Ashtabula Environmental Management Project

Main Extrusion Plant Demolition Project

Demolition of the Ashtabula Environmental Management Project’s Main Extrusion Plant

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ABSTRACT

Significant progress was made this year toward closure of the Department of Energy’s Ashtabula Environmental Management Project (AEMP) with the demolition of the 9-building Main Extrusion Plant Complex. The 44,000 square foot building complex formerly housed uranium extrusion facilities and equipment. At the start of the project in October of 2001, the buildings still contained a RCRA Part B storage area, operating mixed waste treatment facilities, active waste shredding and compacting process areas, and a state EPA permitted HEPA ventilation system. This paper presents a discussion of the multidisciplinary effort to bring the building to a safe shutdown condition in just six months, including relocation of existing process areas, utility isolation, and preliminary decontamination. Also discussed is the demolition strategy in which portions of the facility remained active while demolition was proceeding in other areas. Other details of the technical approach to the demolition are also discussed, including innovative techniques for demolition, galbestos removal, contamination control, and waste minimization. These techniques contributed to the early completion of demolition in July of 2002, fully two months ahead of schedule and $1.5 million under budget.
INTRODUCTION

The RMI facility is contaminated with both radiological and hazardous materials resulting from almost thirty year's operation for the US Department of Energy (DOE) to shape nuclear materials. DOE's Office of Environmental Restoration and Waste Management (EM) has contracted RMI Environmental Services (RMIES) to conduct the Ashtabula Environmental Management Project (AEMP) to satisfy the DOE's financial responsibility to the RMI Titanium Company (RMI) for the removal of radiological and hazardous contaminants. The goal of the AEMP is to reduce radioactive contamination at the site to levels which will allow it to be released for unrestricted use. The project will allow RMIES to terminate its license with the Ohio Department of Health, and satisfy the requirements of a Nuclear Regulatory Commission (NRC) approved decommissioning plan. The EMP will also achieve closure of a Resource Conservation and Recovery Act (RCRA) Corrective Action Management Unit (CAMU) located on RMI's property.

The original RMI-owned buildings were constructed in the 1950's, to enclose a titanium/zirconium sponge compaction facility. However, these buildings were never used for that purpose. In 1961, the facility was modified to house an Atomic Energy Commission (AEC) owned, 3850 ton extrusion press. The press and associated process equipment was moved to the site from Adrian, Michigan.

The primary function of the Extrusion Plant from 1962 through 1988, was the extrusion and/or closed-die forging of metallic depleted, natural, and slightly enriched uranium (U). The extrusion was a step in the production of reactor fuel elements for use in DOE defense reactors at the Hanford Reservation near Richland, Washington, and the Savannah River Site near Aiken, South Carolina. Uranium metal and a small amount of thorium metal extrusion work were performed under an exclusion section in the Atomic Energy Act and/or Nuclear Regulatory Commission (NRC) license during the production life of the site. RMIES currently holds an Ohio Department of Health license to decommission the site in accordance with the NRC-approved decommissioning plan.

At peak production in 1986, there were 138 people employed. The 35 acre site includes the primary plant's 7 acres, with approximately 100,000 square feet of plant area.

The removal of the Loewy 3850-ton extrusion press in 1998 was a major milestone in the decommissioning of the RMI Extrusion Plant. In 2002, RMIES completed the demolition of the Main Extrusion Plant complex that housed the press, including a total of 9 buildings housing the press and auxiliary equipment. The demolition of these buildings was undertaken as a project including safe shutdown and relocation of existing processes, utility isolation, contamination reduction, and demolition of the buildings themselves. The total waste generated exceeded 7.5 million pounds in 187 intermodal shipments in fiscal 2002. The project was completed ahead of schedule, in time to earn both the prime contractor and the subcontractor extra fee incentives. The cost of the demolition subcontract was $500,000 under budget, and total project savings were approximately $1.5 million.
SCOPE

The project baseline for the AEMP provided for the removal of the 9 buildings in the Main Extrusion Plant complex over the course of two years. Deactivation of the buildings would take place in the first year, and would include:

- Closure and relocation of a RCRA part B hazardous waste storage area
- Closure and relocation of RMIES’ RCRA-permitted macroencapsulation and microencapsulation facilities, including waste preparation facilities
- Relocation of the site’s mechanical waste processing facilities (shredding, compaction)
- Deactivation of the building’s utilities, including establishment of a new 1,500 kW substation to provide power to remaining facilities at the site
- Contamination reduction in the buildings slated for demolition
- Relocation of the site’s shower, locker room, and portal room to new temporary facilities

The second year of the project was to include the demolition of the 9-building, 44,000 square foot Main Extrusion Plant complex, along with associated debris sizing and packaging.

In September of 2001, the DOE directed RMIES to reduce the project schedule to one year, that year to begin in October of 2001. Some efficiency in cost and schedule was to be realized by demolishing the complex in a single evolution (as opposed to original plans for a building-by-building approach). Also, debris processing could continue into a second year.

In response to this direction, RMIES produced an aggressive schedule for the demolition effort, with highlights as follows:

- Engineer and begin the permitting process for new HWSA and RCRA areas – October 2001
- Complete final macroencapsulation campaign, and begin the RCRA closure process – February 2002
- Complete a specification for subcontracted building demolition, January 2002
- Receive bids, March 2002
- Award, April 1, 2002
- Subcontractor submittals due – May 1, 2002
- Begin demolition – June 1, 2002
- Demolition complete – September 2002

PREPARATIONS FOR DEMOLITION

RMIES undertook the Main Extrusion Plant demolition project with an approach designed to make the greatest possible use of RMIES capabilities during the building deactivation process, combined with the selective application of subcontracted services for final demolition work. Careful development of this approach maximized the use of DOE resources already committed to decommissioning project support. The incorporation of this approach into the development of the technical specification produced a clearly defined scope of work, and a precise division of
contractor/subcontractor responsibilities resulting in project completion with no unanticipated change orders for new scope.

**RCRA Relocations**

RMIES engineering and force account labor completed the necessary design and application work necessary to close and relocate the site’s RCRA storage and processing Areas. This included completion of a final campaign of macroencapsulation of lead-bearing wastes, and sampling and on-site analysis to support RCRA closure. This also included the physical disassembly, decontamination, and relocation of the RCRA processing equipment and stored mixed wastes.

**Temporary Personnel Facilities**

The Main Extrusion Plant complex included over 5,000 square feet of shower, locker room, portal room, and respirator maintenance facilities. RMIES designed and subcontracted for the installation of smaller but equivalent trailer facilities to replace these functions. The effort began in October of 2001, and the facilities were up and running in April of 2002 in time to support utility shutdown in the Main Extrusion Plant buildings.

**Replacement Power**

The main power feed to the AEMP site was through a substation originally designed to support the operation of the extrusion press and supporting furnaces and salt baths. This power feed system was contaminated, and not suited to re-use to supply remaining site needs (due to high heat losses and voltage incompatibilities). RMIES completed the design, procurement, and installation of an entirely new substation to support the power needs for the remaining portions of the site, completing the substation in time to support the termination of power to the Main Extrusion Plant buildings in April of 2002.

**Waste Processing Relocation**

The Main Extrusion Plant buildings have served as a central waste processing facility for the site. RMIES force account personnel completed the removal and relocation of all of the decontamination and waste processing facilities housed in these buildings in the first six months of fiscal year 2002, including:

- Disassembly and relocation of the site’s 200 hp shredder
- Relocation of the site’s 100-ton waste compactor
- Relocation of mixed waste processing and RCRA storage
- Disassembly of a 2,500 square foot HEPA-vented decontamination and waste inspection booth
- Demolition of an Empire sand-blast booth and related permitted ventilation stack
- Relocation of intermodal loading stations
- Relocation of the free release survey area
Building Deactivation and Demolition Preparation

RMIES on-site labor forces had removed the siding from 35,000 feet of Butler-type buildings in 2001, and were interested in maintaining as much work as possible of the larger scope of the Main Extrusion Plant demolition. Utilization of on-site resource to complete the vast majority of deactivation work allowed engineers to develop a precisely defined scope of work for the demolition subcontractor. RMIES-performed deactivation work included:

- Deactivation of electrical supplies to the Main Extrusion Plant buildings, including substation isolation and switchgear removal
- Complete deactivation and “safing” of other utilities, including gas, city water, and sprinkler water; visible “double guillotine” breaks were made in conspicuous locations to demonstrate deactivation
- Siding removal from auxiliary buildings
- Contamination reduction in the buildings; a high pressure wash-down that collected 5.4 mCi of loose material, reducing the potential for releases and exposures during demolition (decontamination factor = 10)
- Removal of readily acceptable hazardous materials; including mercury switches, lights, PCB ballasts, emergency lighting batteries
- Installation of pumps to route rainwater collected from the newly exposed slabs to the waste water treatment plant

RMIES’ goal in the building preparation effort was to turn over a thoroughly “dead” building to the subcontractor. The DOE shared this goal, and a safety representative from the Ohio Field Office visited the site to verify the success of our deactivation efforts prior to the start of subcontracted demolition work.

SUBCONTRACTING APPROACH

Careful project planning, building deactivation, and technical specification development paved the way for efficient, on time, and on budget completion of the Main Extrusion Plant demolition project. Further supporting this effort was the decision to structure the demolition subcontract as a fixed-price service subcontract offering the bidders maximum flexibility to select an approach to the work. A total of 10 bids were received in response to the request for proposal. The subcontract specification included a rudimentary sequence for the work, but did not define any aspect of the approach in detail. Key elements of the subcontract and technical specification leading to the success of the project include:

Definition of RMIES/Subcontractor Interfaces

The technical specification provided a clear description of the condition the buildings would be in at the time the subcontractor arrived on site. RMIES deactivation activities performed prior to the subcontractor's start of work ensured the safety of demolition workers, and also reduced the potential for unanticipated increases in scope. A work area turnover procedure was implemented to confirm that contract-defined initial conditions were present. Walk-downs performed by
RMIES and the subcontractor produced a written checklist confirming these conditions prior to the start of work. RMIES-provided services (material handling, waste disposal, health physics support) were not only described in the technical specification, but the methods the subcontractor would use to coordinate activities with RMIES were also described. In some cases, such as intermodal container use, the subcontractor was required to submit and update a schedule detailing the support RMIES needed to provide. The subcontractor submitted work plans for each major element of the work. These described the approach to the work, defined the work area, and identified support requirements for completion. Daily reviews of the progress of the work between the RMIES and subcontractor project managers promoted the smooth flow of work. No changes were required due to RMIES delay or failure to perform.

**Subcontractor Defined Technical Approach**

Perhaps the single most important characteristic of the technical specification providing for efficient and effective project completion was the flexibility provided the subcontractor to define the technical approach to demolition. Providing this flexibility complicated the proposal review process, but it allowed subcontractors the flexibility to propose methods with which they were familiar and experienced.

**Technically-Based Bid Evaluation Criteria**

Considering the degree of flexibility given the subcontractor to define the technical approach to the project, a technically-based evaluation was necessary. Bid evaluations were performed using a 60% technical, 40% cost criteria. The technical evaluation awarded points for each of the RFP’s required submittals defining the subcontractor's approach. An evaluation team specifically evaluated the technical approach, experience and references, innovation in the technical approach, and techniques for safety or quality assurance. Extensive and detailed evaluation of the bids was performed to determine the bidder's familiarity with the specification, ability to perform the work, and preparedness to interface with existing RMIES systems, procedures, and personnel.

**SUBCONTRACTOR INTEGRATION**

Planning and coordination of subcontractor activities with RMIES operations demanded close attention to the interfaces between the two organizations. The technical specification required various submittals from the successful bidder, Sharp and Associates of Columbus (Sharp), be developed prior to the start of work and also as the work preceded. Key examples included:

- Submittal of a detailed project schedule for resource planning, in which the subcontractor identified needed RMIES support for waste handling, waste container delivery, Health Physics Technician support, and utility use.

- Sharp and Associates submitted detailed work plans for each major subtask for RMIES review and approval. These work plans described the subcontractor approach to the safe performance of the work, and included specific requests for RMIES support.
• Safe work procedures were developed by Sharp and integrated into the RMIES safe work procedure and work permitting system. These procedures called for RMIES development of radiological work permits, and review and approval of welding and cutting permits, confined space permits, pre-lift checklists for hoisting and rigging, and necessary utility lockouts. Specific procedures were also submitted and approved for waste handling, hazardous waste handling, as well as asbestos and lead protection.

• One key negotiated interface was the continued use of the old change facility and locker rooms by Sharp during the demolition. RMIES had intended to put the old facilities into a cold shutdown, and put all personnel through the new change and portal facilities. Sharp proposed utilization of the old facility until its scheduled demolition, as the old facility was more convenient to the work area. This approach was successful, and was safely achieved by routing all new utilities to the change area, avoiding the potential of having undiscovered active utilities cross into the confirmed “dead” demolition zone.

The submittal of the various work plans and procedures provided RMIES the opportunity to review the subcontractor's proposed operations in advance, to coordinate activities, to veto some activities, and to direct task performance in accordance with the procedures submitted for the project. This provided excellent control over safe work performance, and minimized prime/subcontractor conflict.

FEATURES OF THE DEMOLITION WORK

Once the Main Extrusion Plant deactivation process was completed, the subcontracted demolition work was cleared to begin. Major aspects of the demolition performed by Sharp included:

Galbestos Siding Removal

Portions of the Main Extrusion Plant were covered with galbestos siding. The galbestos was generally considered non-friable asbestos containing material (ACM), but proper care in its handling is required to prevent damage to the panels that could generate friable material. Approximately 50,000 square feet of galbestos was manually removed and individually stacked in intermodal containers for disposal at Envirocare. The demolition specification required that the galbestos be double wrapped as though it were friable, to prevent the appearance of non-compliance if panels were damaged during transit to the disposal facility.

In addition, fiberglass insulation behind the galbestos panels was the greatest source of loose contamination on the project. The insulation was wetted, rolled, and bagged as it was removed behind each panel. Individual bags were then lowered to the ground, and used as padding to keep galbestos panels from shifting, and in the bottom of intermodals loaded with masonry debris to prevent damage to the intermodals during loading (and provide a natural compaction of the insulation).
Behind the siding and insulation was the inside wall of the High Bay, sheet steel welded or screwed to support purlins. Manual removal of each panel proved tedious, and jeopardized the project schedule. Sharp developed a special “push rod” to address the problem. The 24-foot long rod was developed by Sharp for attachment to their track-hoe, and its hammer-nose end provided for much more rapid removal of the underlying siding.

**Roofing Removal**

Removal of the High Bay roofing presented several challenges to the demolition. Fall protection relocation and roof removal progress were reviewed and coordinated daily to assure worker protection during the demolition work. Protection from heat stress and high winds also figured into the daily work plans for the roof removal effort. The several layers of roofing were manually removed, lowered to the ground in 2 yd³ buckets using an extended boom forklift, then emptied into intermodalists for disposal. Welded and bolted roof decking was also removed using Sharp’s “push-rod”.

**Bridge Crane Removal**

The bulk of the structural steel demolition of the Main Extrusion Plant buildings was accomplished using a 120-ton hydraulic crane. However, a larger 200-ton crane was used to remove the plant’s three bridge cranes. The use of the larger hydraulic crane allowed for the removal of the plant’s bridge cranes without ever repositioning the hydraulic crane. This provided for rapid deployment of the crane, quick removal (all three bridge cranes in a single shift), and quick demobilization of the hydraulic crane (a significantly reduced free-release effort was possible since the crane hadn’t moved in contaminated areas). Specific work plans were developed for these lifts at RMIES request, equivalent to critical lift planning even thought the lifts did not specifically qualify as critical.

**Structural Demolition**

The larger buildings in the Main Extrusion Plant included vertical support beams with 14-inch flanges and 24-inch webs. Disassembly of these structures was generally by unbolting, with the beams secured by the 120-ton crane. Purlins and ancillary components (conduit, remaining piping) were first removed from the beams using a track-mounted metal shear. Auxiliary Butler-type buildings were demolished almost exclusively with the shear. The masonry structures of the old change area were demolished with the shear as well. All debris was sized to meet disposal site waste acceptance criteria. Large beams were cut to 10-foot lengths, and were sized by RMIES to meet the 10-inch criterion. Beam sizing was accomplished using a plasma-cutting jig developed by RMIES to remove the flanges from the beams.

**Waste Water Treatment Plant (WWTP) Wall Removal**

A final lift was required to remove the east wall of the WWTP. The WWTP had been constructed as an addition to the Main Extrusion Plant, and had no east wall of its own. A structural engineering assessment was performed by RMIES to determine that the building was, in fact, free standing of the Main Extrusion Plant. However, demolition of the Main Plant
required removal of the WWTP east wall. After careful separation of the WWTP structure form the Main Extrusion Plant, the wall was removed in a single lift (also controlled by a unique subtask procedure at RMIES’ request). After removal, the WWTP was enclosed with a temporary canvas wall.

CONCLUSION

Decommissioning is not construction. Standards applied to a decommissioning project, identified in the specification for the work, and enforced as the work proceeds, should focus on the safe performance of the work. The end product is an empty building or an empty lot, so exhaustive application of conventional construction quality standards and configuration control practices is unnecessary. However, a clear definition of the initial site conditions and deliverable end product is still required. The development of a clear definition of the scope of work is key to the project's success.

Further, the nature of decommissioning makes it possible, even desirable, to perform the work on a fixed-price service contract basis. The end product is so easily defined that this greatly simplifies the customer's role in getting the work done. Initial conditions can be described by the specification, and left to the bidder to determine by inspection. The approach to demolition is unlikely to be affected by minor changes in field conditions having significant impact on a construction project.

Finally, there may be any number of valid approaches to successfully complete a decommissioning project. Different service vendors offer different skills, and have varying combinations of strengths and weaknesses that may direct the strategy they develop. The technical specification will attract the greatest variety of bidders, and benefit from the most innovative ideas, if the specification is not restrictive in defining the approach to the project. Certainly, boundary conditions such as utilities that must remain in service, or adjacent buildings that must not be damaged will drive the specification development. However, details such as the cutting or decontamination technique to be used need not be specified.

A decommissioning subcontract, like any subcontract, work best when interfaces with the existing organization's capabilities are clearly defined, and the scope of work is clearly established. These basic elements will ensure the project's completion with minimum conflict, change orders, and deviation from schedule.