

Comparison of the Alternative Asbestos Control Method and the NESHAP Method for Demolition of Asbestos-Containing Buildings

By

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EXECUTIVE SUMMARY

The Asbestos NESHAP (National Emission Standard for Hazardous Air Pollutants) requires the removal of all Regulated Asbestos-Containing Material (RACM) prior to the demolition of the buildings that fall under the auspices of the NESHAP. This removal process can be a costly and time-consuming endeavor and contributes to the growing crises of abandoned buildings in this country. The Alternative Asbestos Control Method (AACM) allows certain asbestos-containing materials (ACM) to remain in the building during demolition. In addition to leaving most of the ACM in the building, the AACM process differs from the NESHAP process in that it requires pre-wetting of the interior of the building with amended water (water with a wetting agent added), continuous wetting with amended water during demolition of the building, containment of all runoff, removal of two or more inches of soil after demolition, disposal of all material as regulated asbestos-containing waste, and the use of respirators and protective garments throughout the entire demolition process.

This research effort compared the use of the NESHAP process with the AACM process on two architecturally identical asbestos-containing buildings in a remote location at the Fort Chaffee Redevelopment Authority near Fort Smith, AR. The buildings contained significant quantities of asbestos-containing wall systems and vinyl asbestos floor tile.

EPA does not endorse the AACM at this time as an approved method under the asbestos NESHAP for demolishing buildings containing RACM.

Conclusions

The following conclusions are relevant to the demolitions of the identical structures at Fort Chaffee Redevelopment Authority:

Primary Objectives

- The airborne asbestos concentrations measured by transmission electron microscopy (TEM) during both the NESHAP and the AACM demolition processes 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), the maximum asbestos air concentration was 0.0005 s/cm^3 (one structure observed) for the NESHAP process and 0.0019 s/cm^3 (four structures observed) for the AACM process.
- The airborne asbestos (TEM) concentrations were near or below the limit of detection. The statistical analyses for the demolition phase of both processes showed that the airborne asbestos (TEM) concentrations from the AACM were equal to the NESHAP (based upon the observed proportion of detects). The statistical analyses comparing both total processes (including the soil removal phase of the AACM) showed that the airborne asbestos (TEM) concentrations from the AACM were not equal to the airborne asbestos (TEM) concentrations from the NESHAP Method ($p=0.0006$, 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.). The empirical evidence (the proportion of non-detects and the maximum values) from the investigation suggests airborne asbestos (TEM) concentrations from the AACM were greater than the airborne asbestos (TEM) concentrations from the NESHAP Method. Based upon the observed proportion of detects, it was concluded that the difference between the two methods is a function of the Day 2 AACM activities (soil excavation and removal). This was likely due to an operational error where no water was added during the soil removal stage of the process.

- The statistical analyses showed that the post-excavation asbestos TEM concentrations in the soil from the AACM were not equal to the post-demolition asbestos concentrations in the soil from the NESHAP Method ($p=0.033$). Based on descriptive statistics, it was concluded that the post-excavation asbestos concentrations in the soil from the AACM were less than the post-demolition asbestos concentrations in the soil from the NESHAP Method. Polarized Light Microscopy (PLM) analyses for all soil samples from both processes indicated very low concentrations of asbestos; the NESHAP post-demolition soil had only one of ten samples with detectable asbestos (0.3 percent) whereas the AACM post-excavation soil had no samples with detectable asbestos at an analytical sensitivity of 0.1 percent.
- The cost of the NESHAP demolition process (\$108,331) was approximately twice the cost of the AACM demolition process (\$57,864) for this site. Costs specific to conducting the research were not included.

Secondary Objectives

- Based upon descriptive statistics, the fiber concentrations in air from the AACM as measured by phase contrast microscopy (PCM) were equal to the fiber concentrations from the NESHAP Method.
- A brief visible emission was observed during the removal of a concrete foundation structure during the NESHAP demolition, but it was not an asbestos-containing material. No visible emissions were observed during the AACM demolition.
- Settled dust asbestos loadings during the AACM demolition were equal to the settled dust loadings during the NESHAP demolition.
- The statistical analyses showed that the total particulate concentrations, as collected and measured by National Institute of Occupational Safety and Health's (NIOSH) Method 0500, from the AACM were not equal to the total particulate concentrations from the NESHAP Method. Based on the observed proportion of detects, the total particulate concentrations from the AACM were higher than the total particulate concentrations from the NESHAP Method. This is attributed the extended sampling period for the AACM process, which included soil removal and disposal. Since wetting was inadvertently not performed during the soil removal, it is possible that this increased the particulate loading.

- Based on the observed proportion of non-detects, the worker breathing zone asbestos concentrations (TEM) from the AACM were less than the worker breathing zone asbestos concentrations (TEM) from the NESHAP method. This was due to the concentrations encountered by workers during the abatement required by the NESHAP. The maximum breathing zone asbestos concentration was 0.093 s/cm³ for the NESHAP process (abatement phase) whereas no asbestos was detected on any of the AACM worker breathing zone samples (<0.005 s/cm³).
- One NESHAP worker had an Eight-Hour Time-Weighted Average (TWA) fiber (PCM) concentration which equaled the Occupational Safety and Health Administration (OSHA) PEL (Personal Exposure Limit) of 0.1 f/cm³. The maximum TWA fiber concentration for the AACM was 0.03 f/cm³.
- Based on descriptive statistics, the NESHAP post-demolition soil asbestos (TEM) concentrations were greater than the NESHAP pre-demolition soil concentrations; the AACM pre-demolition soil asbestos (TEM) concentrations were greater than the post-excavation soil concentrations; and the AACM post-demolition soil asbestos (TEM) concentrations were greater than the AACM post-excavation soil concentrations.
- The time required to perform the AACM process (1½ days) was about one-fifth the time required to perform the NESHAP process (ten days) for this site. The abatement phase of the NESHAP process was very labor intensive (nine days) and took nine times longer than the demolition itself (one day) for this site.
- Both the NESHAP and the AACM processes left minimal amounts of small fragments of asbestos-containing material (ACM) debris, primarily vinyl asbestos floor tile, in the soil at the completion of the processes; however, the AACM process (post-excavation) left less ACM debris than the NESHAP process (post-demolition).

Results for other secondary objectives of lesser significance are found in the body of the report.

A simplified comparison of results is presented in Table ES-0-1.

Table ES-0-1. Simplified Comparison of Results for the NESHAP and AACM Demolitions at Fort Chaffee

| PARAMETER | REPORT SECTION REFERENCE | MORE EFFECTIVE | | EQUAL |
|--|--------------------------|------------------|------|----------------|
| | | NESHAP | AACM | |
| Asbestos (TEM) in Air (Demolition Only) | 6.1.2.1 | | | ✓ ¹ |
| Asbestos (TEM) in Air- (Demolition and Soil Removal) | 6.1.2.1 | ✓ ^{1,2} | | |
| Asbestos (TEM) in Soil | 6.1.4 | | ✓ | |
| Asbestos (PLM) in Soil | 6.1.4 | | | ✓ |
| Cost | 8 | | ✓ | |
| Visible Emissions | 4.4.1 4.4.2 | | | ✓ |
| Fibers (PCM) in Air | 6.1.2.3 | | | ✓ |
| Asbestos in Settled Dust (TEM) | 6.1.2.2 | | | ✓ |
| Asbestos (TEM) in Worker Breathing Zone | 6.1.5 | | ✓ | |
| Fibers (PCM) in Worker Breathing Zone | 6.1.5 | | ✓ | |
| Particulate in Air | 6.1.2.4 | ✓ | | |
| Time | 4.2 4.4.1-4.4.2 | | ✓ | |
| Asbestos (PLM) Debris in Soil | 6.1.4.2.3 | | ✓ | |

¹ Concentrations were near or below the limit of detection limit for both processes.

² Water was inadvertently not added during AACM soil removal phase.

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