01-14 Building Demolition

The Department of Energy (DOE), its West Valley Demonstration Project (WVDP) contractor, CH2M HILL Babcock & Wilcox West Valley (CHBWV), and their subcontractor, American Demolition and Nuclear Decommissioning (ADND), employed innovative methods to safely demolish a radiologically contaminated building in a manner that prevented pollution and minimized the amount of radiological waste generated. The project team maintained radioactivity and dust emissions well below limits, either recycled or disposed as construction and demolition (C&D) debris approximately 25% of the total waste generated (119,082 cubic feet), and avoided the generation of 543 metric tons of greenhouse gases (GHG).

Figure 1: The 01-14 Building

The 01-14 Building (Figure 1) was a four-story, 2,200 square feet per story, concrete and steel-framed building that housed a vitrification off-gas system and a cement solidification system, which was used to solidify low-level waste liquids. Its ventilation stack was permitted under the National Emission Standards for Hazardous Air Pollutants (NESHAP) and the cement solidification system was permitted under the Resource Conservation and Recovery Act (RCRA).

CHBWV and ADND spent months preparing for the demolition activities. They established objectives for the work that included, protecting workers, the public, and the environment; complying with DOE orders and state and federal regulations and requirements; and minimizing pollution and the generation of radioactive waste. They characterized the facility, identifying systems, such as electrical and water supply, that interfaced with other buildings. They defined the hazards, which included asbestos, other hazardous materials and wastes, and radiological contamination. Using a formalized systems engineering approach, CHBWV developed end points for transitioning the facility to a demolition ready condition, taking into account the initial conditions of the facility, the end state objective, facility boundaries and interfaces, regulatory requirements, and the work activities to be completed. End point specifications reduced risk through elimination or stabilizations of hazards.

Significant removal of source terms prior to demolition was key to preventing the spread of contamination and minimizing pollution. CHBWV removed equipment and hazardous materials, such as asbestos, lead, light ballasts, and circuit boards. They drained and flushed systems and applied fixatives to components both internally and externally. Contaminated vessels, vent ducts, and large pipes were internally foamed or grouted.

Demolition was implemented in three steps. Although the entire building became waste, CHBWV carefully staged the sequencing of the demolition in order to segregate clean waste from radiologically contaminated waste. First, ADND removed the uncontaminated outer portions of the building (Figure 2), including an office, conference room, control room, and drum storage area.

Figure 2: Removal of the uncontaminated outer portions of the building.

Figure 3: Removal of the uncontaminated roof and concrete walls.

Next, they pulled off the uncontaminated roof and outer concrete block walls (Figure 3). Finally, demolition of the contaminated portion of the building, including re-heaters, off-gas piping, off-gas filter housing, miscellaneous piping and internal components was completed (Figures 4). About 25% of the total waste generated was either recycled or disposed as construction and demolition debris rather than low-level radioactive waste (LLW).

The CHBWV/ADND team conducted the demolition with rigorous work controls. They established a safety boundary around the perimeter of the demolition work zone and strategically located 12 low volume air samplers and continuous air monitors (CAM) at various elevations around the perimeter and inside the adjacent facilities. Breathing zone air samplers were used to monitor workers in the contamination area. Health and Safety personnel conducted the monitoring for airborne radioactivity and dust. They monitored air samples approximately every 30 minutes during demolition and compared the results to established alpha and beta background data. Gross alpha/beta counting was performed on air sample filters at the end of each shift and the previous day's air sample results were evaluated prior to start of each shift. All air filters were counted after seven days to allow for the decay of the short lived activity. Throughout the demolition activities there were no observed levels of concern.

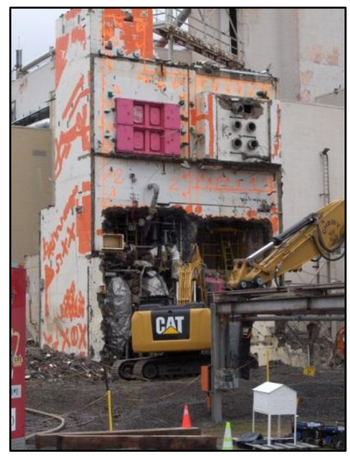

Figure 4: Demolishing the contaminated portion of the 01-14 Building.

- Over 2,200 real time work area air sample counts with no readings above statistical background.
- Over 950 long lived air samples from areas inside and outside the construction zone with the vast majority below 0.02 derived air concentration (DAC), 9 above 0.1 DAC and none above 0.5 DAC.
- Taking thousands of routine smears and towel wipes outside the contamination area on horizontal and vertical surfaces with none found above the release limits of 20 dpm/100cm^2 alpha or 200 dpm/100cm^2 beta-gamma.
- Total worker dose accumulated during demolition of approximately 10 person-mrem.
- Samples from the site's ambient air monitoring network confirmed that there was no detectable radioactivity found offsite.
- Average respirable dust concentrations of 0.234 mg/m^3 are well below the American Conference of Industrial Hygienists (ACGIH) threshold limit value of 3.0 mg/m^3.

CHBWV deployed a remote-controlled water cannon mounted to a mobile piece of equipment to maintain dust suppression during demolition activities. The runoff from the water used for dust suppression was collected, sampled, treated, and released through a state pollutant discharge elimination system (SPDES) permitted discharge point. A lockdown surfactant was applied to debris piles to prevent the spread of contamination.

Overall, the project team saved approximately $607,000 by characterizing as much debris as possible as C&D or recyclable material rather than LLW and $835,200 by transloading the LLW from truck to rail for transport to the LLW facility in Utah. Shipping by rail also avoided the use of approximately 53,000 gallons of diesel fuel, thus avoiding generation of about 543 metric tons of GHG emission.