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Type and Amount of Asbestos in Floor Tile and Mastic

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Evaluation and abatement of asbestos-containing floor tile and mastic are an important environmental industry in the United States and other parts of the world (Hoskins, 2001). Asbestos is a common component of floor tile and mastic (Lange, 2002). Regulatory agencies classify a building material as being asbestos-containing if it has greater than 1 percent asbestos (Lange, 2002). Asbestos can be categorized into two mineralogical forms: serpentine and amphibole, with chrysotile being the only member of the serpentine group (Skinner, 2003). It has been suggested that most of the asbestos used in the United States and other parts of the world is of the chrysotile variety (Health Effects Institute – Asbestos Research – HEI-AR, 1991; Hoskins, 2002). It is commonly suggested that 95% of asbestos in US building materials is chrysotile, which is consistent with the current worldwide production of this mineral (Hoskins, 2002). Little information has been published on the actual percent and form of asbestos in floor tile, mastic and other materials (Bladwin et al., 1982; HEI-AR, 1991). The HEI-AR (1991) report indicated that the percent asbestos in "floor tile and sheeting goods" ranging from 21 to 30. Based on a Medline search, there appears to be no studies specifically examining the percent and form of asbestos in floor tile and mastic; although, some have reported the percent and form of asbestos in these materials as part of other types of studies (Lange, 2002).

This investigation reports on the percent and form of asbestos in floor tile and mastic. A comparison with previous published data is presented

MATERIALS AND METHODS

Data on the percent (amount) and form of asbestos reported in floor tile and mastic was abstracted from inspection reports conducted by the author and from various asbestos abatement contract specifications, all of which were performed in Pennsylvania during the time period 1998-2003. Reports presented were collected at random from data available to the author. When multiple samples were collected a range of the percent asbestos is presented. Analysis of the materials was performed using polarized light microscopy (EPA Method EPA/600/R-82/116). Many buildings report having asbestos-containing floor tile and mastic as well as

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Table 1. Number of samples, asbestos concentration and estimated area for floor tile and mastic.

Study Number	Number of Samples Collected	Concentration	Flooring Area[a]
Floor tile	1	15%	5,000
Floor tile	21	5-17%	>100,000
Floor tile	1	15%	5,000
Floor tile[1]	10	2-5%	65,000
Mastic[1]	4	3-5%	
Floor tile[2]	1	7%	5,000
Mastic[2]	4	5-15%	
Floor tile	10	2-5%	50,000
Floor tile[3]	4	10%	10,000
Mastic[3]	4	negative	
Floor Tile[4]	21	5-10%	>100,000
Mastic[4]	21	2%	
Floor tile[5]	10	2-5%	75,000
Mastic[5]	4	3-5%	
Floor tile	2	2-4%	5,000

a - square feet; 1-5 represents samples abstracted from the same report

some of these materials which are not asbestos-containing. The total number of positive samples for each asbestos report is shown. Data from ten reports were abstracted for this study. Each report is for an individual building or structure. All floor tile reported in this study were 9 inches by 9 inches in size. An estimate of the flooring area is also provided for each report.

RESULTS AND DISCUSSION

Table 1 shows form of material, number of positive samples and percent asbestos for each of the ten reports. The number of individual samples that was positive for asbestos ranged from 1 to 21, while the percent asbestos was 2 to 17% for floor tile and 2 to 15% for mastic. During sampling of floor tile and mastic, it is common that floor tile and associated mastic are both analyzed for asbestos. The only asbestos mineral form reported in the samples was chrysotile. Generally, the larger the area being evaluated the larger the number of samples collected.

Two samples did not report a range of percent asbestos (e.g. 10%). It is likely that the laboratory analyzing these materials observed that all the

samples were greater then 1 percent and provided an estimated number which they applied to all the positive results for that set of samples.

These results suggest that floor tile is in a much lower percent than that reported by others (HEI-AR, 1991). However, the percent reported can be considered too highly vary and is also variable within the same building. This is a result of different types of materials existing within the same building. Many regulatory agencies have identified floor tile as a hazardous material, although others have suggested that this is a form of legislating science (Lange, 2002). Asbestos was used as a binder in floor tile (HEI-AR, 1991) and is suggested to not be released to any significant extent even when the floor tile or mastic are disturbed or broken (Lange, 2002). This is supported by previous air sampling (Lange, 2002) during asbestos abatement. If criteria used by the US Occupational Safety and Health Administration for the World Trade Center are applied to these materials (Lange, 2002a), there is an extremely low likelihood of few or any fibers being released during abatement with most if not all fibers measured being non-asbestos (Lange, 2002a).

Previous studies have reported that chrysotile is not by itself a causative agent of mesothelioma, lung cancer (Ilgren, 2002) or asbestosis (Ilgren, 2002; Bernstein et al., 2003) as has been reported for members of the amphibole group. Chrysotile when combined with smoking can cause lung cancer, but it can be considered that smoking is the actual contributor of this disease. Since chrysotile appears to be the mineral form of asbestos in floor tile and mastic along with low exposure levels reported during abatement, the likelihood of disease resulting from disturbance of these building materials is extremely low (Hoskins, 2002). Future studies are warranted to confirm the findings reported in this investigation.

REFERENCES

Baldwin CA, Beaulieu HJ, Buchan RM, Johnson HH (1982) Asbestos in Colorodo schools. Public Health Rep 97: 325-331.

Bernstein DM, Chevalier J, Smith P (2003) Comparison of Calidria chrysotile asbestos to pure tremolite: inhalation biopersistence and histopathology following short-term exposure. Inhalation Toxicol 15: 1387-1419.

Health Effects Institute - Asbestos Research (1991) Asbestos in public and commercial buildings: a literature review and synthesis of current knowledge. Cambridge, MA.

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

Ilgren ED (2002) Coliga fibre: a short fibre, amphibole-free chrysotile –Part 4: further evidence for a lack of fibrogenic and tumorigenic activities. Indoor-Built Environ 11: 171-177.

Lange JH (2002) Impact of asbestos concentrations in floor tile on exposure during removal. Int J Environ Hlth Res 12: 293-300.

Lange JH (2002a) How do you interpret regulations: through science or agency rules? Toxicol Ind Health 18: 107-108.

Skinner HCW (2003) Minerology of asbestos minerals. Indoor-Built Environ 12: 385-389.