EM-53 Lessons Learned Bulletin

December 2014

Demolition of Radiologically-Contaminated Buildings

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PMLL ID: PMLL-2014-WVDP-Bldg 01-14 D&D-01

Date: 7/17/2014

Statement:

The West Valley Demonstration Project (WVDP) completed demolition of Building 01-14 in July 2013. While the project was successful in terms of personnel safety (no injuries during deactivation or demolition) and radiation safety (no uptakes or atmospheric excursions), the overall project ran over budget and behind schedule. The project team developed a detailed report capturing all of their lessons learned from this complicated demolition project. The primary lesson learned was that it is essential to perform advance planning and scheduling, and coordinate and cooperate with all affected organizations in order to increase the likelihood of successful completion of all project scope safely and within planned budget and schedule. Without good up-front planning, particularly with demolition projects involving complex facilities and contaminants and challenging infrastructure or neighboring facility interfaces, project cost and schedule can be adversely impacted during the demolition phase.

Discussion:

While the WVDP Building 01-14 project did not meet its cost and schedule targets, some principles the project team used were successful, and should be applied to other projects. The most important lessons learned from WVDP's Building 01-14 Demolition project are related to up-front planning and coordination. The Building 01-14 deactivation and demolition activities were completed over budget and behind schedule. In the Request for Proposal (RFP) for the WVDP as a whole, the scope statement of work including 01-14 Building was discussed very little, and the focus of the statement of work and subsequent proposal was on the Main Plant Process Building (MPPB) and the Vitrification Facility (VF), resulting in a less detailed planning for the Building 01-14 project. Deactivation and demolition work requires skilled, experienced planners, as there are numerous hazards and complexities involved in the deactivation/demolition arena. Characterization should be conducted early in the deactivation process and should include all facets of the work.

The WVDP team made effective use of mockups during pre-demolition activities which led to more efficient work practices in the field as well as provided a higher degree of confidence to those personnel with less experience in demolition work. Early on in the deactivation process, criteria were established for fixing and leaving contaminated material/equipment in place for removal during demolition vs. removal prior to demolition. This was a good project policy which allowed removal of large or previously inaccessible contaminated equipment/system components to be completed by heavy equipment in accordance with As Low As Reasonably Achievable [ALARA] principles. Finally, the importance of the "right tool for the job" applies as much to a demolition job as it does to any other work. The WVDP project used several different pieces of equipment in order to complete the demolition, and changed approach at times in order to achieve more efficiencies during the execution project.

Analysis:

The WVDP Building 01-14 Demolition project lessons learned came from a variety of sources, both formal and informal, including but not limited to: worker feedback, daily planning meetings, pre-job briefings, post-job briefings following individual demolition tasks, and a final post-job briefing upon completion of the project. The primary lessons learned are summarized below:

Due diligence: The RFP noted that the 01-14 building was inactive and that much of the equipment within was never used. Based on the little available information at the time of bidding, there was very little effort put into the contractor due diligence process for understanding the difficulties of dealing with Building 01-14. It is incumbent on the bidder to do a thorough due diligence review within the limited time and access constraints in order to arrive at a cost and schedule that are realistic.

Planning: The Building 01-14 project used very knowledgeable and competent planners for the work. Many of the work packages prepared dealt with multiple radiation and industrial hazards. The building's systems were complex and interwoven with other facilities' systems; therefore, an understanding of how each system functioned alone and together with other systems was very important.

Characterization: A few areas of the 01-14 characterization work were delayed, including final facility radiation (rad) surveys for waste dispositioning, polychlorinated biphenyl (PCB) and asbestos. Final facility rad surveys were delayed due to new survey guidelines (termed the "two sigma process" that the EM contractor attempted to implement in order to save money via disposing of radioactively "clean" debris to an in-state industrial landfill. Due to difficulties/delays in obtaining reviews and approvals from state agencies, this process was abandoned part way through the review and approval process. Asbestos sampling was delayed due to a lack of qualified, experienced samplers and a lack of knowledge about state regulation and its impacts on deactivation and demolition activities at the WVDP site. Once the asbestos sampling was finally initiated, excessive samples were collected from some areas and insufficient samples from other areas. Also, costly Transmission Electron Microscopy (TEM) analysis was initially being run on all samples submitted to the labs. This process was later revised to utilize less expensive Phase Contrast Microscopy (PCM) analysis (unless there was a fiber hit).

Mockups: Mockups included: development of the grout mix for filling the VF Off-gas line and shearing of the grouted line to validate rad engineering calculation assumptions for airborne contamination release percentages; vessel foaming, pipeline foaming and internal painting; sleeve/bag cuts; Petrogen Oxygen-Gasoline cutting; Durasoil contamination control application; and the application of Thermaflex contamination encapsulant to the interior contaminated surfaces of selected areas of the cells and VF Off-gas Filter Housing. Additionally, an integrated mockup was conducted with the Waste Management Organization to run through the specific equipment, equipment placement, and roles and responsibilities of the involved parties during waste packaging and disposition.

Leave for Demolition: Key equipment and other items of concern that were to be removed during demolition were painted with high visibility paint to make the equipment operator and field personnel aware that special precautions were required when working around those items. The criteria wasn't perfect, because it also allowed certain pieces of equipment to remain in place for removal during demolition that could have been more efficiently removed during deactivation because those pieces were too small for the heavy equipment to handle well. During demolition, it is very difficult to remove small, contaminated items with large, heavy equipment.

Proper Selection of Equipment: The equipment selected for use on the Building 01-14 Demolition project included a Caterpillar (CAT) 374D equipped with a shear, bucket, and hammer, as well as a high reach boom to allow the excavator to reach the top of the building. A CAT 320 with bucket and concrete pulverizer were utilized for debris load-out and concrete-sizing. A CAT skid steer was used to move stone and perform small detail work for the project. A six wheeled Ranger equipped with a water cannon was used for dust suppression. The Ranger could be operated remotely so that it could be placed close to the point of demolition while allowing the operator to be stationed much further away in a safe, warm, dry area. The Ranger was equipped with multiple nozzles which were deployed based on distance to the structure, wind speed, and type of coverage required. A high pressure spray system was used to apply Durasoil contaminant encapsulant on the debris pile left at the end of the day in order to minimize airborne contamination. Special laminates were installed on the heavy equipment windshields to provide an additional layer of safety. (Heavy equipment uses a substantial amount of fuel during operations). Initially the project was filling the heavy equipment from a small mobile tank in the bed of a pickup truck. This proved to be painfully slow and inefficient; an improvement was made to utilize a larger emergency diesel storage tank. The pump on the tank didn't work well but it was still more efficient than the mobile tank in the pickup truck. The preferred method would have been to refuel the equipment when the diesel truck refueled the main WVDP tank. However, the Building 01-14 equipment was inside a contamination area, so the radiological control issues may have exceeded the time-savings gained during the refueling process, had this third refueling option been pursued.

Actions:

The WVDP Building 01-14 Demolition project recommends the following items be considered during the planning stage of any Decontamination and Decommissioning (D&D) project:

(1) Development, review, and approval of large multi-phased work packages can be more efficient than development of several smaller work packages. It decreases the amount of time spent on preparing redundant boilerplate language and hazard control sets, and the larger package also give work crew members an idea of what's coming next (as long as the work scope is the same)

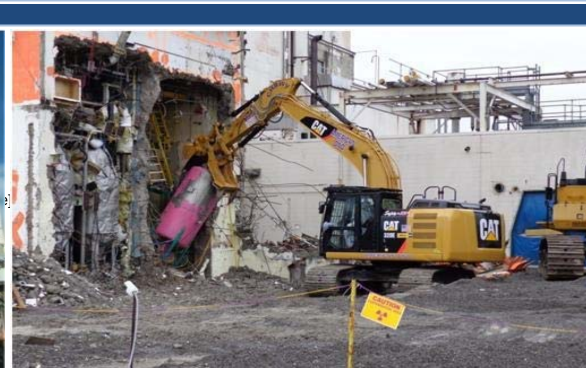
(2) Thoroughly characterize contaminants (e.g., Radiological, asbestos, PCB) early in the facility deactivation process, in order to establish strategies for the most cost-effective, safe and compliant disposition of equipment, structures and materials that will be removed during the demolition phase.

(3) Use Mock-Ups during pre-demolition activities to allow for more efficient work practices in the field, and to increase the confidence of crew members who may not have as much experience in demolition.

(4) Establish criteria early in the deactivation process for fixing and leaving contaminated material/equipment in place for removal during demolition, versus removal of those items prior to demolition. Be aware that small, contaminated items may be better to remove during the deactivation phase, because it is very difficult to remove such items with large, heavy equipment during the demolition phase.

(5) Consider dust suppression methods during pre-demolition phase. For example, use of fire suppression water for dust control can put a lot of water on the demolition site, and the project needs to be prepared to manage that volume. Constructing a moat system may be better than constructing a berm, depending on site topography and the footprint in which all demolition activities must be contained. In addition to the rate of application, wind speed and direction must also be considered during introduction of dust suppression water at a demolition site. For example, use of a water cannon to stream water directly above and over the excavator cab can cause visibility issues for the operator; in such cases, it may be better to introduce water from above the point of demolition (e.g., via an aircraft de-icing machine and/or piping and tanks mounted directly on the excavator).

Critical Decision(s):	Non-CD
Facility Type(s):	Infrastructure
Work Function(s):	Communication; Environmental; Infrastructure/Site/Utilities
Technical Discipline(s):	Environmental



Workers demolish the West Valley Demonstration Project's largest and most complex ancillary facility, building 01-14, which was completed in July 2013. (Photos from Reference 2)

REFERENCES:

1. "Demolition of Radiologically-Contaminated Buildings," U.S. Department of Energy West Valley Demonstration Project, West Valley, NY. July 17, 2014.

2. "West Valley Demolition Marks Important Accomplishment for EM," U.S. Department of Energy Headquarters, Washington, D.C. July 13, 2013. Retrieved from http://energy.gov/em/articles/west-valley-demolition-marks-important-accomplishment-em on December 10, 2014.

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