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Mechanical Demolition of Buildings with Concrete Asbestos Board Siding: Methodology, Precautions, and results at the Hanford Central Plateau

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-09RL14728

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ABSTRACT

Since the start of its contract in 2008, the CH2M HILL Plateau Remediation Company (CH2M HILL) has demolished 25 buildings with concrete asbestos board (CAB) siding using mechanical means. While the asbestos contained in CAB siding is not friable in its manufactured form, concerns persist that mechanical methods of demolition have the potential to render the asbestos friable and airborne, therefore posing a health risk to demolition workers and the public. CH2M HILL's experience demonstrates that when carefully managed, mechanical demolition of CAB siding can be undertaken safely, successfully, and in compliance with regulatory requirements for the disposal of Class II Asbestos-Containing Material (ACM).

INTRODUCTION

Many industrial structures built post-World War II up to the 1970s utilized siding and roofing materials containing asbestos fibers. Much of the material was in heavy corrugated sheet commonly referred to by several names including concrete asbestos board (CAB), fiber cement siding, and transite. This material is recognized as Class II Asbestos Containing Material (ACM). Abatement has typically focused on manual removal techniques with controls common to nonfriable abatement activities. However, due to their age, many structures clad with CAB are no longer structurally sound, making manual removal difficult if not dangerous to perform.

In 2008, CH2M HILL (as the demolition team member in Washington Closure Hanford LLC) performed the mechanical demolition of the 384 Power House. The 384 Powerhouse had CAB on the exterior walls and roof. Structural evaluations of the roof indicated it was not in condition to support manual removal of the panels. CH2M HILL worked with the client and the regulators to get approval to mechanically demolish the structure. Successful demolition occurred with no incident and no exposures of personnel above the Permissible Exposure Limit (PEL).

Since the demolition of the 384 Powerhouse, numerous structures with CAB siding and roofing have been demolished at Hanford. In particular, under the current contract on the Hanford Central Plateau, CH2M HILL Plateau Remediation Company has mechanically demolished 25 facilities encompassing more than 300,000 square feet of structures that had CAB siding and roofing. Where mechanical demolition of CAB was once the exception, it is now the preferred approach for industrial safety reasons. The results achieved at Hanford may prove useful to others in the industry facing similar issues.

METHOD

Manual removal of CAB has always been difficult from an industrial safety perspective. Personnel must work in full Personal Protective Equipment either in manlifts or on scaffolding to remove the CAB fasteners (often with lead washers), break any bond between adjacent panels and the building, and capture the panels before they fall. The panels are often quite large and heavy, requiring mechanical means to hold and lower them to the ground. The condition of the structural steel elements supporting the panels is often suspect, especially since many of these buildings have been abandoned and not maintained for years. At Hanford, many of the structures also used CAB on the roof. CAB roofing cannot structurally support personnel so elaborate structures would be required around and over the buildings to support personnel access and material handling. Building 384 Powerhouse (see Figure 1) had all of these issues. CH2M HILL determined the safest way to demolish the structure was to mechanically remove the CAB as part of traditional demolition and worked with the Department of Energy, the Environmental Protection Agency (EPA), and the Washington Department of Health to successfully achieve this goal.

Figure 1 – 384 Powerhouse demolished in 2008.

Removal of regulated asbestos containing material (RACM) is required by 40 CFR Subpart M, which states under section 61.145(5)(c)(1),

> "Remove all RACM from a facility being demolished or renovated before any activity that would break up, dislodge, or similarly disturb the material or preclude access to the material for subsequent removal. RACM need not be removed before demolition if:
>
> … (iv) They are Category II nonfriable ACM and the probability is low that the materials will become crumbled, pulverized, or reduced to powder during demolition.

While the regulation is clear that RACM must be removed from the building prior to demolition, it does not take into account other factors, such as the inherent risk to the workers of the removal itself. Hanford has experienced injuries and even fatalities from working at heights and specifically on weak roofs. Manual removal of CAB from the 384 Powerhouse posed a much higher risk due to falls and other injuries than the potential risk of making the ACM friable (therefore regulated). There was one portion of the roof of the 384 Powerhouse that was damaged and other portions that could not even be inspected.

Most structures at Hanford are demolished under the authority of CERCLA in accordance with the Removal Action Work Plan (RAWP). The RAWP contains language which has been approved by the Department of Energy and the regulators (EPA and Washington Department of Ecology). The following is the RAWP language agreed to in regards to asbestos removal:

> In situations where Class I Thermal System Insulation and /or Class II regulated asbestos-containing materail (RACM) is inaccessable, removal poses siginificant worker safety issues, the building/structure is structurally unsound and/or in danger of imminent collapse, or removal requires initiation of demolition activiites, emission controls similar to those addressed by EPA's Alternative Asbestos Control Method, EPA/600/R-08/094, "Comparison of Alternative Asbestos Control Method and the NESHAP Methos for Demolition of Asbestos-Containing Buildings," will be used. Notification to EPA will be provided prior to implementation of this alternative control method. Notification may be in the form of email and will provide pertinent information such as an estimate of potential ACM that will remain prior to demolition.
>
> **4.3.3 Asbestos Emissions**
>
> Removal and disposal of asbestos and ACM are regulated under the Clean Air Act. The substantive provisions of these regulations provide for special precautions to prevent environmental releases or exposure to personnel of airborne emissions of asbestos fibers during removal actions. In situations where removal of RACM is impractical or infeasible prior to demolition, emission controls similar to those addressed by EPA's Alternative Asbestos Control Method will be used as discussed in …

The controls commonly listed in the RAWP for demolition of structures/buildings containing Class II RACM during demolition are as follows:

1. An accredited asbestos building inspector will perform a comprehensive inspection of the building/structure to be demolished.
2. An estimate of the potential ACM that may reside in the building or structure [is provided].
3. A competent person trained in asbestos regulations will provide oversight during active asbestos demolition activities.

4. Track hoes, end loaders, and equivalent equipment and control explosives may be used during demolition in conjunction with wetting processes to minimize generation of dust.
5. Should RACM remain, the building will be thoroughly and adequately wetted with amended water (water to which a surfactant has been added) prior to demolition, during demolition and during waste handling and loading. To the extent feasible, cavity areas and interstitial wall spaces will be wetted. A fixative or sealant may be used to reduce the potential for fiber and dust generation during the demolition process. Additionally, fixative or sealant will be used on demolition debris that will remain undisturbed for greater than 24 hours.
6. Breakage of ACM will be minimized and ACM debris generated during that day will be containerized for disposal, to the extent practical.
7. The "National Emission Standards for Hazardous Air Pollutants" (NESHAPs) asbestos standard of "no visible emissions" from RACM or ACM will be employed.
8. In the event of inclement weather that will impede the ability to adequately wet the structure, demolition activities will be delayed or halted.
9. Worker protection requirements will be followed. Personal protective equipment (PPE) will either be disposed of as RACM or decontaminated in accordance with Occupational Safety and Health Administration (OSHA) practices.
10. Potentially contaminated water will be controlled during demolition. Impervious surfaces will be thoroughly washed with water following completion of the asbestos-related activities.
11. Upon the removal of demolition debris, bare soil within the asbestos-related demolition area will be excavated to a minimum depth of 7.62 cm (3 in.) or until no debris is found. If berms or other run-off controls were used to contain water, they will be removed and disposed of as potentially asbestos-contaminated.

These requirements are implemented at the work site through the appropriate controls. In addition, both the worksite and the personnel have been extensively monitored during the demolition and waste load-out activities.

RESULTS

The 284-W Powerhouse (Figure 2), where demolition was completed in September 2011, is a positive example of the continuing results for the approach at Hanford. The structure was demolished and loaded out in 20 days with CAB in place. No asbestos exposures over the PEL were detected by 130 boundary air samples taken. Personal (lapel) monitors also showed no detectable asbestos releases.

Figure 2 – 284-W Powerhouse demolished in September 2011

For the 25 structures demolished during this period, a total of almost 700 boundary air samples were collected and analyzed. Several hundred personal (lapel) samples were also collected on personnel inside the posted boundaries including the equipment operators and waste load out personnel. In addition, bias samples were often collected at locations close to the debris size reduction activities. The samples collected and analyzed over more than a two year period showed no indication of release or exposures over the PEL.

DISCUSSION

While the number of buildings demolished at Hanford and the number of samples collected does not make a conclusive argument that CAB cannot be made friable with normal demolition techniques, it certainly provides a significant body of evidence for the success of the approach. Of course, there are many factors that affect how to demolish a structure and dispose of the waste. These factors will impact the success depending on each site.

The most obvious factors which contribute to this success at Hanford are:

1. The availability of onsite waste disposal where the handling and cost of asbestos-containing waste is not much different than other potentially contaminated waste. Therefore, segregation of demolition debris from the potential asbestos contamination is not necessary from a debris handling or asbestos disposal aspect.

2. The space between structures is typically significant enough to allow for large exclusion zones. There are not many restrictions due to cohabitation issues or potential contamination of adjacent facilities.
3. The willingness of the regulators and client to understand the industrial safety issues associated with manual CAB removal.