REMOVAL ACTION NO. 9 BUILDING 65 THORIUM OVERPACKING
PROJECT INFORMATIONAL PACKAGE

10/11/95

DOE-0030-96
DOE-FN EPAS
50
REPORT
Mr. James A. Saric, Remedial Project Director
U.S. Environmental Protection Agency
Region V - 5HRE-8J
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Chicago, Illinois 60604-3590

Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

REMOVAL ACTION NO. 9 - BUILDING 65 THORIUM OVERPACKING PROJECT
INFORMATIONAL PACKAGE

Enclosed is information on the Building 65 Thorium Overpacking Project, scheduled to be conducted as part of Removal Action No. 9, "Removal of Waste Inventories." Since the overpacking project is not scheduled to begin until late in calendar year 1995, the Department of Energy, Fernald Area Office (DOE-FN) wishes to keep both the Ohio Environmental Protection Agency (OEPA) and the U.S. Environmental Protection Agency (U.S. EPA) informed of current plans to implement these upcoming activities. The enclosed package provides a general overview of the project and does not intend to replace information submitted annually as part of Removal Action No. 9 documentation.

The update of procedures, documents, and summaries as required for Removal Action No. 9, in accordance with the Amended Consent Agreement (ACA), will reflect activities associated with the Building 65 Thorium Overpacking Project. Since the Thorium Overpacking Project is scheduled to begin late in 1995, and the annual update of Removal Action No. 9 procedures was last provided in June 1995, the procedures for this project will be provided as an addendum to the June 1995 update, before the start of project operations.

This document is submitted for informational purposes; however DOE-FN does request your comments to facilitate appropriate project planning.
If you have any questions or require additional information on this project, please contact John Trygier at (513) 648-3154.

Sincerely,

Johnny Reising
Fernald Remedial Action Project Manager

FN: Trygier

Enclosure: As Stated

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BUILDING 65

THORIUM OVERPACKING PROJECT

INFORMATIONAL PACKAGE

DOCUMENT # TOP-EPA-0001

REVISION 2

SEPTEMBER 1995

Prepared by:

WASTE PROGRAMS MANAGEMENT DIVISION

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

Fernald Environmental Restoration Management Corporation
P.O. Box 538704
Cincinnati, Ohio 45253-8704
BUILDING 65
THORIUM OVERPACKING PROJECT
INFORMATIONAL PACKAGE

REVISION 2

DATED: SEPTEMBER 1995

APPROVED BY
VICE PRESIDENT WASTE PROGRAMS MANAGEMENT
DATE: 9/8/95

THORIUM OVERPACKING PROJECT MANAGER
DATE: 9/15/95

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
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I. INTRODUCTION

Background

The Fernald Environmental Management Project (FEMP), formerly the Feed Materials Production Center (FMPC), is a Department of Energy (DOE) owned facility. Production at the FEMP ceased in 1989 due to a refocusing of the site's mission to that of waste management and environmental restoration. In addition to the production of uranium metal products to support DOE defense programs prior to 1989, the FMPC was used by DOE as an interim storage site for thorium and thorium compounds.

A Removal Site Evaluation (RSE) for the thorium storage buildings (Ref. 1), conducted in 1991, identified the Building 65 containers to be in a severe state of deterioration with resultant leakage of material. In May 1991, following negotiations with the U.S. Environmental Protection Agency (EPA) and the DOE, modifications to the 1990 Consent Agreement incorporated the Thorium Management Program into a removal action (Removal Action No. 9)(Ref. 2) to address remaining inventories of thorium. The action was consistent with Section IX of the Amended Consent Agreement (ACA) then under negotiation and the provisions of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 CFR Part 300)(Ref. 3).

A primary objective of the Thorium Management Program, under Removal Action No. 9, is to prepare all thorium inventories currently at the FEMP for offsite shipment and disposal. This action entails characterization, identification, packaging, and interim storage in order to meet receiving facility waste acceptance criteria. The on-going thorium actions are consistent with anticipated final remedial actions based on the fact that mitigation of personnel/environmental risk and safe, permanent disposition of the FEMP waste/materials are ultimate goals.

Project Scope

The scope of the Thorium Overpacking Project (TOP) is to safely and effectively overpack approximately 5,600 drums of thorium bearing materials into approved strong, tight containers. This is in preparation for off-site shipment for final disposal at the Nevada Test Site (NTS).

The drum overpacking will be accomplished through implementation of a Remote Controlled Material Handling System (RCMHS) which includes a mobile unit fitted with appropriate controls for remote
operation, remote control command unit, handling attachments, and visual monitoring system. The system also is complete with documentation and provisions for required personnel training.

Construction of an addition to Building 65, which will adjoin Building 64, provides adequate operational area to begin the overpacking project, maintaining a separation between operations personnel and the drum stacks. Eight (8) high efficiency particulate air (HEPA) filter units will be installed along the west side of Building 65. These units will maintain directed air flow on the entire Building 65 and new addition complex, as well as, pull air from the areas of lower radiological contamination levels to areas of higher radiological contamination levels.

Overpacked thorium bearing materials will be transferred to adjacent Building 64 for weighing and labeling, then to the designated staging area prior to shipment to NTS for disposal. The scope of this project is completed when all drums of thorium are overpacked and removed from Building 65, and any dunnage and loose material has been packaged awaiting preshipment staging.

Project Objectives

This project is designed to accomplish the following objectives:

- Package deteriorated drums and loose materials to provide secure containment of the waste.
- Package and certify all waste, per Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements (NVO-325), and the FEMP Waste Certification Program Plan, thereby allowing the packaged material to be shipped to NTS for disposal.
- Minimize occupational radiation exposure during overpacking operations, and the potential for environmental release due to a catastrophic event such as a tornado, earthquake, etc.

II. WASTE DESCRIPTION

The drummed material in Building 65 has been characterized using process knowledge as specified in 40 CFR 262.11 (c)(2) and OAC 3745-52-11 (c)(2). To confirm the process knowledge characterization and meet the intent of NTS Waste Acceptance Criteria, sampling and analysis has been performed on the waste. The analysis agreed with the process knowledge characterization which identifies the waste as RCRA non-hazardous.
The drummed materials in Building 65 are composed of several material types. The table below summarizes the inventory of drummed materials, by material type, in Building 65.

<table>
<thead>
<tr>
<th>Description</th>
<th>Drums</th>
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<tbody>
<tr>
<td>Wet Sump or Filter Cake</td>
<td>34</td>
</tr>
<tr>
<td>Oxides Clad or Mixed with Zirconium</td>
<td>1</td>
</tr>
<tr>
<td>Thorium Oxalate</td>
<td>1536</td>
</tr>
<tr>
<td>Thorium Hydroxide, DRY</td>
<td>4031</td>
</tr>
<tr>
<td>TOTAL</td>
<td>5602</td>
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</table>

The majority of the material was generated during the Monex Process and drummed at the DOE Mound Plant. The Monex Process was piloted at Mound to treat Monazite Sand (a type of thorium ore) from Brazil. Drummed material from this process contains dry thorium hydroxide (30.69 percent thorium) and wet thorium oxalate cake (21.63 percent thorium). The wet thorium oxalate cake is expected to contain little or no moisture due to evaporation over the past 15 years.

Other materials in Building 65 include small quantities of partially-oxidized thorium metal generated by the FEMP thorium metal process and dry solid thorium oxide (clad or mixed with zirconium) received from the Bettis Laboratory in West Mifflin, Pennsylvania, and the Argonne National Laboratory in Argonne, Illinois.

III. PERMIT INFORMATION SUMMARY

Since the proposed project is being conducted as part of Removal Action No. 9, it is exempt from the requirement to obtain formal permit approval under CERCLA 121 (e), 40 CFR 300.400(e) and Paragraph XIII.A of the ACA, provided all substantive permitting requirements associated with the project are addressed. Although exempt from administrative permitting requirements, Paragraph XIII.B of the ACA requires DOE to supply specific information regarding the permits that would have been required for the project in the absence of the CERCLA permitting exemption described above. Based upon DOE's evaluation, no environmental permits would be required to complete the project in its current form. The preparation of a permit information summary will not be required for the project.
IV. PROJECT SCHEDULE

The project baseline schedule denotes the key project activities for the TOP. A baseline logic diagram, illustrating the required sequencing and critical paths for all activities reflected in the complete project baseline schedule, has also been developed for this project. The baseline schedule for key project activities is used by FERMCO and the DOE as an objective basis for comparing actual progress or status to planned objectives. The key project activities for start of operations and completion of thorium preshipment staging are indicated below:

- DOE Approval to Operate November 27, 1995
- Start of Operations November 28, 1995
- Completion - Preshipment Staging January 14, 1995

* The DOE approval to operate will be based on DOE evaluation of FERMCO's safety and operational readiness review conducted under DOE Order 5480.31.

V. MANAGEMENT ORGANIZATION AND RESPONSIBILITIES

The Thorium Overpacking Project will be implemented in a two-phased approach. The first phase includes the project technical and support organizations responsible for the design, construction, and system startup. The second phase includes the waste operations and support organizations responsible for the overpacking, handling, labeling, and preshipment staging of the thorium material. Figure 1 illustrates the organizational infrastructure for all phases of the project.

VI. BUILDING 65 THORIUM OVERPACKING OPERATION

Facility Modifications and Equipment

The Building 65 Thorium Overpacking Project is designed to package approximately 5,600 drums currently stored in Building 65 into white metal boxes (WMBs) or Thorium Overpacking Containers (TOCs). The drums in Building 65 are stacked 3 high, with 4-foot by 8-foot sheets of plywood between stacks with a central aisle, approximately 10 feet wide and 50 feet deep, north to south (See Figure 2). There are eight drums on each sheet of plywood, with the bottom row of drums resting directly on the concrete floor. Inspections of Building 65 interior have shown that the majority of the drums appear to be structurally intact; however, a significant portion of the drums show signs of deterioration (See Figure 3).

TOCs are primarily used for overpacking operations. WMBs are used for overpacking operations when drums exhibit advanced signs of deterioration, especially around the bottom. The use of TOCs
FIGURE 1. BUILDING 65 THORIUM OVERPACKING PROJECT ORGANIZATION
and WMBs reduces the hazard associated with storage of these materials and enables the material to meet the NTS Defense Waste Acceptance Criteria, Certification, and Transfer Requirements (NVO-325 Rev. 1). The requirements of the FEMP Waste Certification Program Plan are also met, thereby allowing the packaged material to be shipped to NTS for disposal.

All overpacking of drums occurs in Building 65. Figure 4 presents a footprint of the Annex and Buildings 64/65. To facilitate the removal of the drums from Building 65, a 50-foot extension of Building 65 will be constructed on the north end (and hereafter referred to as "the Annex") to provide an enclosed work space between Building 65 and the adjacent warehouse, Building 64. Following construction of the Annex, the north wall of Building 65 will be removed.

The Annex is constructed to provide an operational area in which to begin the drum retrieval, staging, loading, closing, and monitoring the TOCs or WMBs, and perform routine fork truck and equipment maintenance on the RCMHS and ancillary equipment. The area used for maintenance will be separated from the main area of the Annex by shield blocks, and shadow shielding. The overpacking area will be separated from Building 64, and ventilated via eight (8) HEPA filter units located along the west side of Building 65. Each unit will be equipped with a prefilter and a single stage HEPA filter element.

The actual retrieval of the drums, and their subsequent placement into WMBs or TOCs, is performed by a RCMHS. The safe handling and reliability of the RCMHS are critical aspects to the success of this application. The RCMHS is a standard industrial forklift platform retrofitted with remotely operated controls and manipulators to perform project tasks. The RCMHS will include off-the-shelf components integrated with remote control equipment and limited new hardware. The base unit will consist of a commercially available forklift modified for remote control, 1300 pound drum handling, and/or manipulating attachment capacity under extreme conditions, a 8000 pound maximum gross weight lifting capacity for transport of the loaded overpacking containers, and a navigation system. The remote control command unit will include all standard controls necessary to operate RCMHS. Other features such as: self centering of steering control(s) and attachment controller, supervisory halt switch, parking brake switch, start-stop switch in series with two ignition key switches, and speed control capability will also be included in the system. In addition, the RCMHS includes closed-circuit television cameras that provide the operators with views of the drums and the vehicle motions. The
drums are retrieved using a drum manipulation attachment on the RCMHS. Another RCMHS attachment is used to pick up loose thorium materials as required for good housekeeping.

Overpacking Operation

This project is designed to successfully overpack all thorium drums currently in Building 65 into approved TOCs or WMBs, while minimizing contaminant release, and occupational exposure. The overpacking project will be conducted in the following basic sequence:

1. Lid removal and placement of TOC or WMB
2. Drum Retrieval
3. Placement of drums into TOC
4. Probable or actual failures, requiring special attention, loaded into TOC or WMB.
5. TOC or WMB lidding, and monitoring
6. TOC or WMB transferred to Building 64, weighed and labelled
7. TOC or WMB transfer to staging area prior to shipment to NTS.

The above sequence will provide for direct movement of thorium drums from their positions on the stack, to containment in either a TOC or WMB. Failed drums will be transferred to the appropriate overpacking container, to minimize the spread of contamination.

Figure 5 depicts the overpacking process for the TOCs and WMBs, and Figure 6 illustrates the Building 65 Annex, the Remote Operating System (ROS) trailer, and the Building 64 operational layout.

Supervisors and all additional support personnel will remain in the ROS trailer during remote overpacking operations and monitor activities in Building 65 and the Annex using Closed Circuit Television (CCTV) equipment.

Drum Retrieval

The key piece of equipment to be utilized on this project will be the RCMHS. The RCMHS will have the same control functions and operational capabilities, as that of a standard type forklift, however solenoid switches and servo motors replace the operator in the unit itself, allowing the operator to work in a remote location, up to 500 feet away. For this project, the RCMHS operator
FIGURE 5. TOP PROCESS FLOW DIAGRAM
FIGURE 6. OPERATIONAL LAYOUT OF BUILDINGS 64 AND 65
will be stationed in the ROS trailer. Oversight of the RCMHS’s operation is gained through usage of CCTV camera(s) mounted on the unit. The RCMHS is being developed specifically for applications involving the need to introduce a remote unit into a hazardous environment, while minimizing the potential risk to personnel.

Other systems to be utilized on this project include two CCTV cameras (in addition to the RCMHS mounted camera(s)), to provide orthogonal views of the operational area. These cameras can be relocated as needed to insure that the optimum view of the desired operation is maintained.

The RCMHS will be monitored by two qualified operators in the ROS trailer, via CCTV. Prior to retrieving a drum, the candidate drum’s condition will be visually evaluated by the operator to determine the probability of the drum failing during handling, and the subsequent retrieval method to be used.

When no special handling is required (i.e., the operator feels the drum may be placed in the TOC without risk of failure), the RCMHS will retrieve an empty TOC from the staging area within the Annex, and transport it to the stack. The RCMHS will then remove the lid of the TOC and set aside. The RCMHS will then use the appropriate drum handling attachment to pick the drum from the stack, transport the drum to, and place it within, the TOC located adjacent to the stack. If special handling is required, the process outlined for deteriorated drum retrieval will be followed. The drum retrieval process will begin by overpacking those drums located at the north end of Building 65.

The RCMHS will remove drums in the following sequence across the entire face of the drum stack:

1. Remove drums individually from the top sheet of plywood.
2. Repeat across the entire width of the stack, 1-1½ plywood sheets deep (top row only).
3. Remove emptied plywood sheet and transport to staging area in south end of annex.
4. Repeat for second (middle) layer of drums. Remove drums only one plywood sheet deep.
5. Repeat for bottom layer of drums (no plywood on floor).

The operation will continue south on the east stack, working across the entire face of the stack, 1-1½ plywood sheets deep, until all drums stored on plywood oriented east to west have been removed,
allowing adequate access to the west stack. The retrieval sequence for the west stack, will then begin on the north-east corner of the west stack, and continue as described above, until the east stack restricts further access to the west stack. The RCMHS will then return to the east stack, and begin clearing from the center aisle. The plywood sheets will be stacked in a designated storage area within the annex until the end of a shift, at which time they will be transported via standard forklift to a sea/land container staged on the east side of Building 64. Upon completion of the overpacking project, the plywood will be dispositioned at the NTS.

Deteriorated Drum Overpack

Deteriorated or damaged drums, which may fail if handled normally using the drum grab, will be handled as described below. Whenever practicable, the 55 gallon drums will be loaded directly into a TOC, to minimize handling and maintain exposure ALARA. The following sequence outlines the drum observation/packaging operation:

1. RCMHS operator observes condition of drum.

2. RCMHS operator conducts trial lift (6" vertical, using drum grab) to determine if drum will fail.

3. If drum does not fail, operator continues lift and places drum in TOC, located next to stack.

4. If drum shows indication of failure, and is on the second or third tier:
   a) Operator lifts drum the minimum amount required to allow drum to be moved, immediately above the plywood, until it is over the WMB.
   b) Operator rotates drum to appropriate orientation to place into WMB.
   c) Operator places drum into WMB.

5. If drum is on first (ground) level and is likely to fail, the following sequence applies:
   a) Operator slowly approaches drum, with drum grab attachment.
   b) Operator secures drum as low as possible, approximately 8 inches from the drum bottom.
   c) Operator lifts drum minimum amount required to allow clearance onto the TOC deck.

1 All drums in Building 65 show some signs of deterioration (surface rust, dents, etc.). For the purpose of this document, deteriorated drums are defined as those drums which can be visibly identified as likely to fail, via collapse, bottom release, etc.; and therefore, represent a potential for a release of uncontained thorium into the working environment.
d) Operator releases drum, and maneuvers it into its appropriate spot in the bottom portion of the TOC.

In the handling methods listed above, every effort will be made to place the drums into a WMB or TOC with a minimum release of materials outside of the container. In the event that a drum fails and causes a spill, the following cleanup procedures will be implemented:

1. Supervisor will visually inspect loose material via CCTV. The RCMHS will be utilized to cleanup loose material.

2. RCMHS will be sent to attachment staging area (south end of Building 65 Annex).

3. Loose material clean-up will be facilitated through utilization of the drum retrieval attachment.

4. RCMHS will return to scene of failure, and remove as much material as practical.

5. Supervisor will evaluate clean-up to determine need to continue clean-up, or return to drum retrieval.

6. If further clean-up is required, manual efforts will be employed. These efforts will include the use of shovels and/or HEPA vacuum units.

7. Loose material is packaged and shipped to the NTS. Supervisor approves cleaning results.

8. RCMHS returns clean-up attachment to attachment staging area and overpacking operation continues.

**Drum Packaging**

All drums will be placed in approved metal boxes (WMB or TOC) to provide secure containment of the thorium waste. Low Specific Activity (LSA) waste is defined in 49 CFR 173.403N as uranium or thorium ores and physical or chemical concentrates of those ores. Packaging of the drums in these metal boxes meets the requirements specified for LSA waste in 49 CFR 173.425. This packaging and preshipment staging configuration will minimize release of radioactivity and occupational exposures pending shipment to the NTS.

After loading of a TOC is complete, the modified lid will be brought to the loaded TOC. Special guide keys along the short sides of the TOC will align the lid. The TOC is then transported to the designated lidding station.
The lidded TOC or WMB will be relocated by the RCMHS to a staging station just inside the Annex, next to the connecting door between the Annex and Building 64 and then monitored by a radiological technician, using a smear test on the exterior to verify that the surface contamination does not exceed allowable limits. The operator of the RCMHS will control the operation of the connecting drive through door between Building 64 and the Annex.

The door will be opened when a TOC or WMB is available and removed from the Annex, into Building 64, and the door closed, in as brief a period of time as practicable, to minimize any infiltration of contaminants from the Annex to Building 64. The container will then be weighed and labeled. After final preparation of the metal box for shipment, it will be transported, by forklift, to a shielded staging area in Building 64, where it will await certification for shipment.

**Operation Coordination, Drum Identification, and Documentation**

The operation will be supervised and coordinated by the Shift Supervisor. The supervisor and control personnel will ensure that appropriate handling procedures are observed; packaging requirements are fulfilled; all drums are overpacked in an efficient manner; the spread of contamination is minimized by implementing appropriate responses to unplanned releases from deteriorated drums; and that personnel exposure potential is maintained ALARA through best appropriate usage of time, distance, and shielding.

Personnel working in the Annex, as well as Building 64, will be in audio contact with the supervisor. This will be accomplished using hands free radio communications, which will allow audible communications, even when full PPEs are being utilized. The existing waste streams in Building 65 are comprised of various physical and chemical forms of thorium, the materials meet the requirements of 49 CFR 173.412(g) for compatibility of packaged materials. The waste materials in each package will be identified, to the extent possible, using container type, FEMP Lot Code Identification, and weight differences in the containers of drummed material. As stated above, two-way communication between all stations and operations personnel will be provided for overall project coordination.

**Packaging and Staging for Shipment Requirements and Procedures**

This section presents the packaging requirements for LSA waste. The thorium waste qualifies as LSA waste suitable for shipment under United States Department of Transportation (DOT) regulations [49 CFR 173.403 (n)(1)], DOE Order 5480.3, and Nuclear Regulatory Commission (NRC) regulations.
as physical or chemical concentrates of thorium ore. Plywood from the drummed thorium stacks in Building 65 will be packaged in accordance with DOT requirements as specified in 49 CFR 173.425(a).

The expected dose rate from the packages is well within the limits of 200 mrem/hour for shipment as specified in DOT requirements (49 CFR 173.441, "Radiation Level Limitations").

The overpacking and preshipment staging will be conducted in accordance with FERMCO Procedures. These procedures will be implemented to meet all DOE, and DOT packaging requirements.
REFERENCES


3. National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 CFR Part 300).
Dear Mr. Saric and Mr. Schneider:

REMOVAL ACTION NO. 9 - BUILDING 65 THORIUM OVERPACKING PROJECT INFORMATIONAL PACKAGE

Enclosed is information on the Building 65 Thorium Overpacking Project scheduled to be conducted as part of Removal Action No. 9, "Removal of Waste Inventories." Since the operational phase of the overpacking project is not scheduled to begin until late in calendar year 1995, the FEMP wanted to keep both Ohio EPA and USEPA Region V informed of current plans to implement these upcoming activities. The enclosed package provides a general overview of the project and does not intend to replace information submitted annually as part of Removal Action No. 9 documentation.

The update of procedures, documents, and summaries as required for Removal Action No. 9 in accordance with the Amended Consent Agreement (ACA) will reflect activities associated with the Building 65 Thorium Overpacking Project. Since the Thorium Overpacking Project is scheduled to begin late in 1995, the annual update of Removal Action No. 9 procedures for this project will be included in the June 1996 submittal.

If you have any questions or require additional information on this project, please contact Johnny Reising at (513) 648-3139.

Sincerely,

Jack R. Craig
Director

JRC:TJW:tss
Attachment

c: F. M. Ito, FERMCO
   W. E. Kortier, FERMCO
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