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Public Health Service

Centers for Disease Control
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HETA 2000-0407

Ms. Maureen O'Donnell
U.S. Department of Labor
Occupational Safety and Health Administration
200 Constitution Avenue, N.W.
Washington, D.C. 20210

Dear Ms. O'Donnell:

In August 2000, the National Institute for Occupational Safety and Health (NIOSH) received your request for Technical Assistance on behalf of the Occupational Safety and Health Administration (OSHA). You asked NIOSH to assess asbestos exposure to downstream users of vermiculite who either expand vermiculite or use expanded vermiculite as a product ingredient.

Vermiculite ore is a micaceous mineral used as insulation, in cements, and in horticultural mixes.¹ Some vermiculite has been documented to be contaminated with asbestos. In the 1980s, NIOSH found significant asbestos exposures and excess asbestos-associated lung disease (asbestosis and lung cancer) among workers who processed vermiculite at the W.R. Grace & Co. Mine and Mill near Libby, Montana.² That mine and mill closed in 1990, but uncertainty remains about potential asbestos contamination of the current sources of vermiculite.

To assess potential asbestos exposure, NIOSH conducted site evaluations at 10 facilities that either expand vermiculite or use expanded vermiculite as a product ingredient. Seven facilities were expansion plants that exfoliate the raw vermiculite ore. These plants then bag the exfoliated vermiculite for re-sale or use it as a product ingredient in a downstream process; for example, the production of thermal insulating materials, horticultural growing media or fertilizers. The other three facilities were horticultural nurseries that mix expanded vermiculite with other potting materials such as perlite and peat moss. The planting media is then used for potting seeds or seedlings.

Two facilities expanded vermiculite ore from the W.R. Grace & Co. Kearney Mine and Mill in Enoree, South Carolina. One facility used Carolina Vermiculite Co. ore from the Brown #2 mine in Woodruff, South Carolina. Two facilities used ore from the Virginia Vermiculite Ltd., R.E. Sansom Mine and Mill in Louisa, Virginia. Lastly, two facilities imported ore from Palabora Mining Co. Ltd. located in Phalaborwa, South Africa. Thus, the vermiculite ore used by these facilities came from three domestic sources and one international source.

NIOSH collected bulk and air samples (personal breathing zone and area samples) at the 10 facilities described above. Samples were analyzed by NIOSH, OSHA and the Environmental Protection Agency (EPA) according to each agency's standard analytical method for asbestos.

Bulk samples of vermiculite and other raw material were collected if the material was likely to be present in airborne dust. Bulk samples were collected in triplicate for asbestos analysis; OSHA and EPA analyzed one sample each, and NIOSH retained the third sample for storage. A total of 56 bulk samples were collected. Trace (<1% visual estimate) amounts of actinolite-tremolite asbestos were found in 4 samples, and unidentified asbestiform fibers were found in 3 samples. Another sample showed the presence of asbestiform fibers (tremolite and anthophyllite fibers were suggested), however, the fibrous content was <1 percent.

Workers were selected for personal sampling based on their observed potential for dust exposure during the various stages of vermiculite processing. Sampling began at the start of tasks and continued for as long as possible. General work-area samples were also collected in areas representative of certain processes, particularly near processes expected to generate dust. Background levels of airborne asbestos were characterized by collecting air samples outside at a location upwind of vermiculite processing and storage areas. Duplicate particulate samples were collected side-by-side for each area and personal sample. One set of air samples was sent to the NIOSH contract laboratory for analysis and then on to OSHA, and the other set was sent to the EPA.

A total of 391 duplicate sets of air samples were collected. NIOSH analyses identified a total of 62.5 asbestos fibers. Of these fibers, 43.5 fibers were identified as actinolite-tremolite, 18.5 were identified as anthophyllite, and 0.5 were chrysotile. Airborne non-specific fiber concentrations for all jobs and areas ranged from below the limit of detection of the analytical method to 1.15 fibers per centimeter cubed (f/cm^3). The concentration of asbestos fibers for all jobs and areas ranged from 0 to $0.07 f/cm^3$.

Jobs with the highest potential for asbestos exposure are the furnace operators (job tasks include loading the furnace with raw materials and monitoring the exfoliation process) and baggers (job tasks include bagging the exfoliated vermiculite and stacking bags on pallets). The asbestos fiber concentrations measured for the furnace operators ranged from <0.004 to $0.07 f/cm^3$ (mean value = $0.02 f/cm^3$), and the asbestos fiber concentrations measured for the baggers ranged from 0 to $<0.03 f/cm^3$ (mean value = $0.01 f/cm^3$).

Copies of the individual reports for each of the 10 facilities were sent to you as they were completed during the course of the study. We also provided management at each specific facility with a copy of the report for their facility. These reports contain additional details about the sampling and analysis methods and results.

This letter serves to close-out this technical assistance. If you have further questions, do not hesitate to contact us at (304) 285-5759.

Sincerely,

Joseph E. Burkhart, MS, CIH
Deputy Director
Division of Respiratory Disease Studies

cc:
HETAB file
Close-out file (HETA 2000-0407)

¹. Addison J [1995]. Vermiculite: a review of the mineralogy and health effects of vermiculite exploitation. *Reg Tox and Pharm* 21:397-405.

². Amandus HE, Wheeler R, Jankovic J, Tucker J [1987]. The morbidity and mortality of vermiculite miners and millers exposed to tremolite-actinolite: Parts I-III. *Am J Indust Med* 11:1-37.