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Progressively Safer, Cheaper Demolition of Fernald

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Abstract

Fluor Fernald, Inc. has been progressively improving Decontamination and Dismantlement (D&D) at the Department of Energy's Fernald Environmental Management Project by applying new technologies and better methodologies to the work. Demolition issues existed in the past that necessitated new or improved solutions to maintain worker safety, protect the environment and accomplish the work in a cost effective manner. Lessons learned from D&D of 80 structures has led to a systematic approach, which can be implemented in various D&D arenas.

When facility production was halted, hold-up material and process residues remained in the process piping and components. Over 500,000 pounds of material was removed by workers who completed the tasks two years ahead of schedule, $7 million under budget and with an excellent safety record. This success was the result of detailed planning and infusion of lessons learned as work progressed from facility to facility. Work sequences were developed that reduced airborne contamination.

Demolition of structures has been performed at Fernald by carefully selected and qualified subcontractors. Asbestos and lead abatement, equipment, piping and conduit removal, and structural demolition have been completed to progressively higher performance specifications developed by Fluor Fernald based on lessons learned during execution.

Safety continues to be the primary consideration in performing potentially hazardous work. Technologies such as hydraulic shears have been developed and used to keep workers away from danger. A new technology, "Cool Suits," has been demonstrated to help prevent heat stress when anti-contamination clothing is required in elevated temperature working conditions. For tall structures, implosion technologies have been employed with progressively improved results.

Several other new technologies have been evaluated by Fluor Fernald and applied by subcontractors. The improved technologies included the oxy-gas torch, which uses gasoline instead of acetylene gas, and a vacuum system for asbestos removal of wall insulation. These new methods proved effective and beneficial.

Fluor Fernald has integrated demolition activities with waste disposal requirements to enhance overall efficiency. The relatively straight steel configurations required for recycling, and waste acceptance criteria that dictate waste sizes are typically included in the subcontract specifications

The progressive improvements by Fluor Fernald have led to cost savings and schedule acceleration without increased risk to workers or the environment. When Fluor Fernald came to the site in 1992, the remediation baseline reflected a completion schedule of 2020 and a cost of $7.2 billion. The current projection is 2008 and $4.2 billion.

Introduction

The Decontamination and Dismantlement (D&D) efforts at Fernald have evolved through standardization of planning and contracting methodologies and inclusion of lessons learned from completion of predecessor activities. This paper addresses some elements of the progression toward safer, cheaper D&D at Fernald.

Safe Shutdown – The first Step in D&D

When production was halted at Fernald in 1989, over 500,000 pounds of process residues remained in the process piping and equipment. The effort to remove these residues , isolate all utilities, remove stored equipment and parts, and clean equipment surfaces was called "Safe Shutdown." In some areas the Safe Shutdown group removed one inch deep pigeon droppings, which can cause the lung desease, Histoplasmosis. Safe Shutdown was completed two years ahead of schedule, $7 million under budget with an excellent safety record.

Continual improvement through lessons learned is credited to the project success. After each building complex was completed, debriefings were held with the workers, supervisors and safety personnel. These lessons learned were included in planning the next complex. It was apparent that planning needed to be in detail and the workers carefully briefed before any activity was started. One of the lessons learned was the need to carefully sequence the work to prevent excessive airborne contamination. By planning airborne creating activities late in the schedule, the exposure period was significantly decreased and contamination was not spread.

The Safe Shutdown effort prepared the buildings for demolition by subcontractors. Safe Shutdown left the buildings isolated from energy hazards (utility isolation) and with reduced radiological, chemical and biological hazards.

Utility Integration

One of the innovations needed in order to support the missions of Safe Shutdown, new facilities construction, D&D, and site excavation was the Utility Integration Project (UIP). Originally developed and implemented to ensure that site utility configurations did not negatively impact Safe Shutdown schedules, D&D activities, and other site remediation projects, the program grew into a utilities planning and implementation program that provided cost and schedule effective project execution.

In the beginning, a team was organized to evaluate how utilities could be effectively isolated from each building. This also included any necessary redistributions for cases where cutting electricity from one building or complex negatively affected other buildings or complexes (many of the buildings were linked in series, so by cutting off one building, other buildings would be cut off as well). During this process it became clear that some major utility redistributions would be required which would benefit not only Safe Shutdown and D&D, but also benefit the new remediation and processing projects that required utilities. As a result plans were developed and implemented to bring the main electrical distribution above ground, looping

south and west of the excavation zones. Above-ground utilities would, then, allow all planned projects access to adequate power without any major configuration changes through the duration of site remediation.

Water distribution was also an issue as demolition continued. In order to continuously supply water to the plant west side, engineers and project managers identified a strategic location on the southwest area of the site to build a new water distribution facility. This location allows a direct supply of water to structures that will remain on-site for as long as facilities need water, and will provide important links to the existing water lines until they are no longer needed.

By developing the UIP early in the remediation program, Fluor Fernald has been able to realize significant savings. Advance planning allowed coordination of installation efforts to coincide with other similar activities, and to eliminate many redundant excavations and rework. Another added value of UIP is the identification of non-utility issues that need to be addressed in the overall site strategic planning. Examples include many functional relocations that would need to be modified as D&D and excavation progressed. Some of these functions include laundry services, medical housing, etc. Because of early identification, many of these functions can be addressed more cost effectively than would be otherwise possible. Many of the more recent site integration efforts on-site have taken their cue from UIP, ensuring that their success at Fernald continues down the path of accelerated remediation.

Subcontracting the Demolition

Contractual Streamlining

Fernald's 273 structures were organized into D&D complexes and Implementation Plans were approved by the EPAs, the final task fell to Fluor Fernald to find D&D contractors to remove contaminated materials and tear the structures down. Initially contracting for these D&D services followed a traditional approach of specification development describing the requirements and methods and manners of work for each structure. Invitations for bids (IFBs) were issued and awards were made to the lowest, responsible responsive bidder.

Streamlining in this area took on two forms: Model Construction Contract, and changing from an IFB method to a request for proposal (RFP) method. These innovations have greatly reduced scheduled time and cost through standardization, and reduced risk through better proposal evaluation.

The Model Contract contains the same standards and information necessary for every project, familiarizing the contractor with the similarities of the new project as compared with past ones. In this vein, a subcontractor who has previously proposed or worked at Fernald can easily step into the same role again because of the recognizable structure of the Model Contract.

Within the Model Contract, Fluor Fernald ensured that specifications for D&D would become consistent from one contract to another. To achieve this end, Fluor Fernald developed a set of Master Performance Specifications that provide for safe work practices in each of its project-specific contracts. For example, every project the same requirements for asbestos removal, lead

abatement and ventilation are incorporated. This allows for the integration of lessons learned from each successive contract into the next RFP.

By way of example, during one of the first contracts, some pieces of contractor equipment became contaminated to a point where they could not be cleaned for removal from the site. To prevent this in the future, provisions were incorporated into the Master Performance Specifications requiring the subcontractors to utilize strippable coatings, filters and other means to prevent equipment contamination that would prevent free release from the site. Additionally, the previously contaminated equipment was provided to future contractors, potentially saving mobilization and decontamination costs.

Would-be contractors must provide detailed accounts of how they will meet these standards without variation. Safety simply cannot be compromised.

Through the transition from the IFB format to the RFP significant improvements were made in terms of cost reduction and offeror evaluation. In addition to considering who can perform a job at the lowest cost, Fluor Fernald now invites bidders to submit technical proposals addressing how they will meet contract performance specifications and while allowing the contractor to propose the most efficient methods of completing the work. Additionally a company must demonstrate its expertise and past performance in the particular remediation area. In addition to cost the offeror is evaluated on their expertise, past performance, proposed methods of work, and safety history/program. Updated evaluation methods included the incorporation of oral presentations given by the actual proposed project team. This helped insure that "proposal writers" are not solely responsible for the ultimate success of the project.

Overall, the evolution of awarding D&D contracts has raised the quality with which projects are completed. The Model Contract combined with the RFP process assures that the best combination of cost-saving and safety-enhancing techniques is used to complete work successfully.

Labor Hour Contractor Utilization

Fluor Fernald recognized the need for a method to quickly utilize funding from project under runs and technology programs to accomplish D&D work. With agreement from DOE and the US and Ohio EPA Fluor Fernald established the Miscellaneous Small Structures (MSS) Project. This project utilized an existing labor hour construction contract with a small disadvantaged business contractor. The Master Performance Specifications were used as a basis for developing suitable specifications and Fluor Fernald construction engineers wrote work plans for execution by the subcontractor. To date 14 structures have been removed under the MSS Project. Removal of these structures utilizes small pockets of funding that would not be sufficient for larger complexes, clears room for access to larger complexes and accelerates the D&D effort. Technology funding was obtained to deploy the Oxy-Gas Torch and other technologies under the MSS Project. The Oxy-Gas Torch uses gasoline instead of acetylene gas and was proven to be the most successful technology for cutting large carbon steel tanks.

Building Complex Demolition

When Fluor Fernald was awarded the Fernald contract, engineers planned to demolish the first building, Plant 7, by removing each structural member similar to the way it was erected. Through brainstorming, the planning team looked for a safer, more cost effective method. As a result an IFB was issued and a contract awarded based upon demolishing the structure by cutting the columns at each floor level and lowering the floor and columns to the ground. Track mounted hydraulic shears would then cut the steel apart.

After award, the subcontractor brought in Controlled Demolition, Inc to propose demolishing the structure by implosion. The safety considerations of removing workers from positions needed to cut the columns was instrumental in winning support for this plan. Recognizing community concerns about use of explosives, DOE, Fluor Fernald, and the contractor held meetings with stakeholders and won their approval. Following implosion, the structure was demolished using track mounted hydraulic shears. Implosion was used on two other tall structures at Fernald. The remaining structures are low enough to be dismantled using shears.

Track mounted hydraulic shears are the technology of choice by Fluor Fernald and subcontractors for removing building structures. Using these shears, which can exert over 800 tons of force, workers are kept safely away from the hazards.

Shears distort the structural shapes as they cut. This distortion can cause member configurations to exceed waste acceptance criteria (WAC) for the on site disposal facility or for recycling, when that is permitted. The WAC had to be included in the Master Performance Specifications to ensure that subcontractors cut to acceptable configurations.

Initially shears were only used on the structure and located outside of the building. Some buildings contain large process equipment including machine tools such as lathes. The shears were brought into the buildings to dismantle this equipment and then interior platforms and mezzanines.

Technology Utilization

The D&D Project has participated in the Large Scale Technology Demonstration effort. As a result, technologies including the Oxy-gas Torch for cutting thick carbon steel, the Vec-Loader for removing asbestos wall insulation and cool suits for protecting workers from heat stress while wearing anti-contamination clothing have been deployed and used by our subcontractors.

Summary

The use of standardized specifications and contract documents has formed a baseline for collecting lessons learned which generate progressive improvement in the D&D process. These lessons learned are generated by workers, subcontractors and Fluor Fernald supervisors and actively sought as work is completed.

Improved subcontractor selection methodologies have ensured that the subcontractor project team understands the requirements and is prepared to meet the high safety standards at Fernald.

This approach, coupled with utilization of technologies has led to cost savings and schedule acceleration without increased risk to workers or the environment. The initial baseline in 1992, when Fluor Fernald came to the site, was a scheduled completion of 2020 at a cost of $7.2 billion. The current projection is 2008 and $4.2 billion.