

**A Plutonium Finishing Plant Model for the CERCLA Removal Action and
Decommissioning Construction Final Report – 8411**

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ABSTRACT

The joint policy between the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE) for decommissioning buildings at DOE facilities documents an agreement between the agencies to perform decommissioning activities including demolition under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). The use of removal actions for decommissioning integrates EPA oversight authority, DOE lead agency responsibility, and state authority for decommissioning activities.

Once removal actions have been performed under CERCLA, a construction completion report is required to document the completion of the required action. Additionally, a decommissioning report is required under DOE guidance. No direct guidance was found for documenting completion of decommissioning activities and preparing a final report that satisfies the CERCLA requirements and the DOE requirements for decommissioning. Additional guidance was needed for the documentation of construction completion under CERCLA for D&D projects undertaken under the joint policy that addresses the requirements of both agencies.

A model for the construction completion report was developed to document construction completion for CERCLA D&D activities performed under the joint EPA/DOE policy at the Plutonium Finishing Plant (PFP). The model documentation report developed at PFP integrates the DOE requirements for establishing decommissioning end-points, documenting end-point completion and preparing a final decommissioning report with the CERCLA requirements to document completion of the action identified in the Action Memorandum (AM). The model includes the required information on health and safety, data management, cost and schedule and end-points completion.

INTRODUCTION

A series of milestones for decommissioning the Plutonium Finishing Plant (PFP) were made part of the Hanford Federal Facilities Agreement and Consent Order (HFFACO), also known as the Tri-Party Agreement (TPA), in 2002. Using the authority of the Joint EPA/DOE Policy for Decommissioning Under CERCLA and Executive Order 12850, the U.S. Department of Energy (DOE) did two things: issued Action Memoranda for decommissioning the 232-Z Building and PFP's above-grade complex under CERCLA, and subsequently prepared removal action work plans to ensure compliance with

applicable, relevant and appropriate requirements (ARARs) to execute the decommissioning work in a safe and compliant manner while monitoring budget and schedule.

To document construction completion for decommissioning activities at PFP, a model for the construction completion report was developed. The model integrates the DOE requirements for decommissioning and establishing end-points with the CERCLA requirements to document completion of the action identified in the Action Memorandum. The model also includes provision for the required information on health and safety, data management, cost and schedule, and end-points completion verification documentation.

Background

PFP was used to process and store plutonium and support operations for national defense and is located in the 200 West Area of the Hanford Nuclear Reservation (Figure 1.). Activities performed at PFP included:

- Converting and processing plutonium
- Fabricating weapons components
- Producing and blending plutonium and uranium feed materials for advanced reactor fuel
- Recovering plutonium and americium
- Handling and storing special nuclear material
- Supporting laboratories
- Handling process waste.

Plutonium production operations ceased at PFP in 1990 under direction from DOE-Headquarters. Plant resources were then re-directed toward cleaning out the facilities and stabilizing/repackaging the several tons of special nuclear material then in inventory. In October 1996, DOE issued a letter which directed the DOE, Richland Operations Office (RL) to “initiate deactivation and the transition of the PFP in preparation for decommissioning”. To transition the PFP Facility to a low-risk/low-cost surveillance and maintenance (S&M) condition, planning was initiated to integrate deactivation activities with the ongoing activities to stabilize plutonium-bearing material. The end point criteria document developed for PFP established the final end-point for the buildings as clean slab-on-grade.

Milestones were developed in 2002 to decommission the 63 PFP structures beginning with the 232-Z Incinerator Building. Because the transition phase of the decommissioning effort spans 16 years, documenting the completion of the milestones, compliance with the requisite Action Memoranda and the decommissioning activities resulting in the slab-on-grade end-point for the PFP buildings is necessary. Since the 232 Z Incinerator building was scheduled to be completed well ahead of the other decommissioning activities at the PFP complex, it served as the pilot and validation of the PFP acceleration plan. The model developed allows for documenting this decommissioning work as the scope of the Action

Memoranda is completed. It also provides information to be used as necessary to support a decision of “no further action” under CERCLA if that option is compatible with other cleanup activities in the 200 West Area of the Hanford Site.

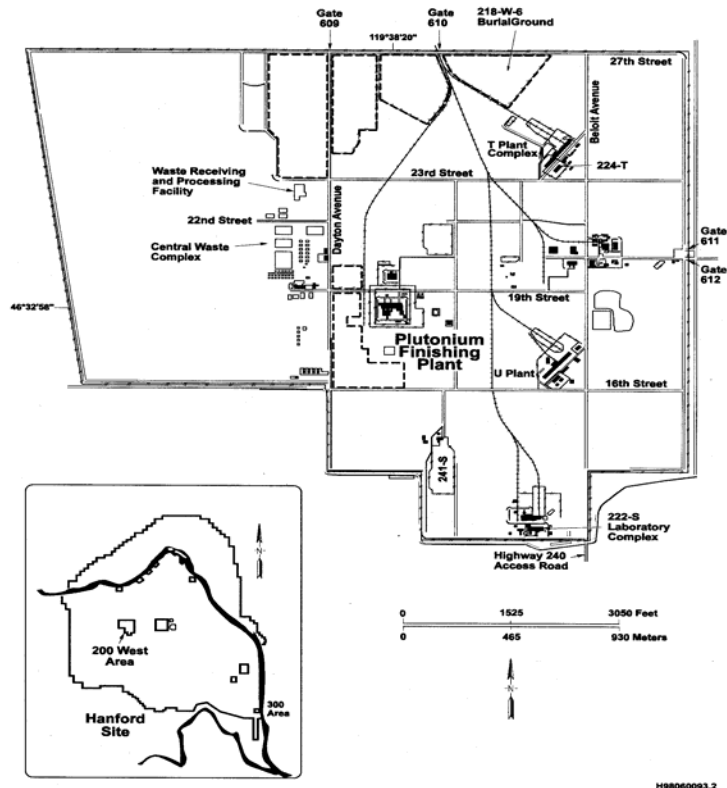


Figure 1. 200 West Hanford Site

MODEL DEVELOPMENT

The model was developed after researching requirements and guidance provided by the U.S. Environmental Protection Agency and the U.S. Department of Energy. The model documents the PFP decommissioning work in series of phased reports covering construction completion, or completion of the deconstruction activities. These phased reports with result in a final report for each Action Memorandum. To develop the model, EPA guidance for performing and documenting removal actions was considered because the *Policy on Decommissioning of Department of Energy Facilities Under the Comprehensive Environmental Response, Compensation, and Liability Act*, [1] allowed decommissioning to occur as removal actions. The requirements for EPA five-year reviews were analyzed for requested information to add to the model, which would facilitate these types of reviews. Additionally, decommissioning guidance documents

such as *U.S. Department of Energy Office of Environmental Management Decommissioning Resource Manual*, [2], the *Decommissioning Handbook*, [3] DOE/EM-0383, January 2000, and DOE Order 430.1, *Life-Cycle Asset Management [LCAM]* [4] were reviewed with particular attention to end-point completion and generating the final report.

According to the decommissioning guidance, a decommissioning project final report or equivalent must be prepared, consistent with the graded approach, after all technical work has been completed and verified. The final report describes decommissioning activities; accomplishments; final facility status; and lessons learned, including evaluation and feedback on the safety management system.

The *DOE Decommissioning Resource Manual* (Chapter 5) and the *DOE Decommissioning Handbook* (Step 20), document a requirement to prepare a final project report. At minimum, the final project report should include facility background; history and project purpose; facility description including buildings, systems and radiological and toxicological contamination; removal action objectives; work scope and technical approach; and work performed. Work performed includes project management, project engineering, site preparation, decommissioning activities, post decommissioning radiological and chemical surveys, cost and schedules, waste volumes generated, occupational exposures to personnel, final site condition, lessons learned, and references.

The need for post-decommissioning activities may be documented in the report. The *Decommissioning Implementation Guide*, [5] Step 21 states: *Additional post-decommissioning activities may be required based upon environmental regulatory requirements under CERCLA or RCRA (if decommissioned facility is included in a RCRA-permitted facility or is otherwise subject to RCRA requirements), future land and facility uses, and agreements between DOE Program Offices. Actual post-decommissioning activities may include continuing site control activities, as necessary, pending property or facility release or transfer to another authorized party; or administrative actions consistent with the decommissioning end state and/or site plan.*

EPA guidance *Superfund Removal Procedures*, EPA-540/R-94/C23, June 1994, [6] provides guidance for final removal action reports. The guidance format includes site background covering past and present activities, NPL status, Action Memorandum information including any deviations, site description and preliminary assessment information, removal activities, key issues, cost information, and information about disposition of wastes.

The requirements of OSWER Directive 9360.2-01, *Model Program for Removal Site File Management*, [7] were reviewed because EPA requires the management of site files for removal actions. Information on chronology of events and decisions, entry and exit of personnel and equipment, work accomplished, costs, and site conditions are included.

The PFP final report model incorporates the major elements of DOE's decommissioning guidance and EPA's removal action report guidance. It also provides for summarizing

the elements needed for site files for removal actions, and provides salient information for the five-year review process and any decisions of “no further action”.

PFP Decommissioning Construction Final Report Model Elements:

- Introduction:
 - Description of location, size, environmental setting, operational history
 - Operations and waste management practices that contributed to the contamination of the site
 - Regulatory and enforcement history of the site
 - Major findings and results of the site investigation
 - Prior response actions
- Background of area of response action
- A Summary of requirements specified in the Action Memorandum
 - Removal Action Objectives (RAO), Operational & Maintenance (O&M) requirements, and security requirements,
 - Basis for response action goals
 - A Summary of planning documents
- Construction Activities for response action
 - Step-by-step summary description of activities undertaken to implement the response action: mobilization, site prep, sampling activities
- Chronology of Events
 - Tabular summary of major events
 - Associated milestones
 - Monitoring and sampling and surveying events
 - Final sampling and surveying
 - Inspections
 - Demobilization
- Performance standards and construction Quality Control
 - Provide an explanation of the approved construction quality assurance and construction quality control requirements
 - Provide an assessment of the performance data quality, including the overall quality of the analytical data, with a brief discussion of quality assurance and quality control procedures that were followed, use of a QA PP, and comparison of analytical data with data quality objectives
- Final Inspections, certifications, end-points
 - Include adherence to health and safety requirements while implementing the response action
- O&M activities
- Observations and lessons learned pertaining to project management, contamination control, successful demolition tactics.

A comparison of requirements and the PFP model are presented in Table I. Table I presents the elements of guidance from the two agencies in the first two columns. The last column shows the elements that were decided for the PFP model final report.

Table I. Comparison of DOE and EPA Guidance and PFP Model

DOE Decommissioning Guidance	EPA Removal Action/Remedial Action Guidance	PFP Model for Final Report
Executive summary Facility background And history	Executive Summary	Executive Summary
Facility description: Buildings, systems	Facility description	Introduction, Facility Description and Operational History
Nature and extent of contamination, radiological and chemical	Nature and extent of contamination	Chemical and radiological contamination data, constituents of concern, nature and extent of contamination
Project objectives		Background of area of response action, site access, current land use, project objectives, requirements of Action Memorandum (AM)
Work scope		Scope of construction activities for response action
Technical approach		Approach
Work performed: Project management Site characterization Work activities Waste management, disposal and volumes Final surveys/analyses		Chronology of events, scope of removal action, schedule, demolition. Compliance with ARARs and Health and Safety Final configuration: Pre-demolition characterization, Post demolition characterization Waste management, generation, disposal and volumes Final surveys and analyses Performance standards and construction quality control
Cost and Schedule	Cost	Cost and schedule
Final condition description	Description of completion of scope of Action Memorandum (AM), deviations from AM	Final configuration documentation, end-point completion documentation, surveys and postings, compliance with Action Memorandum and deviations from Action Memorandum (if any)
Lessons learned	Lessons learned	Observations, lessons learned, project management information including scope, schedule and budget discussion.

Application of model to D&D of 232-Z: A Synopsis

The completion of the decommissioning of the 232-Z Waste Incineration Building under a CERCLA removal action is documented in the *232-Z Waste Incineration Building Removal Action Construction Completion Report* (Hopkins)[8]. A synopsis of the report follows to provide an example of section contents:

Introduction, Facility Description, Operational History and Contaminants of Concern, Removal Action Scope: The 232-Z Contaminated Waste Recovery Process Facility (Building 232-Z) (Figure 2) recovered residual plutonium through incineration and/or leaching of contaminated waste scrap material. Building 232-Z was designed and built during the late 1950s and early 1960s to house a combustible waste incinerator known as the Contaminated Waste Recovery Process Facility. The building was approximately 11.3 m wide and 17.4 m long; the walls were of cinder block construction. Failures of equipment, as well as spills, resulted in the release of radionuclide and other contamination to the building and external soils. Based on the potential threat posed by the residual plutonium, the DOE determined that it was appropriate to remove Building 232-Z to slab-on-grade, and documented the decision through a CERCLA Action Memorandum. The Action Memorandum requires DOE to remove contaminated equipment and demolish the building to a slab-on-grade condition. The COCs for waste designation fall into three primary categories – radiological contaminants, chemical constituents, and those associated with building/structural materials. The radiological COCs for Building 232-Z are linked to the sources of feed materials that were processed through the facility.



Figure 2. 232-Z Building

Construction Activities: As stipulated in the Action Memorandum, process equipment was removed from the facility and packaged for disposal. After removing asbestos, interior surfaces were painted to fix loose contamination, floor penetrations were grouted and sealed, and the building was demolished. The ductwork between the 232-Z Building and the 291-Z Building was grouted.

Chronology of Events, Removal Action Activities and Schedule: The major activities associated with the demolition of the 232-Z Building are listed in the schedule of critical path activities, which is included as an appendix. A summary table (Table II) is provided.

Table II. Summary of 232-Z Removal Action Activities (2 pages)

Activity	Duration
Deactivation	
Deactivation Project Start	10/01/2003
Process equipment removal from inside the glovebox	10/01/2003 to 05/28/ 2004
Non fissile work	06/01/2004 to 11/04/2004
232-Z Sampling & Analysis plan (DOE/RL-2004-22)	09/22/2004
232-Z CERCLA Action Memorandum (04-AMCP-0486)	11/05/2004
232-Z site specific health plan (HNF-20848)	11/06/2004
232-Z RAWP (DOE/RL-2004-61)	11/16/2004
232-Z Waste Management Plan (HNF-20862)	11/16/2004

Table II. Summary of 232-Z Removal Action Activities (2 pages)

Continue equipment removal from inside glovebox	07/22/2004 to 03/24/2005
Incinerator glovebox decontamination and removal	08/19/2004 to 06/30/2005
Scrubber cell process equipment removal and decontamination	07/01/2005 to 03/27/2006
Process room equipment removal	03/25/2006 to 04/21/2006
E4 Filter box removal	04/24/2006 to 05/12/2006
Final filter removal	05/01/2006 to 05/31/2006
Step out from DSA containment controls	05/24/2006
Stack 296-Z-14 stack operations terminated	05/28/2006
Completed Deactivation and isolation	05/28/2006 to 05/31/2006
Fix contamination and transition to Demolition	06/01/2006
Building Demolition	
Demolition preparation	06/02/2006 to 06/08/2006
Start demolition	06/09/2006
Stack 296-Z-14 torn down	06/11/2006
Scrubber cell demolished	06/22/2006
Rubble loadout and shipping to ERDF (41 ERDF cans)	06/10/2006 to 07/27/2006

Table II. Summary of 232-Z Removal Action Activities (2 pages)

Fix slab and review with Washington Dept. of Ecology	07/10/2006
Place gravel and ecology blocks on slab	07/11/2006 to 07/19/2006
Clean the CA, Remove demolition boundary & Post	07/20/2006 to 07/26/2006
DOE-RL & WDOE completed final inspection	07/27/ 2006
Complete TPA milestone M-83-40	07/27/2006 (9 weeks early)
232-Z Final SOG Characterization Report (M2300-06-010)	08/09/2006
Washington Dept of Ecology M-83-40 acceptance letter	08/24/2006

Cost Data In Thousands:

FY03 \$1, 526

FY04 \$2, 188

FY05 \$5, 364

FY06 \$7, 701

Demolition, Health and Safety: Mobilization, air monitoring, water control, health and safety, final configuration and postings are discussed in this section. Figure 3 presents the process of demolishing the building and the use of water sprays to control contamination. A site-specific HASP was prepared that evaluates the chemical, radiological, physical, and biological hazards that might be encountered during D&D activities at Building 232-Z. The HASP identified the controls and requirements for safety and health of personnel during D&D activities at Building 232-Z and included the requirements for hazardous waste operations, as specified in 29 CFR 1910.120 and DOE Standard 1120-98. The HASP provided requirements and controls for the following:

- Organizational roles and responsibilities
- Hazard identification and evaluation information
- Training requirements for personnel
- Identification and discussion of PPE expected to be used
- Medical surveillance requirements
- Personnel and environmental monitoring requirements
- Decontamination procedures
- Worksite control measures
- Emergency management
- Confined space entry policies
- Environmental protection requirements for spills
- Hazard communication requirements.

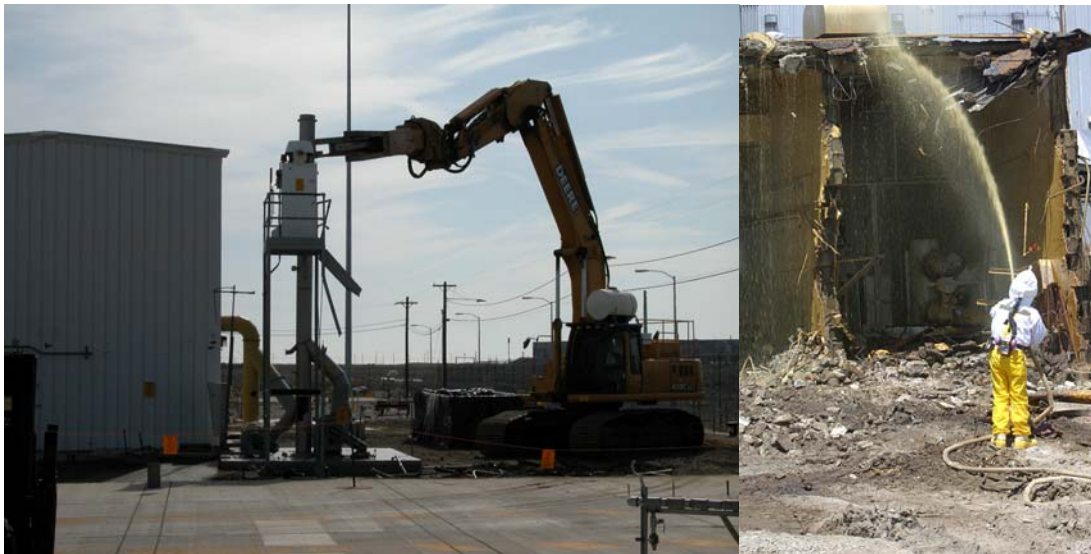


Figure 3. Stack demolition and water control during demolition

Final surveys and sampling: The 232-Z Building Final Slab-on-Grade Characterization Report documents the radiological and hazardous constituents at this facility before and after demolition. In a letter of August 24, 2006, the Washington Department of Ecology

concluded that the requirements of the TPA Milestone that address building demolition have been met (Figure 4).

Waste Generation and Management: Building debris was packaged and sent to the Environmental Restoration Disposal Facility (ERDF) for disposal.

Performance Standards and Construction Quality Control: The slab was sealed to prevent exposure to any residual contamination.

Final End-Points: Clean slab-on-grade (Figure 4)



Figure 4. Final Decommissioning End-Point Completion: Clean Slab on Grade

Operations and Maintenance Activities: Provided for periodic surveys and routine surveillance and maintenance of remaining slab.

Observations and Lessons Learned: The demolition team used open air demolition techniques, including use of fixatives before and during demolition to control and contain contamination, to demolish the building to slab-on-grade. By removing the major source term prior to demolition and leaving the general fixed contamination in walls, ceilings, and floors, the project showed considerable savings and reduced worker hazards and exposure. Water misting during demolition activities was very effective in reducing contamination migration.

CONCLUSION

Upon the completion of removal and remedial actions, a final report on the construction activities is required to document the completion of the CERCLA action. Additional guidance was needed to document construction completion under CERCLA for D&D projects undertaken under the joint DOE/ EPA policy and performed as non-time critical removal actions. To document construction completion for D&D activities at PFP, a model report for the final decommissioning under CERCLA was developed. The model developed at PFP integrates the DOE requirements for decommissioning and meeting specified end-points with the CERCLA requirements to document completion of the

action identified in the Action Memorandum. It also includes the required information on health and safety, data management, cost and schedule and end-points completion and verification. The model fully integrates the DOE decommissioning guidance for final reports with EPA guidance for reports undertaken under non-time critical removal actions.

REFERENCES

1. "Policy on Decommissioning of Department of Energy Facilities Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)", U.S. DOE, U.S. EPA May 25, 1995.
2. , "U.S. Department of Energy Office of Environmental Management Decommissioning Resource Manual", DOE/EM-0246, August 1995.
3. , "Decommissioning Handbook, January 2000.
4. DOE Order 430.1, Life-Cycle Asset Management [LCAM]", Chg. 1, DOE/EM-0383, October 26, 1995.
5. , "Decommissioning Implementation Guide", DOE G 430.1-5, 2000.
6. "Superfund Removal Procedures", EPA-540/R-94/C23, June 1994.
7. , Model Program for Removal Site File Management. OSWER Directive 9360.2-01
8. A.M HOPKINS, *232-Z Waste Incineration Building Removal Action Construction Completion Report*, HNF3158, Rev.0.

BIBLIOGRAPHY

- DOE, "Engineering Evaluation/Cost Analysis for the Removal of the Contaminated Waste Recovery Process Facility Building 232-Z", Rev. 2, DOE/RL-2003-29, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE, "Sampling and Analysis Plan for the Contaminated Waste Recovery Process Facility, Building 232-Z", Rev. 0, DOE/RL-2004-22, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
- DOE, "232-Z Removal Action Work Plan", Rev. 0, DOE/RL-2004-61, U.S. Department of Energy, Richland Operations Office, Richland, Washington.