Bull. Environ. Contam. Toxicol. (2006) 77:723–725

DOI: 10.1007/s00128-006-1123-7

Bulletin of Environmental Contamination and Toxicology

Asbestos Abatement in a Location Previously Improperly Abated

J. H. Lange,[1] S. L. M. Sites,[2] G. Mastrangelo,[3] K. W. Thomulka[4]

[1] Envirosafe Training and Consultants, Post Office Box 114022, Pittsburgh, PA 15239, USA
[2] Analytical Laboratory Services, Inc., 251 Park Avenue, Chambersburg, PA 17201, USA
[3] Department of Environmental Medicine and Public Health, University of Padova, Via Giustiniani, 2-35128 Padova, Italy
[4] 5209 Homestead Circle, Emmaus, PA 18049, USA

Received: 25 August 2006/Accepted: 19 October 2006

Removal of asbestos-containing materials (ACM) has become a common activity in the United States and other locations (Hoskins, 2001). Generally, most buildings have complete abatement undertaken, which is removal of all ACM in a specific location. However, for economic and practical reasons sometimes only a limited amount of ACM is removed with the remaining left in place and removed later or repaired/ encapsulated. This is commonly termed partial removal/abatement and is usually performed for economical reasons or due to time constraints. There are projects where removal was not properly conducted. Based on our literature survey, there are no case reports on asbestos abatement from a location after improper removal was been conducted.

MATERIALS AND METHODS

Area (perimeter) and personal air, including excursion limit (EL), samples were collected using 25-mm diameter electrically conductive extension cowl cassettes consisting of mixed cellulose ester filters (0.8um] (Lange and Thomulka, 2002). Samples were analyzed using phase contrast microscopy (PCM) as described in the NIOSH 7400 method. The flow rate for personal samples was about (nominal) 2 liters per minute (lpm) and areas samples about 10 lpm. Personal and perimeter measurements were from the breathing zone, within a two-foot radius of the head, and outside the work area, within ten feet of the containment structure, respectively. EL samples were collected for 30 minutes. Personal measurements were reported as a time-weighted average (TWA) and area samples as a task-length average (TLA) with a sampling time period of at least 2 hours. Some personal samples were collected for a time period longer than 8 hours. These samples were adjusted to a TWA, by using the total collection time in the calculation. Thus, if samples for an individual worker were 10 hours, this time was used in the calculation.

Full containment was employed during this project, along with negative air filtration and a three stage decontamination chamber. Work practices generally followed the OSHA asbestos requirements, including wet methods. Abatement of sprayed-on ACM had been previously conducted

Correspondence to: J. H. Lange

on the ceiling area in this work location. This abatement was apparently not properly performed and debris from the spray-on ACM existed on top of the plaster ceiling and iron work associated with the ceiling area. In some locations considerable debris existed that was not accessible until the plaster ceiling was removed. Wetting of this material was also difficult.

The detection limit for personal/area and EL samples was 0.01 and 0.08 f/cc, respectively; and the exposure limits for personal and EL samples, by OSHA, were 0.1 f/cc-TWA, which is the permissible exposure limit – PEL, and 1.0 f/cc-30 min/day, respectively. Exposure values reported below the detection limit were included in calculations at one-half this value (Oehlert et al., 1995). Five inside final clearance samples were collected for this project upon completion of work and cleaning. These samples were collected as required by the US Environmental Protection Agency and were analyzed by transmission electron microscopy. Summary results are reported as arithmetic (AM) and geometric means (GM), standard deviation (SD), geometric standard deviation (GSD) and range.

Materials abated contained more than 1% asbestos, which by regulatory definition is characterized as ACM. Determination of ACM was performed by polarized light microscopy. This abatement was performed in various schools located in the eastern part of the United States around 2000.

RESULTS AND DISCUSSION

Air sample results for this project are shown in the table. The AM for personal samples is at the PEL, while the GM is below in all categories of work/activity. The highest exposure level was associated with abatement of plaster. Except for plaster, all EL's were at or below the detection limit. Perimeter samples were below 0.01 f/cc, which is considered background using PCM. Since airborne contaminators, including asbestos, are not normally distributed, the average of exposure is best represented by its GM; however, the AM is a more appropriate value for substances that represent a chronic toxicant, like asbestos. Three background samples before the start of work were at a concentration over 0.01 f/cc, but less than 0.02 f/cc. The work area passed TEM final clearance.

This study along with others (Lange and Thomulka, 2002) demonstrate that the risk associated with abatement of ACM is not great and should not be categorized as a "hazard" for those in this occupational environment. For the most part, asbestos activities today are an example of "extreme" application of the precautionary principle (Yarborough, 2006). Overall, even when improper removal was previously conducted, exposure to workers, at least based on the PEL and EL, did not occur. These data do provide historical information on exposure to these workers, which will be useful in future epidemiological investigations. As with other studies, the EL was not exceeded and appears to have become sampling for

Table. Summary statistics for air samples, in fibers per cubic centimeter (f/cc), involving abatement of various types of materials.

Type of Sample^	Nos. of Samples	AM	GM	SD	GSD	Range
Plaster - personal	13	0.10	0.09	0.07	2.4	0.03 - 0.31
EL	13	0.23	0.11	0.29	3.3	<0.08 - 0.90
Bagout - personal	2	0.03	0.03	0.01	1.3	0.03
EL	2	<0.08	<0.08	ND	ND	<0.08
Cleaning	1	0.06	0.06	ND	ND	ND
Floor tile - personal	2	0.08	0.08	0.01	1.0	0.08
EL	2	0.15	0.15	ND	ND	0.15
Light fixture - personal	2	<0.08	<0.08	ND	ND	<0.08
EL	2	<0.08	<0.08	ND	ND	<0.08
Perimeter	8	<0.01	<0.01	ND	ND	<0.01

^ samples at the same concentration could not be calculated – listed as ND

regulatory and bureaucratic purposes only, and does not provide useful information on potential disease risks; thus, should be eliminated as a requirement.

The greatest risk for these workers is associated with their lifestyle and tobacco consumption (Lange et al., 1987). Recent studies (Lange et al., 2006) have reported that abatement workers have a smoking rate of around 80%, which is the highest of any occupational group. Since smoking is highly related to cancer, including lung cancer, this habit will be more closely associated with future health risks than asbestos exposure. Future effects should be directed at smoking reduction programs and personal safety along with strict controls on abatement. This would provide the greatest cost benefit in disease reduction.

REFERENCES

Hoskins JA (2001) Mineral fibers and health. Indoor-Built Environ 10:244-251.

Lange JH, Weyel DA, Rosato LM, Tucker D, Malek DE, Mayernick JA, Ryan L (1987) Preliminary results of smoking patterns for workers attending an asbestos abatement course. Scandinavian J Work Environ Hlth 62: 459.

Lange JH and Thomulka KW (2002) Airborne exposure concentration during asbestos abatement of ceiling and wall plaster. Bull Environ Contam Toxicol. 69: 712-718.

Lange JH, Mastrangelo G, Buja A. (2006) Smoking and alcohol use in asbestos workers. Bull Environ Contam Toxicol (in press)

Oehlert GW, Lee RJ, Van Orden DR (1995) Statistical analysis of fiber counts. Environmentrics 6:115-26.

Yarborough CM (2006) Chrysotile as a cause of mesothelioma: an assessment based on epidemiology. Crit Rev Toxicol 36:165-87.