

TECHNOLOGY@ROCKY FLATS

Demonstration & Deployment Summary

Harmonic Delamination: "Sonic Shakedown" makes Smart Work out of Risky Work

Summary

Improving worker safety and advancing the demolition schedule by five weeks were two good reasons for using focused, designer explosive charges, to cause a 'harmonic delamination' of the 5-foot-thick walls in the old Rocky Flats Criticality Lab, Building 886.

The two-story building was draped in black engineering fabric. When the charges went off under the fabric, all that could be seen was some smoke, but little else. The design of these charges set up pressure waves that forced the concrete and rebar to separate, thus allowing demolition equipment to more easily tear down the building.

The Need

Building 886 was constructed in 1964 and was one of five key "Crit" labs in the United States weapons program. The most unique feature of this building was the Critical Mass Laboratory where almost all criticality experiments were conducted. As with many buildings at Rocky Flats, the lab had very thick, hardened concrete walls poured over tightly woven steel rebar. The lab's concrete ceiling was 2-feet thick with walls 4- to 5-feet thick.

Demolition of these types of facilities using standard techniques (such as a tracked

excavator equipped with a grappling claw) is difficult and time consuming due to the strength the reinforced concrete. The longer the demolition and the more aggressive the equipment, the more workers are exposed to the various hazards associated with this type of work.

Conventional explosive techniques are not effective for buildings of this era, which were designed to withstand explosives. A "brute force" approach greatly increases the risk of corollary damage to the building environment and workers.



B886 shown draped in engineering fabric at the moment of detonation

The Technology Solution

Kaiser-Hill Construction hired Controlled Demolition Inc. (CDI) as the D&D subcontractor for Building 886. CDI proposed to use 'harmonic delamination', a technique to fracture concrete away from rebar, to support Kaiser-Hill Construction in the demolition of B886. CDI took two weeks to prepare the building by drilling down from the roof to make 32-ft. holes in the 4-ft. to 5-ft. thick walls. Small amounts of explosives were placed in the holes and set off sequentially in three shots. When the charges were set off, high velocity detonation waves moved through the walls,

separating the concrete from the rebar reinforcement. These pressure, or sonic, waves were tuned to the rebar/concrete laminate so as to literally shakeup the building and make conventional demolition feasible.



View of concrete fractured from the rebar

The Follow-through

Following the detonation of the Harmonic Delamination charges, the structure remained standing but was substantially weakened. Kaiser-Hill Construction moved in and demolition then proceeded manually with the Tracked-Excavator, also called T-Rex. The T-Rex operator, with instructions from the CDI Project Manager, had a much easier time removing chunks of the building during the mechanical demolition stage that began soon after delamination was complete.

Demolition was completed over a weekend. By the time site personnel arrived Monday morning, B886 had been reduced to a very large pile of rubble. About 70 end-dump truckloads were filled with the remains of B886 and removed.

The demolition of Building 886, the 10,000-square foot, former nuclear criticality laboratory was safely completed in 2002. Demolition of the nearly 40-year-old facility

was completed nearly three years ahead of the baseline schedule. Years of effort went into the decommissioning process for B886, including the removal of many tons of radioactively contaminated and hazardous materials and equipment. Careful planning and safety-conscious workers ensured safe completion of the demolition.

Project Manager J.R. Marschall praised the



Conventional demolition work gets underway

D&D crew. "This is another hazardous job performed efficiently and safely by Kaiser-Hill Construction. The fall protection challenges were significant, with all the work that had to be done on the roof, and in removing sections of contaminated roof. Effective planning and workers' attention to detail resulted in excellent safety conditions."



Technology Supporting Paths to Closure

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