

workers may be exposed throughout their entire working lives, and reflects the view that OSHA is regulating workplace conditions and not specific employees.

A second reason for using an assumption of lifetime exposure is that this method permits comparison of the risks from asbestos exposure to the risks posed by other substances that OSHA has regulated or proposes to regulate. Such comparisons are useful to the Agency in ensuring that a consistent policy underlies OSHA's determinations of significant risk. Because the Agency has determined significance of risk in previous rulemakings based on the lifetime exposure assumption, the use of shorter exposure duration for calculating the risk of asbestos-induced disease would preclude the Agency from making such comparisons. As stated in the April notice (49 FR 14120), the Agency has determined that exposure to asbestos results in an excess disease risk that is many times that found for other hazardous agents that have been regulated by OSHA.

OSHA also believes that the argument made by the AIA/NA, that use of an assumption involving a shorter exposure duration would result in a reduction in risk, is invalid. OSHA's risk assessment shows that the total asbestos-related cancer risk is not linearly related to duration of exposure, and that risk is not reduced proportionally when the exposure durations used are reduced. The reasons for this effect are twofold: First, as the population of asbestos-exposed workers ages, the proportion of this population dying from asbestos decreases because many of these individuals die from other diseases that are related to aging. Second, the relationship between exposure duration and the risk of dying of mesothelioma is not linear. Both of these elements contribute to the non-linearity of the relationship between exposure duration and the risk of incurring asbestos-related cancer. The non-linearity of the relationship between risk and duration is illustrated by comparing the total asbestos-related cancer risk for a 45-year exposure duration with that for a 20-year exposure duration. Although there is a 56 percent reduction in exposure duration, there is only a 31 percent reduction in total asbestos-related cancer risk (from 64 to 44 deaths per 1,000 employees). Accordingly, assuming that employees are exposed to asbestos for shorter durations because of employee turnover would actually increase the absolute risk among the larger number of workers exposed for less than their working lifetimes,

compared with the risk predicted for a constant number of workers exposed for a working lifetime. Such an increase in absolute risk is a result both of the larger number of workers exposed to asbestos for some period of time if turnover is taken into account and the non-linearity of the relationship between exposure duration and asbestos-related cancer risk. This is illustrated in a technical report (Ex. 84-405) submitted to the record by OSHA showing that calculating risks taking employee turnover and less-than-lifetime exposure into consideration results in a larger number of predicted asbestos-related cancer deaths than would be predicted using a model that assumes a lifetime exposure duration and no employee turnover. Therefore, OSHA finds that use of the lifetime exposure assumption does not result in an overstatement of the risk of mortality from asbestos-related cancers.

This concept is particularly relevant to the construction industry, which is characterized by higher employee turnover as compared to manufacturing industries. One commenter, the Associated General Contractors of America (AGC) argued that OSHA's risk estimates do not apply to the construction industry because of the unique exposure patterns characteristic of that industry:

Many of the studies on the dangers of asbestos have only limited implications for the construction industry. Forty-five years of exposure to 2 f/cc of airborne asbestos may cause sixty-four excess cancer deaths per one-thousand workers, but few if any construction employees will ever experience such exposure. Very few employees will remain in the industry for forty-five years. Very few will even experience more than low level, intermittent exposure to asbestos. (Ex. 84-457, p. 1)

OSHA recognizes that many construction employees are exposed on a less frequent basis than employees in general industry. However, OSHA disagrees with AGC's contention that the health evidence for asbestos has "limited applications" for construction employees. First, there are construction employees, particularly those employed by asbestos abatement and demolition contractors, who have regular exposures to asbestos. Second, as discussed above, OSHA's determination of the significance of risk must be based on the risks that would be permitted by a standard, and not the actual risk of employees who are exposed at a level below that standard. OSHA has no basis for believing that risks posed by exposure to asbestos at the current PEL of 2 f/cc in construction would be any

different than the risks to employees exposed to 2 f/cc in general industry.

Another issue raised by the AIA/NA involved the effect of fiber type on OSHA's risk estimate for asbestos-related cancer. By not accounting for the different carcinogenic potencies of the various fiber types, the AIA/NA maintained that the "... predicted risk from mesothelioma is likely to be substantially over-estimated" (Ex. 328, p. 1-17). The AIA/NA went on to state:

... OSHA's sole reliance on four studies where exposures were mixed, and where a large number of mesotheliomas were found, biases its risk assessment to the high side ... Had OSHA relied on a more representative set of studies showing the highest potencies, their mesothelioma risk estimate would have been reduced by a least half. (Ex. 328, p. 1-19)

OSHA discusses the health evidence for different fiber types in Section IV of this preamble. In that section, OSHA concluded that, although epidemiological studies indicate that exposure to amphiboles is associated with a greater mesothelioma risk than is exposure to chrysotile, animal studies show the opposite effect. Several rulemaking participants suggested a variety of reasons for this discrepancy. OSHA agrees with Dr. Davis (Tr. 7/10, p. 65) that, on a fiber-by-fiber basis, there are no data to show conclusively that amphibole fibers are more potent than chrysotile fibers. For this reason, OSHA did not distinguish among fiber types when conducting the Agency's risk assessment. Furthermore, no evidence was submitted to the record to indicate that such a fiber-type differential exists for lung cancer risk, which constitutes the largest component of the total cancer mortality risk predicted by OSHA's risk assessment. Moreover, even if OSHA agreed with the AIA/NA and used an estimate of mesothelioma risk that was reduced by 50 percent, the risk of dying of asbestos-related cancer continues to be significant even at the new PEL of 0.2 f/cc: reducing the mesothelioma risk by half results in an excess of 5.3 asbestos-related cancer deaths per 1,000 employees, a figure more than 5 times the Supreme Court's guidelines for significant risk. Therefore, OSHA does not agree with that its risk estimates are significantly overstated because they do not differentiate among fibers of different types.

A controversial issue raised during the rulemaking was whether the combined impact of smoking and asbestos exposure on the incidence of asbestos-related disease should lead OSHA to promulgate regulations prohibiting smoking in workplaces in