Building Owner sues IH Consultant over PLM Floor Tile Analysis

If you think a floor tile analysis by PLM is always adequate, you had better check your liability insurance!!

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Recently, I had a call from an industrial hygiene consultant who is facing a law suit over the analysis of floor tiles by polarized light microscopy (PLM). He specializes in asbestos inspections and operations and maintenance (O&M) plan development. In 1990 he conducted a building survey for a client in which he collected samples of suspected asbestos-containing material (ACM). His samples included floor tiles which he sent to a National Voluntary Laboratory Accreditation Program (NVLAP) accredited lab for PLM analysis. The results came back negative. The building owner developed a management plan based on these results. The consultant collected a fee of $1000 for his services.

Prior to renovations in 1999, a renovation contractor for the building owner collected additional samples of floor tiles from this building and had them analyzed by transmission electron microscopy (TEM). The TEM results showed the floor tiles to contain about 15% asbestos and thus, be ACM. The original PLM analysis failed to detect asbestos in the floor tiles. The building owner is now suing the consultant for the cost of abatement of the floor tiles which is estimated to be between $85,000 and $90,000. The consultant followed all EPA requirements in conducting his survey. He is an accredited inspector who used an accredited lab and followed all the EPA regulations. Yet, he may now be found liable for damages amounting to $85-$90K.

Why did the original analysis of the floor tiles by PLM fail to detect the asbestos found by the later TEM analysis? Many floor tiles have finely ground asbestos fibers which may not be visible by PLM. Also, these flooring materials have a matrix which make the fibers difficult to see even when they are large enough to be visible by PLM. These floor coverings contain an organic vinyl or asphaltic binder, an inorganic carbonate filler and pigments containing fine titanium dioxide particles. These matrix materials make the detection of the asbestos literally like finding a needle in a tarry, "gooey" haystack.

There are procedures available for removing the matrix materials, thus making the asbestos easier to detect. Some investigators have used organic solvents to remove the vinyl and asphaltic materials from the tile. However, this process leaves behind the inorganic phase of the matrix. A more widely used procedure for matrix removal is that of ashing and acid washing to remove the organic and inorganic phases of the matrix, respectively. A portion of the sample is selected, weighed, and the ashing and acid washing treatments are performed. The final residue is dried and weighed to determine the weight loss. Eighty percent or more of the flooring material is often removed following this process. The ashing is conducted at a temperature slightly below 500 degrees Celsius to prevent damage to the asbestos fibers. The acid washing removes the carbonate filler but, unfortunately, does not remove the titanium dioxide particles.

In some samples, the asbestos fibers are large enough to be detected by PLM following these matrix reduction procedures. This matrix reduction concentrates the asbestos into a residue and makes detection and quantification of asbestos an easier task for the analyst. When the titanium dioxide is present, however, these fine particles coat the asbestos fibers and make them nearly impossible to identify by PLM. The preparation procedure for the TEM analysis helps to separate the titanium dioxide from the fibers so that the fibers can more easily be detected. Also, fine fibers which are not detectable by PLM can be easily detected by the TEM.

These matrix reduction steps are not new to the analysis of asbestos in floor coverings. The 1982 EPA ``Interim Method for the Determination of Asbestos in Bulk Insulation Samples" (as found in 40 CFR Part 763 Appendix E to Subpart E) was developed primarily for the analysis of insulation materials, as the title specifies. The Interim Method briefly mentions the use of ashing and acid washing for matrix removal. The method also reminds analysts to correct the analytical result for any weight loss during this procedure. However, a detailed description of these procedures is lacking. In 1988 Dr. Eric Chatfield provided to American Society for Testing and Materials (ASTM) Committee D 22 a procedure which provided the detailed procedures for accomplishing these steps. The procedure is commonly known as "The Chatfield Method," although it has never been formally published. This procedure was incorporated into a section titled "Gravimetry" in the 1993 EPA "Method for the Determination of Asbestos in Bulk Building Materials," EPA/600/R-93/116. EPA has recommended that the 1993 method be used

as "...a preferred substitute..." to the Interim Method (Federal Register, Volume 59, Number 146, August 1, 1994, page 38970).

The State of New York Environmental Laboratory Approval Program (ELAP) currently requires the following disclaimer on all analyses of non-friable organically bound materials (NOBs) analyzed by PLM.:

> "Polarized-light microscopy is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing."

The State of New York program also states in its TEM method that:

> "...NOBs must be analyzed by one of the gravimetric matrix reduction methods, either the PLM method (ELAP Item 198.1) or the TEM method described herein. This TEM method is the **only** method that can be used to report true negative results from NOB samples to clients."

The State of New York reported at EIA'99 that NOB proficiency testing materials were successfully analyzed by all participants in its quality assurance (QA) program who used TEM. Test results were also reported at EIA'99 from the NVLAP program, which supports the EPA asbestos programs. NVLAP found error rates as high as 40% for floor tiles in its program. These results may be optimum because the labs are believed to take more care in analyzing proficiency test materials than for routine samples. Some labs may also resort to TEM to confirm the analysis by the PLM method.

Why doesn't everyone request the use of the improved methods for analysis of floor coverings? These matrix reduction steps take time for the laboratory to conduct. Additionally, the cost of the TEM analysis is significantly more than the cost of analysis by PLM. An informal survey by EPA in 1996 showed the average cost of a routine PLM analysis of floor coverings to be about $20 and the cost of a TEM analysis to be about $100. In the competitive world of asbestos management, most clients are reluctant to spend the additional cost for the TEM analysis. However, making a decision based on inadequate data can be more expensive than the cost of additional analyses. Consultants should consider the overall cost of the abatement or management of asbestos programs when justifying the cost of the analysis. The consultant who is now being sued by the building owner is painfully aware of the ultimate cost of cheaper but inadequate data.

Then why doesn't EPA require the use of the 1993 method for floor covering analysis? EPA has recommended, but has not required, the use of the 1993 method for floor tiles. The current climate in the Congress has made EPA reluctant to require any new regulations which would add to the cost of asbestos management. This policy has makes our regulators begin to look like an HMO for the environment.

Building owners should be aware of the shortcomings of the cheaper PLM analysis for floor tiles. Consultants should convince their clients that the cost of the TEM analysis is well spent and will prevent future problems. If they cannot convince the building owner to use the proper analytical method, they should for their own protection attach a disclaimer to their recommendations citing the shortcomings of the analysis of floor coverings by PLM.