

witnesses, OSHA has concluded that chemically modified asbestos should be regulated in the same manner as unmodified asbestos. To make this intent clear, the phrase "and any of these minerals that has been chemically treated and/or altered" has been added to the definition of asbestos.

OSHA currently regulates all forms of tremolite, actinolite, and anthophyllite as asbestos. Some commenters, most notably representatives of the R.T. Vanderbilt Company, have strongly encouraged OSHA to revise its definition of asbestos to make it mineralogically correct. They have encouraged the Agency to amend the definition to make it clear that only the "asbestiform" varieties of tremolite, anthophyllite, and actinolite are considered to be asbestos (Ex. 337). The Agency raised this issue in the April proposal.

A number of commenters supported the addition of the term "asbestiform" (Ex. 90-3; 90-143; 90-180) or the term "fibrous" (Ex. 90-37; 117A) to the definition. Some urged OSHA to adopt the definition of another governmental Agency (Ex. 90-143; 90-161; 90-107) or to adopt a mineralogical definition (Ex. 90-37; 90-162; 90-179; 230 p. 13).

The modification of the definition to read tremolite asbestos, anthophyllite asbestos, and actinolite asbestos would eliminate other forms of tremolite, anthophyllite and actinolite from the definition of asbestos. OSHA has regulated all of these minerals as asbestos since 1972. The elimination of these minerals from the scope of the standard could only be justified by evidence that exposure to these minerals would not present a health hazard to exposed workers. Therefore, in its deliberations, OSHA examined the data in the record to determine whether or not there is evidence that workers exposed to these minerals are at risk for adverse health effects.

Both Dr. Mearl Stanton and Dr. William Smith have investigated the carcinogenicity of tremolite in experimental animals. Dr. Stanton's experiments (Ex. 84-195) demonstrated that tremolite asbestos is highly carcinogenic when implanted in the pleurae of rats. He also tested two samples of talc that did not induce tumors. These two samples were certified by Dr. Ann Wylie (Ex. 337 Att 2) to be tremolitic talcs which "usually contain approximately 30-50% nonasbestiform tremolite by weight, and small quantities of nonasbestiform anthophyllite and fibrous talc" (Ex. 337 Att 2). Dr. William Smith also conducted a series of experimental carcinogenicity studies in hamsters (Ex. 84-194; 306).

These studies examined the effect of intrapleural injections of a number of minerals including asbestiform and nonasbestiform tremolite. In these studies, samples of asbestiform tremolite and a sample of nonasbestiform tremolite induced tumor formation in hamsters while other samples of nonasbestiform tremolite did not (Ex. 84-194).

In addition to the experimental animal studies, much of the support to eliminate some forms of tremolite, actinolite, and anthophyllite from the definition of asbestos has focused on epidemiological studies of exposed workers. Particular attention has been paid to two prospective mortality studies at a New York state talc mine and mill. The November proposal discussed both studies in great detail.

Briefly, the NIOSH investigators (Brown, Dement and Wagoner Ex. 84-25) concluded that there were significant excesses of lung cancer mortality and of mortality due to nonmalignant respiratory disease. In the opinion of the investigators, this increase could not be accounted for by smoking history alone. They also reported that asbestos was present in the mine and mill. Stille and Tabershaw, studying a larger cohort employed at the same facility, concluded that the lung cancer excess observed was not statistically significant and was "consistent with a smoking effect" (Ex. 84-196). A number of reports, analyses, and letters to the editor that discussed the strengths and shortcomings of the two studies were placed in the record and were discussed in the November proposal (Exs. 84-217; 84-218; 84-231; 84-257; 84-375, 306, 337). (For a detailed discussion see 48 FR 51117-51120.)

Several other authors have investigated the mortality and morbidity associated with anthophyllite and tremolite exposures. Studies by Kleinfeld *et al.* (Ex. 84-181), Kiviluoto *et al.* (Ex. 84-181), Gamble *et al.* (Ex. 84-181) and others were discussed in the November proposal. In general, these studies have found an excess mortality and/or morbidity associated with exposures to these minerals.

OSHA has examined the data in the record that addresses the relationship between the health of workers and exposure to tremolite, actinolite and anthophyllite. There is epidemiological evidence in the record that shows that tremolite exposed workers are at risk for both death and disease. The results in experimental animals indicate that under test conditions that some samples of nonasbestiform tremolite induce tumor formation while others do not. Therefore, OSHA concludes that

exposure to all forms of tremolite, anthophyllite and actinolite should be regulated under this standard.

The Agency recognizes that the minerals tremolite, actinolite and anthophyllite exist in different forms. Further, the Agency has concluded that all forms of these minerals should continue to be regulated for the reasons stated above. Therefore, OSHA is amending the definition of asbestos in recognition that different mineral forms exist and adding a definition for tremolite, anthophyllite and actinolite to make it clear that all of the mineral forms come under the scope of the standard.

Action Level

In the final standard the action level has been set at 0.1 f/cc which triggers the monitoring, medical, and employee information and training requirements. This level is consistent with the trigger currently applied to the medical surveillance provision of the asbestos standard, so it represents no real change to the standard with regard to this provision, but merely clarifies OSHA's policy. This provision is also consistent with other OSHA health standards which trigger monitoring, medical, and training requirements at the action level (e.g., arsenic, 1910.1018; lead, 1910.1025; acrylonitrile, 1910.1045; and ethylene oxide 1910.1047). Regulated areas, hygiene facilities, and protective clothing are triggered at the PEL, consistent with past OSHA rulemaking. [See, for example, inorganic arsenic, 1910.1018].

Representatives of industry, labor and government endorsed the action level concept. Many participants suggested that a 0.1 f/cc action level should be maintained as an appropriate level for the implementation of medical surveillance [Exs. 86-4, 80-49, 90-163, 90-174, 90-180, 158D, 328]. Some commenters were of the opinion that the 0.1 level should trigger implementation of other provisions as well, such as training [Exs. 86-4, 90-49, 90-163, 90-174, 90-180, 158D, 328]. Some commenters were of the opinion that the 0.1 level should trigger implementation of other provisions as well, such as training [Exs. 86-4, 292, 328], regulated areas [Exs. 86-4, 90-49, 292], monitoring [86-4, 292, 328], hygiene facilities and protective clothing requirements [Exs. 86-4, 292]. Other industry spokespersons believed that the action level was overly burdensome, stating their opinion that if the permissible exposure level were a level that adequately protects workers, no action level should be required [Exs. 90-138, 90-166, 90-168].