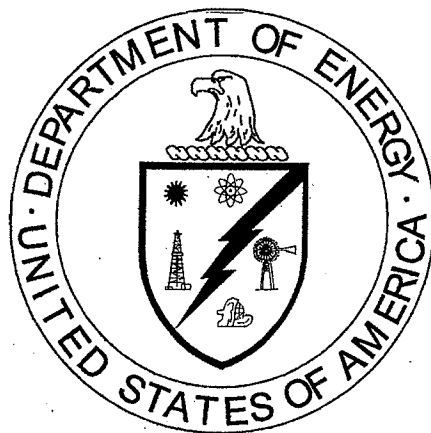


**Removal Action Report
for the C-405 Incinerator at the
Paducah Environmental Remediation Project,
Paducah, Kentucky**



This document is approved for public release per review by:

M. Braven
Paducah Classification and Control Office
Swift and Staley Team

SEP 15 08
Date

**DOE/LX/07-0106&D2
Secondary Document**

**Removal Action Report
for the C-405 Incinerator at the
Paducah Environmental Remediation Project,
Paducah, Kentucky**

Date Issued—September 2008

Prepared for the
U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

PADUCAH REMEDIATION SERVICES, LLC
managing the
Environmental Remediation Activities at the
Paducah Gaseous Diffusion Plant
under contract DE-AC30-06W05001

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ACRONYMS

ACM	asbestos-containing material
ARAR	applicable or relevant and appropriate requirement
CA	contamination area
CFR	<i>Code of Federal Regulations</i>
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
KAR	<i>Kentucky Administrative Regulation</i>
LLW	low-level waste
LP	liquid propane
MLLW	mixed low-level waste
PCB	polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plant
PRS	Paducah Remediation Services, LLC
RAWP	Removal Action Work Plan
RCT	radiological control technician
RCRA	Resource Conservation and Recovery Act
SWMU	solid waste management unit
TSCA	Toxic Substances Control Act
USEC	United States Enrichment Corporation

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EXECUTIVE SUMMARY

The C-405 Incinerator was located in the central portion of the Paducah Gaseous Diffusion Plant at the intersection of Virginia Avenue and Tenth Street. This building was identified as Solid Waste Management Unit (SWMU) 55 in 1991 and was placed in the Decontamination and Decommissioning (D&D) Operable Unit in the fiscal year 2004 Site Management Plan, DOE/OR/07-1849&D2R1. This Removal Action Report documents activities associated with the D&D of the C-405 Incinerator.

The D&D of the C-405 Incinerator was performed as a non-time-critical removal action under the Paducah Federal Facility Agreement. Comprehensive Environmental Response, Compensation, and Liability Act documents that described the logic for this project and the basis for its implementation are as follows: "Removal Notification for the C-405 Incinerator (SWMU 55), C-402 Limehouse (SWMU 480), and C-746-A West End Smelter (SWMU 464) at the Paducah Gaseous Diffusion Plant (PGDP), Paducah, Kentucky"; *Engineering Evaluation/Cost Analysis for the C-402 Lime House, C-405 Incinerator, and C-746-A West End Smelter at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE/OR/07-2227&D2); *Action Memorandum for the Removal of the C-402 Lime House, the C-405 Incinerator, and the C-746-A West End Smelter at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-2237&D2; *Removal Action Work Plan for the C-405 Incinerator and C-746-A West End Smelter Inactive Facility D&D Project at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0002&D2.

The Engineering Evaluation/Cost Analysis analyzed two removal alternatives for the C-405 facility. The alternatives included (1) no action or (2) removal of building contents, demolition of the structure, and characterization and disposal of waste. The alternatives were evaluated for effectiveness, implementability, and cost. The removal action objectives for this action were to accomplish the following:

- Prevent the potential health and safety hazards to on-site personnel from deterioration of the contaminated structures; and
- Minimize or eliminate the potential health and environmental hazards of radiation and hazardous material exposure caused by the potential uncontrolled release of contaminated dust, equipment, and building materials from the facility.

The alternative selected for C-405 was the removal and disposal of the building contents and structure to the concrete slab. This alternative met the removal action objectives and was performed in compliance with applicable or relevant and appropriate requirements in a safe and compliant manner. The total demolition cost was approximately \$910,000 including waste disposal costs. The C-405 D&D field activities began on November 28, 2006, and were completed on July 25, 2007. The work was accomplished through the use of approved work control documents and procedures that guided the field activities throughout the project duration.

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1. INTRODUCTION

This Removal Action Report has been prepared to document completion activities associated with the Decontamination and Decommissioning (D&D) of the C-405 Incinerator described in the *Action Memorandum for the Removal of the C-402 Lime House, the C-405 Incinerator, and the C-746-A West End Smelter at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-2237&D2, and its basis document, *Engineering Evaluation/Cost Analysis for the C-402 Lime House, C-405 Incinerator, and C-746-A West End Smelter at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-2227&D2, as well as the *Removal Action Work Plan for the C-405 Incinerator and C-746-A West End Smelter Inactive Facility D&D Project at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0002&D2. These documents outline the activities and requirements for the infrastructure and structure removal phases of the C-405 Incinerator. The facility structure was demolished to the concrete slab. Fixative was applied to the concrete slab and the slab is posted as a fixed contamination area (CA).

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2. SITE DESCRIPTION

2.1 LOCATION

The C-405 Incinerator structure was located in the central portion of the Paducah Gaseous Diffusion Plant (PGDP) at the intersection of Virginia Avenue and Tenth Street (see Figure 1). A photograph of the C-405 exterior view is provided in Figure 2. Interior views of C-405 are provided in Figures 3 and 4.

2.2 DESCRIPTION

The C-405 Incinerator was constructed in the 1950s. The building was a steel frame structure with transite (asbestos) siding and roof. The structure was built on a concrete slab. On the main (north) façade were two steel and glass garage bay doors. A corrugated sheet metal personnel door and a window were located on the east and west sides of the facility. On the south façade were two glass windows with an awning. The building footprint encompassed approximately 1,030 ft² of floor area (22 ft x 46.5 ft).

The building housed two inactive incinerators that were utilized to destroy combustible materials generated at the PGDP. There was a cinder block wall that separated the two incinerators. The incinerator on the east side was used to destroy radiologically contaminated items. The incinerator on the west side was used primarily for destroying noncontaminated items including classified documents. Each incinerator had a below-grade ash pit. The east side ash pit contained approximately 700 gallons of rain water. The west side ash pit contained no water. The east side of the building also housed a scrubber, miscellaneous pumps, electrical equipment, hoist, motors, and other debris, such as trash cans and paper. The west side of the building contained loose materials, such as motors, electrical equipment and pumps, a ladder, and spare scrubber parts. The two incinerators shared a common chimney that was located in the center of the building. The chimney was concrete lined with firebrick. The chimney was approximately 35 ft in height with its own foundation separate from the building foundation. A dust collector and stacks for the flue and scrubber were located on the roof of the west side. A 500-gallon liquid propane (LP) tank that provided fuel for the incinerators was located southeast of the building.

The C-405 facility included a number of auxiliary systems as follows:

- **Sanitary water**—provided to the building through a 10-inch water main located to the east of the building. A 1-inch water line provided sanitary water to the east side of the facility.
- **Electricity**—fed from two circuits located in the United States Enrichment Corporation (USEC) operated C-400 Building. Electricity was provided to power the lighting and equipment associated with shredding and incinerating material.
- **Gas**—the incinerators were fired originally by a Pyrofax system fed by a fuel manifold system located on the south exterior side of the building. This system was replaced later by a 500-gallon LP gas tank located approximately 25 ft south of the building.

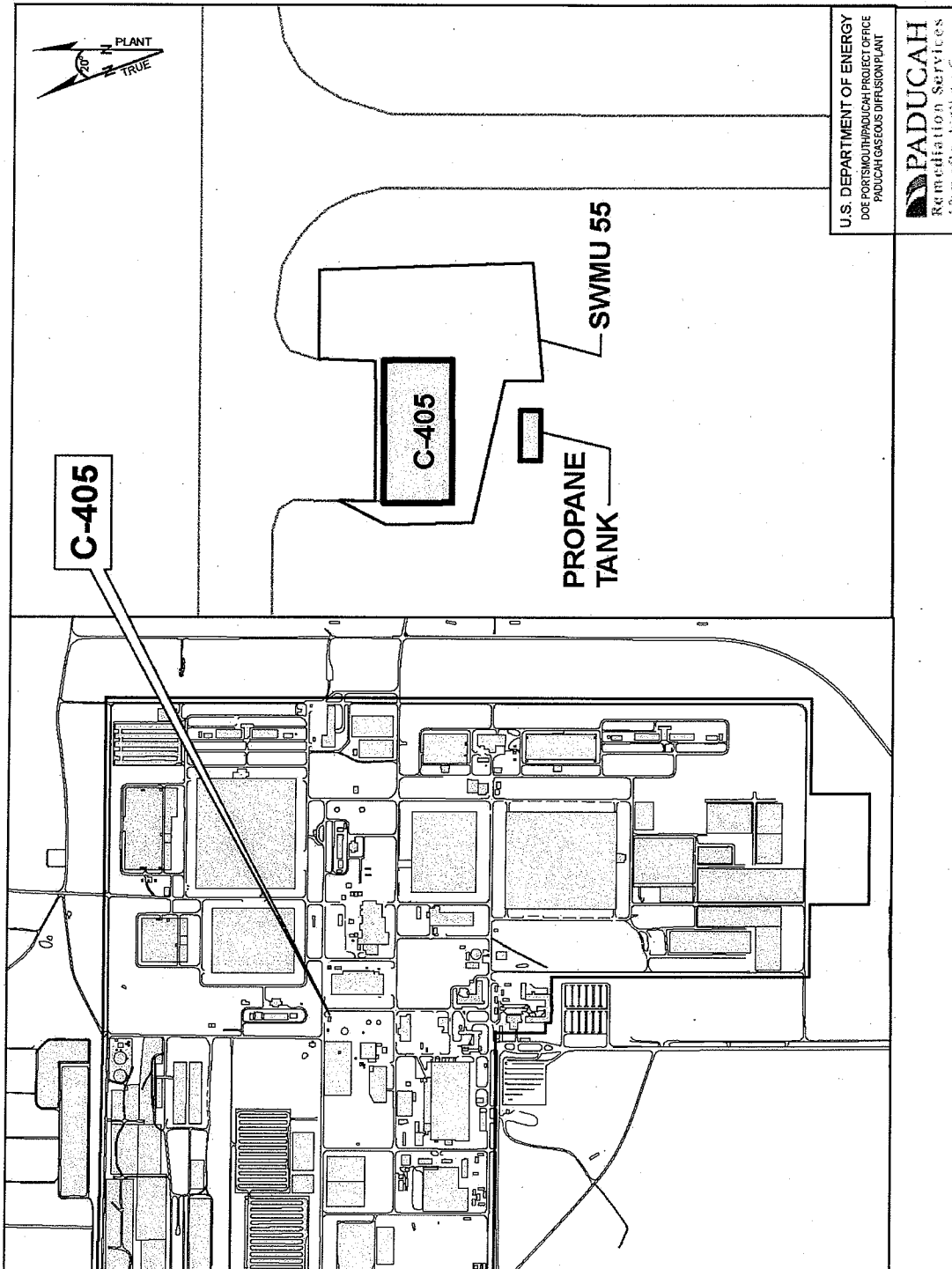


Figure 1. C-405 Incinerator Structure Location

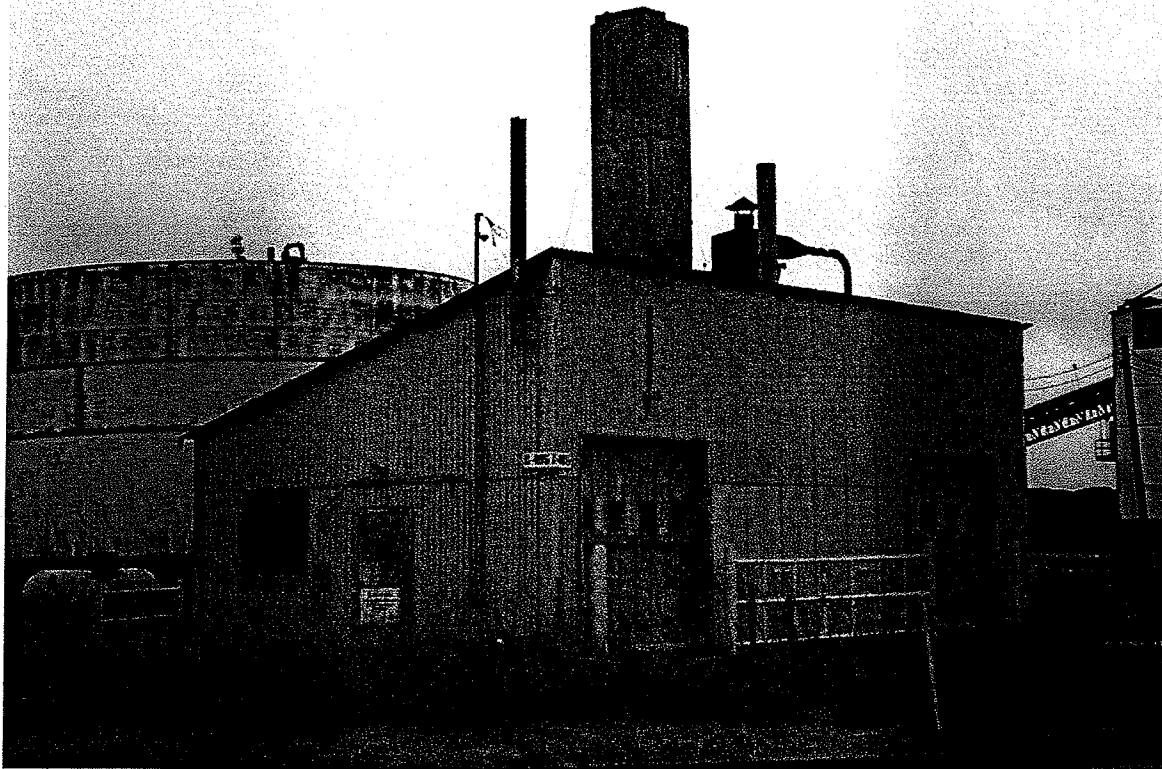


Figure 2. Photograph of Exterior of C-405 Incinerator

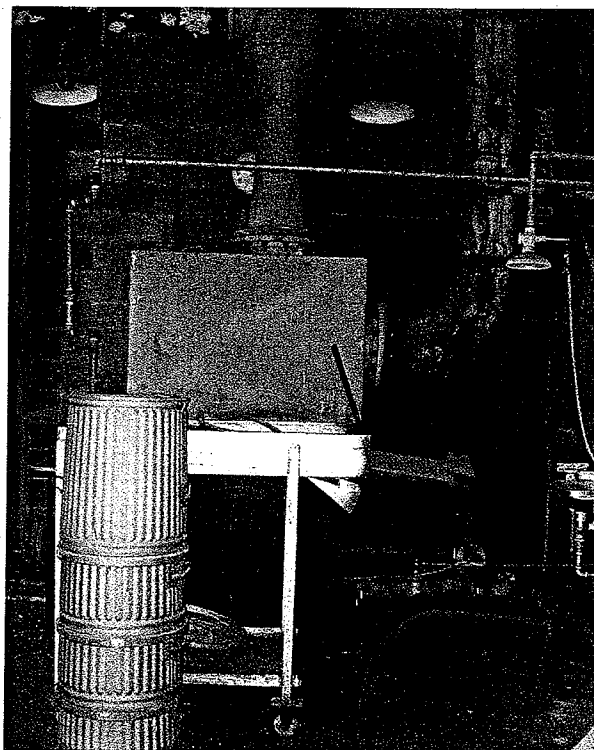


Figure 3. Photograph of Interior (East Side) of C-405



**Figure 4. Photograph of Interior (West Side) of C-405 Incinerator
(Scale for reference—door size is 24 inches x 16 inches)**

2.3 CONTAMINANTS

The C-405 Incinerator was radiologically contaminated. The primary radionuclides were uranium and technetium-99. Radiochemical analysis of the contamination indicated that most of the radioactive contamination was located in the east incinerator and the common chimney. The transite siding and roof were known to contain regulated levels of asbestos and were fastened to the superstructure frame with lead head bolts. Pipe and incinerator insulation were sampled and analyzed for bulk asbestos. The east incinerator insulation contained regulated levels of asbestos and was characterized as low-level radioactive waste (LLW) with asbestos. The pipe insulation sample results identified the insulation as non-asbestos. Paint samples were analyzed for polychlorinated biphenyls (PCBs) and analytical results confirmed that the paint was not regulated under the Toxic Substances Control Act (TSCA). Hexane wipe samples of oil stains indicated that the equipment did not contain PCB oil, but the equipment oil was screened and sampled to ensure PCBs were not present in the oil. A small amount of mixed low-level waste (MLLW) was generated from fuses in the equipment and the building electrical system. Ash was present in both the west and east incinerators. The west incinerator ash residue was not radiologically contaminated and a Toxicity Characteristic Leaching Procedure analysis characterized the ash as nonhazardous. A Toxicity Characteristic Leaching Procedure analysis of the east incinerator ash characterized the ash as MLLW D006 due to cadmium levels greater than 1 mg/L.

2.4 PREVIOUS INVESTIGATIONS/ACTIONS

A walk down of the C-405 Incinerator was conducted in 2003. As a result, the potential for asbestos-containing material (ACM) was expected to be present due to the age of the facility. Ash residue in the incinerators potentially could contain Resource Conservation and Recovery Act (RCRA) hazardous constituents. Residue from the incineration of X-ray film could contain a small quantity of silver. Additionally, electrical equipment pumps, motors, and other auxiliary equipment could contain RCRA hazardous constituents and/or PCBs. No previous removal actions were conducted at the C-405 Incinerator.

3. PROJECT DESCRIPTION

3.1 SCOPE AND PURPOSE

The scope of this non-time-critical removal action included the removal, characterization, and disposal of the C-405 Incinerator contents and structure to the existing concrete slab. The scope did not include removal of external utilities and ancillary equipment, the concrete building slab, building foundation, or the soil in Solid Waste Management Unit (SWMU) 55. These items will be addressed as part of subsequent actions (i.e., Soils Operable Unit, gaseous diffusion plant D&D).

3.2 REMOVAL ACTION OBJECTIVES

The removal action objectives form the basis for the C-405 Incinerator removal action. The removal action objectives for this action were to accomplish the following:

- Prevent the potential health and safety hazards to on-site personnel from deterioration of the contaminated structures; and
- Minimize or eliminate the potential health and environmental hazards of radiation and hazardous material exposure caused by the potential uncontrolled release of contaminated dust, equipment, and building materials from the facility.

3.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

In accordance with 40 *CFR* § 300.415(j) of the National Oil and Hazardous Substances Pollution Contingency Plan, U.S. Department of Energy (DOE) on-site removal actions conducted under the Comprehensive Environmental Response, Compensation, and Liability Act are required to attain applicable or relevant and appropriate requirements (ARARs) to the extent practicable, considering the scope and urgency of the action.

The approved ARARs for this removal action can be found in Appendix B of the *Engineering Evaluation/Cost Analysis for the C-402 Lime House, C-405 Incinerator, and C-746-A West End Smelter at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/OR/07-2227&D2*. The demolition and disposal of C-405 were performed in compliance with ARARs through the use of a comprehensive environmental, safety and health, and quality programs and PRS policies and procedures.

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4. REMOVAL ACTION ACTIVITIES

4.1 PROCESS DEFINITION

The general activities of the removal action included the following:

- Site set up and temporary power installation;
- Removal of loose material;
- Power isolation and electrical D&D;
- Isolation of water line;
- Removal of propane tank and associated piping;
- Removal of installed equipment—scrubber assembly, shower station, eye wash station, incinerators and all associated piping;
- Removal of east ash pit water and incinerator ash in the pit;
- Filling ash pits with flowable fill;
- Removal of interior block wall;
- Removal of transite siding, roof, and building structural steel;
- Chimney removal;
- Site cleanup—demobilization of equipment/materials, radiological posting of the slab;
- Disposal of waste at the PGDP C-746-U Solid Waste Landfill and at an off-site treatment, storage, and disposal facility.

4.2 PROCESS SEQUENCE

The C-405 Incinerator D&D was performed by the DOE prime contractor, Paducah Remediation Services, LLC, (PRS). Fieldwork began on November 28, 2006, under the PRS work control program. Work control documents and/or PRS procedures were utilized to perform all work activities. All work planning incorporated the Integrated Safety Management System and Environmental Management System processes. The Integrated Safety Management System/Environmental Management System ensured that worker safety, public safety, and protection of the natural environment were incorporated into all aspects of the planning and execution of work activities. The core functions utilized included defining the scope of work, analyzing the hazards, mitigating the hazards, executing the work, and providing worker feedback and continuous improvement. Radiological control technicians (RCT) and a safety and health representative provided full-time support for the project and monitored activities to ensure control of contamination.

Prior to the C-405 D&D, the building was in shutdown/inactive status under surveillance and maintenance in the D&D program. The transite building walls and roof were in good shape with all panels intact. The walls and roof were fastened to a structural steel frame with lead head bolts. All installed equipment was abandoned in place, aged, and covered with dust. Loose debris was stored on both the west and east sides of the facility. The electrical equipment was aged and the conduit was intact. All piping was in good physical condition and intact as well.

Electricity was fed to the C-405 Incinerator from two circuits located in C-400. The breaker on the 480V circuit was in the "OFF" position with a defective material tag in place. The 120V/208V circuit was disconnected in 1994. Water was supplied to the facility from the PGDP sanitary water system via a 10-inch water main located to the east of the building. The position of the inground shutoff valve was unverified prior to start of D&D.

Building access was controlled by the facility manager and the entrance requirements for surveillance and maintenance activities were established and defined on a radiological work permit. Access to the building was controlled by a posted CA placard and the ground surrounding the building was roped off preventing entry into the east side of the building.

4.2.1 Site Set Up and Temporary Power Installation

The ground surrounding the C-405 Incinerator was posted as a CA, which prevented free access to the east personnel door. A walkway to the personnel door on the building west side was down posted to allow entry/exit since contamination was not detected on the ground in this area. Due to the site condition, establishing a work area around the building was required prior to commencement of work to prevent the potential of contaminating tools and equipment used throughout the project duration. A ground barrier was placed around the entire building to allow free access to the entire building exterior. Once the ground barrier was installed, all material and support equipment were mobilized to the site in preparation of D&D. A portable generator was placed near the facility to supply power for tools and lighting. Temporary lighting and extension cords were installed inside both the east and west sides of C-405. All penetrations inside and outside the building were sealed to prevent air emissions to the environment.

4.2.2 Loose Material Removal

Once the site set up was complete, the inside of C-405 was fogged with a lock down agent to reduce the airborne particulates and to lock down all the accumulated particulates on the floor and equipment. All loose material from both east and west sides of the building was removed. The loose material included a wooden ladder, pump assembly, spare scrubber separator, metal cart, and loose debris (including ash). Some loose material was size reduced in order to place into containers for disposal. The ash located inside the east incinerator and the chimney was removed and properly packaged (see Section 5.2) for disposal. Each component was inspected visually, and a RCT surveyed the material prior to removal from the building.

4.2.3 Power Isolation and Electrical Decontamination and Decommissioning

The 480V circuit for C-405 was fed from the USEC-operated C-400 Building. The breaker was in the "OFF" position with a defective material tag in place. USEC personnel de-energized the 480V circuit inside the C-400 Building, and PRS personnel verified this isolation. The 120V/208V circuit was located in the same junction box as the 480V. PRS personnel were not able to locate the 1994 disconnection of this circuit; therefore, USEC personnel de-energized this circuit as well. All electrical equipment was air-gapped inside C-405 by PRS personnel. The power sources were treated as energized until electrical personnel verified each component as de-energized prior to cutting and removing equipment. Once all

electrical equipment was air-gapped, electrical equipment from inside and outside the building was removed and packaged for disposal.

4.2.4 Isolation of Water Line

Water to the east side of the C-405 Incinerator was supplied from the PGDP sanitary water system. An inground shutoff valve is located to the east of the building. This valve controls the flow of water into the east side of the building. PRS personnel verified this valve was in the "OFF" position preventing water flow into the building. A 1-inch water pipe located inside the east side wall was cut just above the floor level. The pipe was threaded, capped, and encased with concrete. The original building drawings indicated an additional underground water supply line to the C-616-L Effluent Vault. PRS determined that this water supply line was isolated in the early 1990s.

4.2.5 Propane Tank and Piping Removal

An aboveground 500-gallon LP tank fueled both incinerators in C-405. It was located approximately 25 ft southeast of the building. The tank, concrete footers, and all aboveground piping were removed and properly packaged (see Section 5.2) for disposal. All underground piping associated with the tank was abandoned in place and will be addressed as part of the Soils Operable Unit. The ground openings generated during the removal of the concrete footers were backfilled and the ground was restored to its original contour.

4.2.6 Installed Equipment Removal

Installed equipment in the C-405 Incinerator included the east and west incinerators, scrubber assembly, eye wash station, shower station, motor/blower assembly, and all associated ductwork and piping. All electrical conduit/wiring was removed during the electrical equipment D&D. All piping and ductwork was disconnected from the equipment prior to equipment removal. The east incinerator was encased fully by friable asbestos insulation which was abated prior to equipment removal. All applicable asbestos management practices [Occupational Safety and Health Act (29 *CFR* § 1926.1101 and 401 *KAR* 57:011)] were followed, as specified in the ARARs. The incinerators were dismantled into smaller, more manageable sections for ease of movement and packaging. General housekeeping activities were performed throughout the duration of this phase. High efficiency particulate air filter vacuums and negative air machines were utilized during all asbestos abatement activities. All decontamination water generated was containerized with the ash pit water and scheduled for disposal. The shower water generated from the asbestos decontamination trailer was treated and emptied into the PGDP Sanitary Wastewater Collection Treatment System.

4.2.7 East Ash Pit Sludge & Water Removal

An ash pit (2-ft 6-inches wide x 10-ft long x 4-ft 6-inches deep) was located under the east incinerator. This pit was filled with approximately 700 gallons of rain water and 3 inches of incinerator ash in the bottom. The water was agitated to mix the ash with the water. The ash/water mixture was pumped into a portable container and transported to an on-site permitted storage area. A metal cart with a collection drum was located in the bottom of the pit under the incinerator. This cart and collection drum were removed from the pit and properly packaged (see Section 5.2) for disposal.

4.2.8 Filling Ash Pits

Once the water and incinerator ash was removed from the east ash pit, it was filled with a low-strength, self-compacting, cementitious flowable fill to 6 inches below the existing floor. Once the fill cured, a 6-inch concrete cap was poured on top of the fill making the pit flush with the existing floor. An ash pit (4-ft wide x 5-ft long x 6-inches deep) was located under the west incinerator. This opening was filled with concrete flush to the existing floor. Once the concrete cured in both floor openings, the concrete cap was sealed.

4.2.9 Interior Wall Removal

The east and west side of the C-405 Incinerator was separated by an 8-inch thick cinder block wall. The chimney was located near the center of this block wall. When all equipment and material was removed leaving only the building structure, the interior block wall was removed. All waste generated was packaged for disposal. When all cinder block debris was collected, a RCT performed radiological surveys of the floor and a fixative was applied.

4.2.10 Building Structure and Wall Removal

At this point in the D&D phase, only the building chimney and structure remained. The next work task was the removal of all transite siding and roofing. All glass, window frames, roll up doors, and personnel doors were removed and packaged for disposal. The roof and siding were attached to a steel structure with lead head fasteners. These fasteners were removed and segregated for proper packaging and disposal. The siding and roof were removed and packaged for disposal (see Figure 5). The removal of the transite siding and roof was performed in accordance with all applicable federal and state regulations, as defined in the ARARs. The steel structure was removed with an excavator and shear attachment (see Figure 6). All openings in the concrete floor generated during structure removal were filled with concrete grout flush with the existing concrete floor.

4.2.11 Chimney Removal

A 50-ft construction boundary was established around the perimeter of the chimney to serve as a work area for the chimney removal. Work sedimentation controls were installed to catch any sediment that was generated due to the chimney removal. An excavator with a concrete pulverizer attachment was used in a systematic way to remove the chimney (see Figure 7). A fire hydrant provided the water required to mist the chimney for dust suppression during this demolition activity. As the chimney was removed, all demolition debris was removed from the work area and packaged for disposal. All protruding rebar in the demolition debris was cut to eliminate hazards while packaging the waste for disposal. The chimney was removed to the concrete slab level and all remaining rebar was cut flush with the concrete slab.



Figure 5. Photograph of Transite Siding Removal at C-405

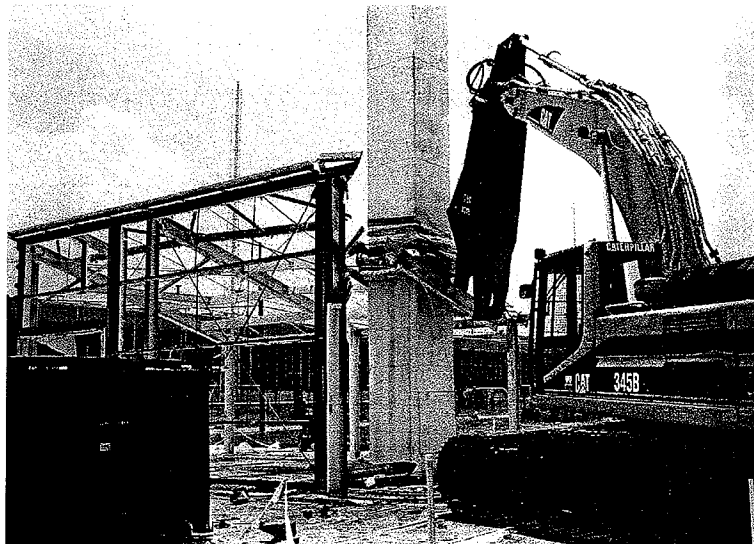


Figure 6. Photograph of Structure Removal at C-405

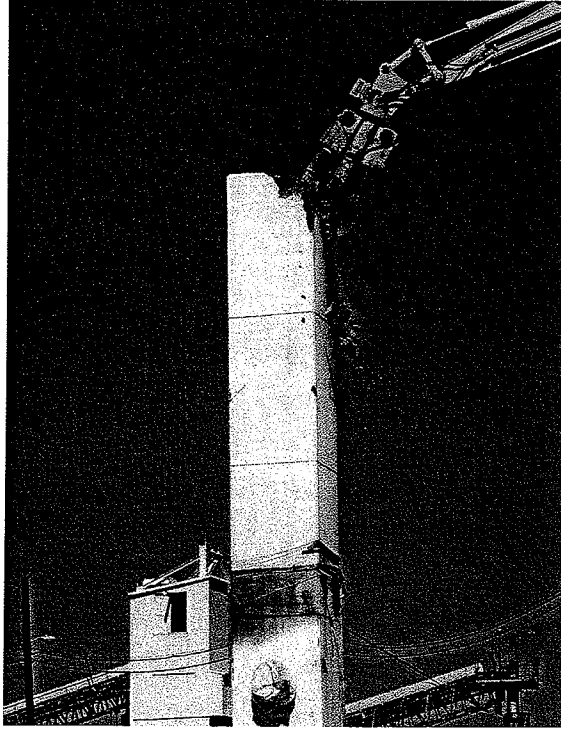


Figure 7. Photograph of Chimney Removal at C-405

4.2.12 Site Cleanup

After demolition of the building was complete, all equipment and materials were demobilized and site cleanup activities began (see Figure 8). The ground barrier and filter cloth were removed and properly containerized for disposal. General housekeeping activities were performed on the concrete slab and around the building grounds. Radiological surveys of the concrete slab were performed to determine the posting requirements. A fixative was applied to the concrete pad to fix the low-level radiological concerns (1,589,238 dpm/100 cm² total beta/gamma, 702 dpm/100 cm² total Alpha). A perimeter boundary control was installed around the concrete slab to clearly demarcate the area as a fixed CA (see Figure 9).

Upon completion of the demolition, engineering personnel performed a walk down to verify the removal action was performed in compliance with the Removal Action Work Plan (RAWP). The demolition and disposal of C-405 met all objectives for removal in compliance with the RAWP.



Figure 8. Photograph of Site Cleanup at C-405

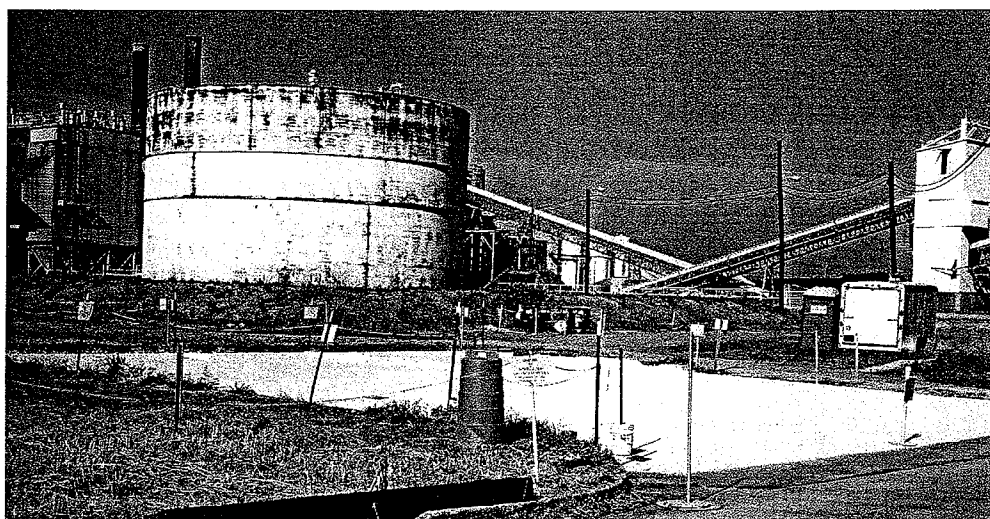


Figure 9. Photograph of C-405 Post D&D

4.2.13 Waste Disposal

All waste generated during the infrastructure and structure removal phases of the C-405 Incinerator D&D was containerized for disposal. All waste materials were segregated according to the waste acceptance criteria of the disposal facility. Approximately 40% of the generated waste was disposed at the Paducah solid waste landfill. The remaining 60% of the waste was shipped to the EnergySolutions facility in Utah. Refer to Table 1, C-405 Waste Categories, Volumes, and Disposition.

Table 1. C-405 Waste Categories, Volumes, and Disposition^a

Waste Stream	Waste Volume	Disposition Location
Demolition Debris Less than the PGDP Authorized Limits	2,756 ft ³	PGDP C-746-U Solid Waste Landfill
Low-Level Demolition Debris	2,200 ft ³	EnergySolutions Utah Facility
Low-Level Asbestos Waste	1,900 ft ³	EnergySolutions Utah Facility
Low-Level Aqueous Waste	700 gallons	EnergySolutions Utah Facility
MLLW/RCRA—Hazardous Waste (includes east incinerator ash and floor sweeping)	28 ft ³	EnergySolutions Utah Facility
MLLW/RCRA—Hazardous Waste (includes lead counterweights, circuit boards, small capacitors, oil)	21 ft ³	Transferred to interim storage for bulking or accumulation

^a There are minor variations in the waste categories and volumes between this table and Table 1 in the *Waste Management Plan for the C-405 Incinerator at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, PRS-FCD-745.

MLLW = mixed low-level waste
 PGDP = Paducah Gaseous Diffusion Plant
 RCRA = Resource Conservation and Recovery Act

5. WASTE MANAGEMENT AND TRANSPORTATION ACTIVITIES

Waste management activities were conducted in accordance with the ARARs and the *Waste Management Plan for the C-405 Incinerator at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, PRS-FCD-745.

5.1 WASTE CHARACTERIZATION

One of the first steps in the planning phase of the project was to characterize the building to determine health and safety requirements for initial entry and to assess potential hazards. This was accomplished by reviewing available radiological survey data and documentation that described the process that had taken place in the building.

A Sampling and Analysis Plan was developed and implemented to characterize waste for compliance with treatment and disposal regulations. Selection of sample locations and media was based on observations of material and waste in the building, previous radiological survey data, waste characterization criteria for the proposed disposal facility, and other relevant historical data on known or suspected hazards. Examples of media and waste targeted for sampling and analysis included these: (1) incinerator ash; (2) liquids; (3) applied dry paint; (4) insulation, caulking, firebrick, mortar, and other waste suspected of being ACM. Hexane wipe samples were collected on oil-stained debris and analyzed for PCBs.

Field screening was used as a qualitative indicator of the presence or absence of regulated materials. The most frequently used field screening tests were for lead and PCBs. Positive field screening results were used as segregation criteria for liquids and debris prior to disposal. Liquids were characterized by laboratory analysis prior to disposal. Debris that had positive field screening results for lead was declared MLLW.

Information on the types, volumes, and disposition of waste generated from C-405 D&D is summarized in Table 1, C-405 Waste Categories, Volumes, and Disposition.

5.2 WASTE PACKAGING

Waste materials generated during the D&D of the C-405 Incinerator were containerized for transportation and disposal. The type of packaging chosen for each waste stream depended on the following:

- U.S. Department of Transportation (DOT) classification;
- Quantity of the waste stream generated; and
- Requirements of the selected disposal facility.

Containers purchased for off-site shipments were purchased in accordance with *Procurement, Inspection, and Management of Items Critical for Paducah Off-Site Waste Shipments*, PRS-WSD-3012. Additional guidance for waste packaging is included in procedure PRS-WSD-3015, *Waste Packaging*.

5.3 WASTE TRANSPORTATION

Waste shipped off-site for disposal was in compliance with all applicable DOT regulations. Guidance for on-site and off-site transportation compliance is contained in the *Off-Site Shipping*, PRS-FCD-745; the On-Site Transportation Safety Document, PRS-WSD-661; and procedure PRS-WSD-3015, *Waste Packaging*.

5.4 WASTE DISPOSAL

The D&D of C-405 generated five distinct waste streams: (1) demolition debris meeting authorized limits for the PGDP C-746-U Solid Waste Landfill; (2) low-level demolition debris; (3) low-level asbestos waste; (4) low-level aqueous waste; and (5) MLLW/RCRA hazardous waste.

The largest volume of waste generated was demolition debris consisting of nonhazardous metal and construction/demolition debris that met the authorized limits for radioactive contamination at the PGDP C-746-U Solid Waste Landfill. This waste was disposed of at the C-746-U Solid Waste Landfill.

The second waste stream consisted of nonhazardous low-level demolition debris. This waste included nonhazardous equipment and debris from the east and west incinerators. It was disposed of as LLW at the *EnergySolutions* facility in Utah.

The third largest waste stream was nonhazardous asbestos waste that met the DOT definition of LLW. This waste was generated from the asbestos abatement/demolition of the east incinerator. It was disposed of as LLW asbestos at the *EnergySolutions* facility in Utah.

The fourth waste stream generated was the low-level aqueous waste. Approximately 700 gallons of rain water accumulated in the ash pit under the east incinerator. This water was pumped into a portable tank and transferred to *EnergySolutions* for disposal.

The fifth waste stream generated was MLLW/RCRA hazardous waste. This waste stream consisted of incinerator ash collected from the east incinerator and chimney and floor sweeping. This waste contained regulated levels of cadmium and carried the hazardous code of D006. This waste was disposed of at the *EnergySolutions* facility in Utah. Other declared MLLW/RCRA hazardous waste, consisting of lead counterweights, circuit boards, and small capacitors (21 ft³), was accumulated for future off-site treatment by macroencapsulation and disposal at the *EnergySolutions* facility in Utah. This waste was bulked/combined with other similar waste due to the small volumes and cost efficiencies and will be disposed of under the Facilities Disposition C-410 Project.

6. PROJECT COST AND SCHEDULE

6.1 PROJECT SCHEDULE

Key milestones included the following:

- Issued Removal Notification April 8, 2005
- Issued D1 Engineering Evaluation/Cost Analysis June 13, 2005
- Issued D1 Action Memorandum September 28, 2005
- Issued D1 Removal Action Work Plan June 30, 2006
- Received regulatory approval on RAWP November 27, 2006
- Started fieldwork November 28, 2006
- Completed fieldwork July 25, 2007
- Completed waste disposition June 12, 2008¹

6.2 PROJECT COST

The total demolition cost to date is approximately \$910,000. This value includes all fieldwork and off-site waste shipment and disposal costs.

¹ Except for the 21 ft³ of bulked waste scheduled for disposal under the Facilities Disposition C-410 Project.

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7. REFERENCES

Action Memorandum for the Removal of the C-402 Lime House, the C-405 Incinerator, and the C-746-A West End Smelter at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/OR/07-2237&D2, December 2005.

C-405 Building D&D, Revision 0, WP-06-FD-P011.

Engineering Evaluation/Cost Analysis for the C-402 Lime House, C-405 Incinerator, and C-746-A West End Smelter at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/OR/07-2227&D2, August 2005.

Environmental Compliance Improvement Plans for RCRA-Regulated Units, Miscellaneous Materials and Legacy Low Level Waste and Listed Waste in Environmental Media at the U.S. Department of Energy Facilities Managed by Bechtel Jacobs Company LLC, BJC/OR-1372/R1, Bechtel Jacobs Company LLC, July 2003.

Federal Facility Agreement for the Paducah Gaseous Diffusion Plant, DOE/OR/07-1707, U.S. Environmental Protection Agency, Atlanta, GA, February 1998.

Removal Action Work Plan for the C-405 Incinerator and C-746-A West End Smelter Inactive Facility D&D Project at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/LX/07-0002&D2, October 2006.

“Removal Notification for the C-405 Incinerator (SWMU 55), C-402 Limehouse (SWMU 480), and C-746-A West End Smelter (SWMU 464) at the Paducah Gaseous Diffusion Plant (PGDP), Paducah, Kentucky,” April 2005.

Site Management Plan, Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/OR/07-0009&D2/R1, October 2007.

Waste Management Plan for the C-405 Incinerator at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, PRS-FCD-745, July 2006.

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