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Comments on the MSHA advance notice of proposed rulemaking.

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The Vermiculite Association

"Promoting the knowledge and use of Vermiculite around the world"

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Comments on the MSHA advance notice of proposed rulemaking.

Mr. John Addison, Dr. M. Allen, Mr. N. Gumble, Mr. E. Moeller

Introduction

These comments comprise the views of The Vermiculite Association. The Vermiculite Association is an organization of mining producers and exfoliators of vermiculite, and industrial users and commercial suppliers of products containing it.

The aims of the MSHA issues are:

1. to reduce the asbestos permissible exposure limits;
2. to revise the analytical methods for analyzing airborne fiber samples;
3. to introduce measures to reduce take-home asbestos contamination.

Historical Perspective

To a large extent, the rulemaking proposed by MSHA stems from the tragic underestimation, by the companies involved and the regulatory agencies, of the risks posed by the asbestos in the vermiculite ore to the workers in the W.R. Grace vermiculite mine at Libby, Montana. It is important therefore to emphasize that the Libby vermiculite deposit is very unusual in containing large amounts of asbestos disseminated throughout the ore-body. This pervasive development of asbestos, to the extent that it is even found within the crystals of vermiculite and other minerals that comprise the rock, has not been seen in any of the other N. American deposits.

Atkinson (1982) reported amphibole asbestos contents of different production grades of Libby vermiculite in the range of **0.3 – 7 %**. This average asbestos content is actually higher than in many asbestos mines. The sample of ‘head feed’ in that report may have been a grab sample that was not necessarily representative of general production but, with between 21 and 26 % asbestos content it may indicate that extremely high levels of asbestos are sometimes present. In view of these amounts of asbestos it is not surprising that measurements and NIOSH estimates of airborne fiber concentrations were extremely high (up to 182 fml^{-1}) in a wide range of occupational settings for periods before 1964 and up to 1971 (Amandus 1988).

Airborne fiber concentrations in the later years of operation were progressively lower as wet processing of the ore was introduced and as dust control practices were improved. Even so, exposure between 1971 and 1982 were only reported as 'less than 1 f/cc' and by 1984, not long before closure of the mine as 'less than 0.1 f/cc'.

The situation in Libby contrasts markedly with those at other vermiculite mines. Amphibole asbestos may be found in some of these mines, but not within the vermiculite ore itself. Asbestos occurs in occasional thin veins, and along shear planes at the margins of later intrusive igneous rock. Quantitative estimates of the asbestos contents are difficult because of the nature of the geology of the mines but the amount is probably less than in the Libby mine by several orders of magnitude (probably a fraction of 0.1%). It is generally avoided during mining of the ore, and the resulting product frequently contains no detectable asbestos using UK MDHS method that has a sensitivity stated as better than 1 part per million. Atkinson (1988) reported transmission electron microscope analyses of vermiculites from S. Carolina with asbestos contents between 22 ppm and 0.49 ppm (depending on which laboratory was used) for the head feed at Enoree, and less than 0.3 ppm for un-graded ore at Patterson. McDonald et al (1988) showed average airborne fiber concentrations at Enoree to be around 0.09 fml^{-1} as measured by TEM; only half of the fibers were identified as asbestos. At the same time, phase contrast microscope fiber concentrations for 122 samples out of 140 were less than 0.007 f/cc while the remainder had an average concentration of 0.031 f/cc .

One important feature of many vermiculite deposits is the presence of high proportions of amphibole minerals in the rock that constitutes the ore. These minerals are noted for their property of cleavage, a tendency for the crystals to split along systematic sets of fracture planes. This means that when crushed they tend to form elongate fragments. These are generally neither as fine nor as long as asbestos fibers but some are nevertheless within the size criteria for regulatory fibers that are required to be counted in phase contrast fiber counting methods. They are not asbestos and OSHA has stated that evidence is lacking to conclude that non-asbestiform tremolite, anthophyllite and actinolite present the same type or magnitude of health effect as asbestos, and that the failure to regulate them as asbestos does

not present a significant risk to employees (Federal Register, 1994). Most of the ‘fibers’ counted in the MSHA compliance testing of currently operating vermiculite mines in N. America have been found by TEM analysis to be amphibole cleavage fragment fibers (Reference report on Virginia Vermiculite samples taken by MSHA in August 2000 and analyzed for MSHA by R.J. Lee Inc). When counting was carried out by skilled analysts (OSHA Salt Lake City) using their best opinions to discriminate between cleavage fragment fibers and true asbestos the MSHA compliance testing of all vermiculite mines (except Libby) consistently produced fiber counts that were below the detection limit of the method (<0.01 f/cc).

Issue 1. Reducing the PEL.

The Vermiculite Association supports the proposal to reduce the PEL for asbestos to the OSHA level of 0.1 f/cc, provided that proper provision is made in the measuring procedures to exclude non-asbestos fibers from the count.

Question a. *What exposure limit would provide the appropriate level of protection to exposed miners? Would adopting the OSHA limits afford sufficient protection to miners?*

It is generally accepted that there is a cumulative fiber exposure threshold for asbestosis. Whether that threshold is 30 f ml.yrs (e.g. cumulative exposure for 30 years at 1 fiber per milliliter) or 50 f ml.yrs, as different experts have suggested, the OSHA PEL should provide sufficient protection. As far as lung cancer or mesothelioma is concerned the issue is more complicated. OSHA accepts that risks of these still persist for cumulative exposures over working lifetimes at the PEL. The balance that is inherent in any PEL between tolerable risk and other socio-economic factors is not a subject for The Vermiculite Association to debate at this time.

Question b. *MSHA’s recent field sampling data show that none of the samples collected exceed the OSHA’s 8 hour time weighted average of 0.1 f/cc when analyzed using the TEM method. Considering the low fiber levels observed, what would be an appropriate agency action?*

The answer to question b lies within the data collected by MSHA. The PCM fiber counts were consistently higher than the TEM fiber counts on the same samples. The PCM fiber counts would in all cases have given a health risk conservative result, at significantly lower cost than the TEM result. TEM analysis should only then be necessary in cases where PCM counts exceeded an action level.

Issue 2. Analytical Method.

MSHA is considering the option of using Transmission Electron Microscopy to analyze fiber samples that may contain asbestos. There are many difficulties associated with recommending this option as is clear from the subsidiary questions in the ANPRM.

The most important question is not asked by MSHA. That is at what level of asbestos presence in a rock or an ore will a decision be made that it is likely to constitute a risk that must be measured by TEM? As MSHA will already be aware, asbestos is a ubiquitous substance that is present in the ambient atmosphere of the planet and may be present in trace amounts in almost any sizeable mine or quarry with igneous or metamorphic rock. Imposition of TEM analysis on those with trace amounts would place an unnecessary burden upon them with no significant benefit to the workers. The asbestos content limit in the OSHA definition of an asbestos containing material is 1% asbestos. Imposing TEM analysis only on mines or quarries with this amount or more would allow situations that are almost as bad as Libby to continue. Some judgement should be made as to what constitutes a significant risk in terms of the asbestos proportions in the rock.

Question c. *What is the advantage for MSHA to use TEM to initially analyze airborne fibers collected on all filters?*

There is no advantage to MSHA to use TEM to initially analyze airborne fibers collected on all filters. A large number of these will contain no asbestos fibers, or asbestos fibers at a concentration below the detection limit of the method. In addition, other mineral dust will almost certainly prevent the collection of analyzable samples or constrain the sample volume to such a low level that detection limits will be too high to be of any value.

Question d. *What is the availability and cost of commercial TEA4 analysis services?*

The availability of TEM laboratories is not the main issue. The main issue is whether the laboratories are competent and have sufficient expertise to make the necessary distinctions between asbestos minerals and cleavage fragment fibers. Those that have the skills are likely to be more expensive than those set up to capitalize on a significant opportunity but without the staff with sufficient training or expertise to carry out the analysis to a suitable standard. It is almost certain that a suitably trained analytical workforce does not exist at present. Nor are the issues of definition and identification of asbestos fibers in the TEM method properly understood or resolved.

Question e. *Should we measure PEL compliance using TEM?*

The use of PCM for compliance monitoring stems from its use in the epidemiology studies upon which the PEL was based; as such it is still the best index of the risk to health that may be present in a workplace atmosphere provided that discrimination of asbestos from other fibers can be correctly done. It is the opinion of The Vermiculite Association that this was being done by MSHA through the OSHA laboratory in Salt Lake City in their analyses of membrane filter samples from vermiculite mines over the last ten years or so.

Until a direct relationship has been established between TEM analyses and PCM analyses there is no justification in assessing compliance with the PEL by TEM analysis. Furthermore, the NIOSH TEM method of counting PCOM equivalent fibers on the basis of a fiber diameter that would be visible if the sample had been examined by PCOM is open to some question as to what truly is the diameter cut-off for PCOM visibility. There has not been sufficient testing of this method to warrant the use of the method for compliance testing.

Question f. *Are there studies which correlate asbestos exposure determined by TEA4 with incidence of asbestos disease?*

There are no epidemiology studies of human subjects where the exposures have been adequately described by TEM analysis to correlate asbestos exposure as measured by TEM

with the incidence of disease. TEM fiber data from animal studies are not adequate for this judgement to be made.

Question g. *Are there data comparing PCM to TEM fiber counts ~~from~~ the same filter ~~for~~ the mine environment?*

MSHA has already collected a certain amount of data from the vermiculite mines (other than Libby) to show that the correlation between PCM fiber counts and TEM asbestos fiber counts on the same filter is poor. In the mining and other mixed dust situations, NIOSH methods that do not discriminate asbestos fibers from mineral fragments have consistently overestimated asbestos exposure.

Question h. *What method is most appropriate ~~for~~ MSHA to use (e.g., EPA, ASTM, OSHA, or NIOSH) to analyze bulk samples ~~for~~ asbestos in the mining industry?*

The available regulatory methods are not validated for quantitative analysis of bulk samples to levels below 1%. As a consequence none of them provide a suitable basis upon which to base an estimate of possible risks at a level where those risks are not significant. One percent asbestos by mass is likely to produce a very significant health risk if a dust cloud is generated from it in a working environment. Any method that is required to detect a risk to health from small amounts of asbestos in bulk materials should have a detection limit, or limit of quantification, considerably below the 1% level. At the same time the method must recognize the differences between normal amphibole minerals and their asbestos analogues. If no such method exists in the US then one should be developed as a matter of urgent priority, using proper scientific protocol and peer review testing tied to sound risk analysis.

Issue 3. Take - Home Contamination.

As with the issues of TEM analysis, the main question to be addressed here is not mentioned. At what point are any regulations regarding workplace preventive measures, education, training etc. to be imposed upon a mine or quarry that contains any detectable asbestos? How is that asbestos to be defined, identified or quantified? Unless provisions are made very carefully with proper consideration of the definitions of asbestos, recognizing the differences

between non-asbestos amphiboles and their asbestos analogues, and accepting the presence of other fibrous minerals and mineral fragment, then the consequences for industry may be very severe and with no direct benefit to the workers.

Issue 4. Sampling and Awareness of Asbestos Hazards.

Question n. *How can mineral dust interference be most accurately removed from the samples?*

Some progress has been made in the development of dust sampling instruments. It is feasible to use a cyclone selector prior to filtration as a means of separating out the respirable fraction from the airborne dust. Since the overwhelming majority of the asbestos hazard is found in this fraction it is possible that this procedure would enhance detection and analysis of asbestos in the atmosphere. If, as has been suggested, the predominant part of the risk is confined to asbestos fibers that are thinner than 0.5 microns in diameter, then appropriate use of a cyclone separator may enhance the analysis of the filters very significantly.

Question o. *Does our current field sampling meet the needs of the mining community?*

The current field sampling methods are adequate for the majority of mines and quames within the USA. When no significant asbestos is found in a given mine or quarry then current field sampling methods are certainly adequate.

Question p. *How should mine operators ensure that **miners** are aware of potential asbestos hazards at the mine site and provide adequate protection?*

There is a need for a balanced and rational explanation of the hazards of asbestos throughout the mining industry. There should be a broad reassurance of the workforce and the general public that, for the majority of the mining and quarrying industry there is no significant health risk from asbestos minerals above that which is presented by the ambient atmosphere from natural processes.

Overview.

The vermiculite industry in the USA is a responsible group of companies that has attempted at all times to comply with what has been required of it by the regulatory agencies. The tragic situation in Libby, Montana in no way represents the current situation for vermiculite producers today. The Vermiculite Association is doing everything it can to encourage higher standards within the industry and is in the process of trying to establish industry-wide standards that are acceptable to users and consumers alike while at the same time maintaining a viable industry. Sections of the media have wrongly asserted that the Libby tragedy exemplifies the whole vermiculite industry, others have wrongly stated that vermiculite itself is asbestos (vermiculite is NOT asbestos). In the face of this pressure the vermiculite industry in the USA is under a serious threat and in order to survive it needs to have a regulatory framework that is rational and responsive not only to the need to protect workers but also fair to the industry.

The Vermiculite Association supports the reduction of the PEL to the 0.1 f/cc standard provided that MSHA is mindful of the need to apply this standard to asbestos alone, and to workplace situations where it is genuinely warranted.