

DRAFT

July 21, 2008 Peer-Review Version

Evaluation of the Alternative Asbestos Control Method at Site Three (AACM3) for Demolition of Asbestos-Containing Buildings

By

Roger C. Wilmoth¹, William M. Barrett¹, Lauren M. Drees¹, Adele Cardenas-Malott²,
Seth S. Schultz³, Craig V. Napolitano³, Mina Bounkhay³, Michael Gange⁴,
and Vicki A. Lancaster⁵

¹US Environmental Protection Agency
Office of Research and Development
National Risk Management Research Laboratory
Cincinnati, OH 45268

²US Environmental Protection Agency
Region 6
Dallas, TX 75202

³The Louis Berger Group, Inc.
Washington, DC 20037

⁴City of Fort Worth
Fort Worth, TX

⁵Neptune and Company, Inc.
Los Alamos, NM 87544

July 21, 2008

Contract No. EP-C-05-058
Task Order No. 0057

EXECUTIVE SUMMARY

The Asbestos NESHAP (National Emission Standards for Hazardous Air Pollutants) generally requires the removal of all Regulated Asbestos-Containing Material (RACM) from a building prior to its demolition. In many circumstances, this removal process can be a costly and time-consuming endeavor and is believed to contribute to the growing crises of abandoned buildings in this country. Under this Alternative Asbestos Control Method (AACM) research project, certain asbestos-containing materials (ACM) were allowed to remain in the building during demolition. In addition to leaving most of the ACM in the building, the AACM process differed from the NESHAP process in that the interior of the building was pre-wetted with amended water (water with a wetting agent added), all demolition and debris-loading activities were continuously wetted with amended water, all runoff was contained, three or more inches of soil were removed after demolition, all materials were disposed of as RACM, and respirators and protective garments were worn by workers throughout the entire demolition process.

This research project (AACM3) is the third of the AACM research efforts, each targeting specific asbestos and building/site configurations. AACM3 evaluated the use of the AACM demolition process on a building which contained significant amounts of asbestos-containing popcorn ceilings and troweled-on surfacing materials.. Separate reports have been issued for AACM1 and AACM2.

At this time, the AACM is a research method only and EPA does not permit its use as an approved work practice under the Asbestos NESHAP for demolishing buildings containing RACM.

Conclusions

The following conclusions are relevant to the demolition of the popcorn building (AACM3) in Fort Worth:

Primary Objective:

- The airborne asbestos concentrations measured in the perimeter ring by transmission electron microscopy (TEM) during the AACM3 demolition process were orders of magnitude below any EPA existing health or performance criterion. At an analytical sensitivity of 0.0005 asbestos structures per cubic centimeter of air (s/cm^3) and corresponding detection limit of 0.0015 s/cm^3 , the maximum asbestos air concentration was 0.0030 s/cm^3 (six structures observed) in the perimeter monitoring ring for the AACM3 process during demolition of a building with popcorn ceilings and troweled-on surfacing material that contained regulated amounts of asbestos.
- Most of the airborne asbestos (TEM) concentrations were near or below the limit of detection, which was 0.0015 s/cm^3 . Due to this limitation, the Peto-Prentice test for censored data (non-detects) was conducted. Based on the results of this inferential test (p -value = 0.29), one would *fail to reject* the null hypotheses of no difference in the perimeter airborne asbestos distributions for AACM3 versus background; therefore one cannot conclude the AACM3 and background airborne asbestos concentrations observed

during the entire process are different (where p represents a strength of evidence that the null hypothesis is true). The smaller the p-value, the stronger the evidence is that the null hypothesis should be rejected. In this study, the null hypothesis was rejected for p values less than 0.05.

Secondary Objectives

- No visible emissions were observed by EPA staff during the AACM3 demolition process.
- The fiber concentrations in air from the AACM3 demolition process as measured by phase contrast microscopy (PCM) were not judged to be different from the background fiber concentrations. The statistical analysis (t -test for mean differences) indicated that *one would fail to reject the null hypothesis of no difference in the mean concentration of total fibers observed for AACM3 and background... ($p=0.97$).*
- There was no statistically significant difference in the settled dust asbestos concentrations comparing the background with the perimeter when the entire process (pre-wetting through cleanup) was evaluated because of a high value with no assignable cause that was observed in one of the background samples. The statistical analysis indicated since *... the results from the inferential tests at the 0.05 level of significance are inconclusive, no inferences can be made regarding the asbestos concentrations in the settled dust of the AACM and background data ...*; however, based upon the descriptive statistics, there does appear to be an increase in settled dust asbestos concentrations as a result of the demolition activity.
- In seventeen worker samples taken over the course of the AACM3 demolition process of the popcorn building, only one sample had detectable asbestos and even then only a single asbestos structure was observed. The extremely low worker breathing zone asbestos concentrations seen in AACM3 appear to offer a significant advantage for the AACM. The Time-Weighted Averages (TWA) were very low (0.002 f/cm^3 max), which is far below the OSHA Permissible Exposure Limit (PEL) of 0.1 f/cm^3 that is based upon PCM analysis.

- The asbestos concentration in the soil after the AACM3 demolition process appeared equal to the background soil asbestos concentration, but there were too many censored data (non-detects) to conduct a meaningful statistical analysis (53-percent non-detects for the background vs. 80-percent non-detects for the post-excavation soil asbestos concentrations). Statistically, the asbestos concentrations in the post-demolition soil were not judged different than the asbestos concentrations in the pre-demolition soils using the Peto-Prentice test for censored data (p value=0.67); however, based upon descriptive statistics, they appear so. Based on this test one would *fail to reject* the null hypothesis of no difference in the asbestos concentration in pre-demolition and post-demolition soils.
- The asbestos concentrations in the pavement surface samples after the AACM3 process were judged equal to the asbestos concentrations in the background pavement surface samples. All background, pre-demolition, and post-demolition pavement samples were non-detect for asbestos at a <1000 s/cm² analytical sensitivity. Since all asbestos concentrations in the pavement surface samples after the AACM3 process were below the analytical sensitivity, no inferential test could be conducted. Based on the empirical data, there is no evidence to suggest the asbestos concentrations on the pre-demolition versus post-demolition pavement and on the pre-demolition versus background pavement are different.
- The concrete slab, which was later removed, had asbestos detected in four of six surface samples.
- No water was released from the AACM3 site. Of the 9500 gallons of amended water added, none required filtration or disposal to the sewer as virtually all either left with the demolition debris or percolated into the soil and was removed with the excavation waste. Water samples taken from pooled sites during the demolition contained asbestos, with a maximum concentration near 100 million structures per liter, thereby justifying the need for soil removal if the water reaches the soil.
- The time required to perform the AACM3 demolition process (3½ days) was about half the time that was estimated to perform the NESHAP (abatement plus demolition) process (six days) for this site. The AACM3 demolition process took far longer than expected because of many administrative delays, disruptions caused by other parties, and a learning curve on the AACM3 technology on the part of the contractor that had to be acquired at the last minute.
- The total cost of the AACM3 demolition process was about \$35,400 or about \$16.50/ft² of building footprint or \$4.48/ft² of surfacing material. This cost is estimated to be about 20-percent higher than would have been required, due to many organizational delays that were encountered; part of which were due to the research nature of the effort. The total cost for a NESHAP demolition (abatement plus demolition) of the popcorn building was estimated to be about \$31,600 or \$14.70 /ft² of building footprint or \$4.00/ft² of surfacing material.