps, 2 shade structures, 6 building slab remains, solvent transfer area structure, and overhead steam condensate and structure. Demolition work included removal of tanks, piping and utilities; asbestos abatement; decontamination of equipment; and revegetation of disturbed areas.

### **Objectives**

The objectives of the project were to decontaminate and remove buildings, tanks, etc., and return the site to a natural state. This project involved three primary tasks:

- Deactivate and re-route utilities
- Decontaminate and remove contaminated and non-contaminated equipment
- Demolish buildings and ramps, and remove slabs and footings

### **Background**

The HE Machining Complex was located in Zone 12 South and comprised of structures 12-24 North, 12-24 South, 12-24A, 12-24SS, 12-25, 12-R-25, 12-78, 12-R-78, and 12-43. Most of the 12-24 complex was constructed in 1945 to serve on Heavy Duty Bomb Load Line No. 4 as the Shell Painting Buildings. However, the buildings were not used for their intended purpose because Pantex Plant closed before Zone 12 went into production. Reactivated soon after the Plant reopened in 1951, the buildings were used to assemble, machine, gauge and stage explosive, radioactive, and inert weapon components.

Building 12-24 was divided into two sections (North and South) consisting of 35 operating bays. Building 12-24 North was a 34,500 square foot facility previously used to fabricate HE components. Some HE-contaminated machining equipment from previous operations remained in the facility. The structure was constructed with heavily reinforced concrete bays due to Class I explosives machining operations performed in the facility. Steam, chilled, warm, and hot water service, air handling units (AHUs), and humidifiers were located in the second story penthouse. Building 12-24 South was a 15,300 square foot facility previously used for component assembly operations. It was

constructed of brick and clay tile walls, a metal-framed built-up roof, reinforced concrete walls separating operating cubicles, and a concrete floor. Steam, chilled, warm, and hot water service was extended from the 12-24 North Penthouse to AHUs; and humidifiers were housed in two rooftop monitors. Outside walls were hollow clay tile, and bay walls were 12-inch reinforced concrete with concrete floors and a built-up roof on cemesto decking. The interior walls and floor were concrete, and the office area had a suspended ceiling. No electricity was supplied to the facility at the time of D&D. The HVAC system was comprised of air handling units (fans), and a duct system with steam re-heat coils and chill water for cooling. Fire protection consisted of a wet pipe system. Boundaries for the buildings were the footprint, plus 6 feet in each direction, and any enclosed yards. Boundaries for utilities associated with the facilities were expected to be the first source connection exterior to the facility.

The roof of this facility was in poor condition, resulting in leaks during rain and snow, with occasional collapse of roofing material. Until the roof decking was removed, entry into the bays was prohibited. There was also gross evidence (fecal matter and dead birds) of animal intrusion (pigeons, rats, etc.), especially in the office area of the facility. Explosives contamination existed in the structure and components of the building, as well as in adjacent soils. Asbestos Containing Materials (ACM) included pipe and tank insulation, HVAC system flexible joints, and roofing materials. HE contamination was in the vacuum lines and abandoned equipment.

### **Project Cost**

Original Project Estimate (Independent) = \$2,322,000

Final Project Cost = \$4,672,000 (not all EM funding)

Additional costs, beyond the original estimate, were due to the following:

- Support buildings added to scope of the D&D
- Helicopter deterrents
- High security area was difficult to access and reduced estimated productivity
- Characterization of contamination inside building was incomplete
- Earthen barricade could not be reused as planned and required disposal

Support buildings in the immediate vicinity of the 12-24 complex were added to the scope after the initial estimate. These buildings were scheduled for D&D in the future, but funding and site logistics supported an accelerated schedule.

The 12-24 complex was located in a high security area that is required to implement specific security requirements such as helicopter deterrents. The addition of helicopter deterrents was added to the scope after the initial estimate was drafted.

The physical location of the complex, with regards to security and access, produced an environment that was not conducive to a high rate of productivity. Getting equipment and personnel to the site on a daily basis, while maintaining a productive atmosphere, was challenging as well as the removal of large quantities of D&D debris from the site.

Articulated dump trucks were used for the majority of the removal and were required to be escorted in and out of the secure zone in addition to being thoroughly searched each time.

Asbestos, lead, and HE were known to be in the facility, but the locations and quantities were not definitive. The ability to accurately characterize the type of waste and amount that would be generated during the D&D was hindered by the unsafe condition of the building and the inability for personnel to easily access critical areas. Areas of asbestos and lead paint were only found after D&D had progressed to a point in which the areas could be safely sampled.

A large earthen barricade, just north of 12-24, was to be removed and a majority of the soil to be used as site fill during the regrading and revegetation process. Soil samples taken just prior to removal revealed areas of contamination that were not detected previously. Rather than reusing the soil at its current location, it will have to be removed and disposed of in an onsite landfill. This meant another 30,000 cubic yards of soil will require transported via articulated dump truck through security zones and subject to inspection upon entering and leaving each time.

### **Strategy**

- Phase I included deactivation and re-routing of utilities and the demolition of the HEMC support buildings (12-43, 12-24A, 12-25, and associated ramps).
- Phase II included asbestos and lead paint abatement at 12-24 north and south.
- Phase III included the decontamination of 12-24 and removal of HE-contaminated equipment and piping.
- Phase IV included the demolition of 12-24 and return the area to its natural state.
- Phase V included the demolition of 12-78 (Not EM funded).

### **Phase I—Re-routing of Utilities and Demolition of Support Facilities**

All utilities were deactivated by BWXT Pantex craft personnel prior to the start of the disconnection and rerouting of utilities. The domestic water lines and high-pressure fire loop (HPFL) entering and exiting the complex facilities were cut, capped, sealed, and plugged. Aboveground utility connections were removed to a minimum depth of 24 inches. Domestic water lines between the lateral or main line of the buildings were abandoned in place. No re-routing of the domestic water main or HPFL were necessary. The lead-in pipes were all capped, cathodic protection installed to reduce the possibility of corrosion, and thrust blocks placed to prevent the water pressure from blowing the cap off.

BWXT Pantex deactivated all electrical service prior to the D&D of the complex. The contractor was just responsible for cutting and capping the electrical service at each building and at the point of origination. No rerouting was necessary.

Telephone and public address lines were disconnected and rerouted prior to beginning D&D to ensure service was not lost to users downstream. The 12-24 complex was never fitted with fiber optics or computer service wiring; therefore, network interruptions were not a concern. Steam lines were rerouted removing the complex from the steam loop.

Phase I concluded with the demolition of smaller support buildings surrounding 12-24 such as 12-43, 12-24A, 12-24SS, 12-25, and nitrogen storage tanks. These were all smaller buildings (offices, filter houses, chemical storage) that supported the operations that were performed inside 12-24.

### **Phase II—Asbestos and lead paint abatement at 12-24 North and South**

Asbestos containing materials (ACM) included pipe insulation, roofing, HVAC expansion joints, and wall materials. Insulated pipe was primarily in the second floor monitors and penthouse. ACM waste containers, transportation, disposal, and disposal fees were the responsibility of the contractor. BWXT Pantex Waste Operations Department personnel were responsible for signing all manifests and all ACMs were disposed of at BWXT approved disposal facilities. This would ensure the waste generated from the Pantex site was handled properly and not mismanaged once offsite.

Loose, flaking lead paint was present throughout the building. Sandblasting was not allowed and waste material was placed in containers supplied by BWXT for disposal by BWXT. Significantly more lead paint was found inside 12-24 than originally expected or budgeted for.

During the demolition, monitoring for both asbestos and lead paint was performed at specified intervals. Since characterization could not be adequately performed prior to D&D, these intervals were increased for this building in comparison to other D&D projects.

### **Phase III—Remove HE Contaminated Equipment**

The complex contained abandoned HE machining equipment. In some cases, small amounts of HE were visible on and around the equipment. The equipment was deactivated, decontaminated, dismantled with a hydro-cutter, removed, and placed in containers provided by BWXT Pantex for flashing and final disposition by BWXT Pantex. The following table is a list of equipment that was abandoned in place when operations were originally suspended in 12-24.

**Building 12-24 Contaminated Abandoned Equipment**

<b>Location.</b>	<b>Machine</b>
Bay 1	Band Saw/Well Saw (Figure 1)
Bay 3	Olofasson Lathe
Bay 7	High Performance Mill (Figure 2)
Bay 9	High Performance Mill
Bay10	Moore Mill
Bay 11	Bourn & Koch Vertical Turret Lathe
Bay 13	High Performance Vertical Lathe (Figure 3)
Bay 15	Mill and Lathe (Figure 4)

Equipment that was contaminated with HE was subjected to a process known as flashing. Each piece is loaded into a flashing chamber, which is located on the Pantex site. The flashing chamber is a thermal device used to remove HE contamination by subjecting the items to intense heat and flame for a set period of time. Thermocouples are installed inside the chamber to ensure that the equipment and environment reach a high enough temperature to completely burn any HE or HE residue that may be present. After being flashed, the equipment can then be disposed of in a more traditional manner such as being recycled as scrap metal.

Plans and procedures for D&D of the HE contaminated equipment were carefully reviewed and approved by the onsite Explosives Safety Department to ensure the highest level of safety. After the contractor had disconnected and lifted each piece of equipment off of the floor, and before the equipment could be relocated, work was stopped and inspections performed by the Project Manager and Explosives Safety personnel. Work could only resume after all involved were satisfied with the cleaning process. D&D of the HE equipment was limited to contractors with at least 5 years experience in HE decontamination.

**Historical HE Contaminated Equipment**

BWXT Pantex will keep the lathe in Bay 2 and the drill in Bay 15 for historical preservation. The contractor carefully decontaminated the equipment to a minimum of 3X, built a suitable crate to protect it, placed it in the crate, and removed it from the building to a location designated by the BWXT Pantex technical representative.



**Figure 1: Bay 1 Saw**



**Figure 2: Bay 7 Drill**





**Figure 3: Bay 13 Vertical Lathe**



**Figure 4: Bay 15 Historical Drill**

## **Phase IV – Demolish Building 12-24**

### **Ramp 12-R-24A**

Ramp 12-R-24A lead from 12-R-44A to 12-24N. It was 24' by 13' and constructed of cemesto walls and a corrugated metal roof on a concrete slab. Prior to demolition, the contractor had to construct a wall in 12-R-24A where the two ramps now intersect. In addition, at the southern end of Building 12-24 S, a wall was similarly constructed at the point where 12-24S intersects with 12-R-30.

### **Demolish 12-24 N & S**

The building was razed and slab and footings removed. Construction debris was handled in accordance with the BWXT Pantex (Pantex site prime contractor) approved Waste Management Plan. The initial design and construction of these facilities is what made these structures so difficult to remove. 12" reinforced concrete walls would be a challenge for any excavator, breaker, or crusher because of the thickness and design.

### **Remove Asphalt Roads and Concrete Walks and Pads**

The contractor demolished and removed sidewalks, paved drives, paved parking, and curbs within the project site.

#### **Estimated Square Feet of Roads, Walks, and Structures**

<b>Type of Material</b>	<b>Estimated Square Feet</b>
Asphalt drives and parking	3289
Concrete sidewalks	1140

### **Earthen Barricade**

An earthen barricade located north of 12-24N was removed. The barricade had an estimated base of approximately 80 feet by 285 feet in length by a height of 30 feet. Soil was originally planned for use as backfill in areas requiring fill material, but further characterization determined contamination was present. Rather than being used for fill material, the barricade would be transported to an onsite landfill and fill material for the 12-24 site would have to be hauled in. Dirt for the fill was excavated from an onsite borrow pit.

### **HE/Soil/Concrete Disposal**

Traditionally, the HE contaminated soil and concrete would be hauled and disposed of as non-regulated material, Class I Texas waste, and buried in an approved lined landfill.

The waste would be hauled in end-dump or side-dump tractor-trailers exempt from any hazardous waste regulations because the concentrations of HE were insignificant.

A problem with this approach was discovered in July of 2006 just as load and haul operations were scheduled to begin. The M&O contractor at the site reviewed a letter of interpretation from the Department of Transportation (DOT) that indicated that any concentration of HE in a mixture is considered a “new explosive” and was subject to the review and approval requirements of the DOT. Previously, concentrations not exceeding 10% of HE in a mixture were considered by general industry as not being regulated and assigned a proper shipping name of “non-regulated material”. The “new explosive” interpretation now required TB700-2 testing of the soil and submittal of a request through the DOE Explosive Hazard Classifier for classification as a non-regulated material. This process proved to be difficult and lengthy with an eight month schedule impact.

### **Backfill**

The contractor will backfill all excavations, and compact the backfill material using a standard proctor, to a density of 88-90 percent with +/-2 percent optimum moisture. The onsite borrow pit will be used as the source of fill material.

Backfill material compacted by heavy compaction equipment is required to be placed in layers 8 inches or less in loose depth. When hand-operated tampers are used, the maximum loose depth is 4 inches.

### **Site Restoration**

The contractor will return the area to the original, natural grade. All areas denuded of vegetation by the demolition of the structure or conduct of work will be returned to correct grade and seeded with the standard plant mix. Where subject to water erosion (e.g. in ditches and similar locations) the seed will be protected with appropriate erosion controls.

### **Funding and Schedule**

DOE committed funding for this project over three consecutive Fiscal Years (FYs 2004, 2005, and 2006). Accordingly, the project was baselined, scheduled, and performed in phases as funding was incrementally received. To mitigate funding uncertainties, the contract was set-up with Phases II through V as options to be exercised at the discretion of BWXT Pantex. In addition, specific project schedules for Phases II through V were negotiated, as funding was available. Funding sources included Environmental Management (EM) for all buildings except 12-78, which was funded by another funding source.

FY 2004 funding awarded to the contractor consisted of approximately \$1.18 million for Phase I (HEMC support buildings) and \$442K for Phase V (Building 12-78). Phase I primarily included demolition of HEMC support buildings 12-43, 12-24A, 12-25 and associated ramps. Phase V included the demolition of 12-78 and its associated ramps.

During FY 2005 the remaining Phases (II, III, and IV) were partially awarded and incrementally funded. Because the project did not start as scheduled in FY 2004, labor under-runs were used as an additional funding source for the remaining phases. Work on these phases began concurrently. The total contracted price for these phases was approximately \$2.37 million, but each phase was incrementally funded as needed with available funds to maximize use of contractor equipment and personnel at the site. Phase II primarily included asbestos abatement and lead paint removal. However, it also included cutting and capping utilities in Buildings 12-24 North and South and re-routing telephone and public address system services that were routed through the building. Phase III tasks included the dismantling, decontaminating, and removing HE contaminated equipment and removal of HE contaminated process piping. Phase IV was the demolition of Buildings 12-24 North and South. Phases II and III were completed in FY 05. The majority of Phase IV tasks were completed by December 2005.

### **Lessons Learned**

The 12-24 complex was allowed to degrade to such a point before demolition activities began that the facility could not be properly evaluated for waste characterization. The roof structure was in very poor condition such that personnel were not allowed inside to determine where contamination was most concentrated. Without this evaluation, more of the building material had to be characterized as contaminated than originally expected to ensure the most conservative outcome. The volume of waste material to be disposed of as contaminated soil/concrete was significantly higher than needed because of a lack of information regarding characterization.