The use of the Walton-Beckett graticule is a major improvement. This graticule was designed for fibre counting, the contrast to those recommended in previous NIOSH methods. (Ex. 123A, Appendix C)

Because the NIOSH 7400 method takes advantage of technological improvements that have been adopted worldwide for asbestos sample analysis but retains the same counting rules as the NIOSH P&CAM 239, OSHA has used the major features of the NIOSH 7400 method as the basis for developing a required standardized sampling and analytical method measuring airborne asbestos concentrations. The method required by the revised asbestos standards for both general industry and construction, referred to as the OSHA Reference Method (ORM), is detailed in the mandatory Appendix A of each standard.

These appendices require that the employer collect airborne asbestos samples using 25 mm diameter mixed cellulose filters and a 50 mm extension cowl. Samples must be analyzed using a phase contrast microscope calibrated using a phase shift test slide and equipped with a Walton-Beckett graticule. The ORM also requires that filter samples be prepared using acetone-triacetin clearing solution and be counted in accordance with the "A" rules contained in the NIOSH 7400 method.

The ORM differs from the NIOSH 7400 method in two important respects. The ORM mandates a flow rate for asbestos sampling of between 0.5 and 2.5 1pm, which is similar to the flow rate range permitted by the NIOSH P&CAM 239 method (1.0 to 2.5 1pm). In contrast, the NIOSH 7400 method permits the use of any flow rate greater than or equal to 0.5 1pm. Secondly, the ORM permits the use of the larger 37 mm diameter filter when the employer has written justification explaining the need to use a larger filter to obtain readable samples. Both of these departures from the NIOSH 7400 method were made in response to commenters who pointed out that the use of high flow rates (e.g., 4 1pm) combined with the use of the smaller 25 mm filter may result in samples that are too overloaded with dust to permit the counting of asbestos fibers. This is particularly true in construction where nonasbestos dust particles released to the air as a result of demolition or renovation activities may interfere with analyzing samples that were collected using high flow rates and the smaller filter. OSHA believes that, by limiting the flow rate and permitting the use of the 37 mm filter in certain circumstances, employers will be more likely to obtain readable samples in dusty environments. In addition, record evidence suggests that the use of high flow rates may increase electrostatic charges in the filter apparatus, preventing some fibers from reaching the filter and resulting in lower fiber counts (Ex. 84-478: Tr. 7/6, p. 99). The implications of including these changes to the NIOSH 7400 method in the ORM, and record comments pertaining to filter overload, are discussed in depth in the section below dealing with the limit of detection of the NIOSH 7400 method.

In order to provide flexibility for employers to use monitoring methods that are different from but equivalent to the ORM, paragraph (d)(6) allows employers to use an equivalent method. To ensure that employers gather reliable exposure data both for their own management purposes and for the protection of employees from exposure to asbestos fibers, OSHA has included criteria in the revised rule for determining equivalency with the OSHA reference method.

These criteria include a protocol for side-by-side comparative testing using the OSHA reference method and the employer's candidate alternative method. The employer's candidate alternative method would be judged acceptable if 90 percent of the samples collected over the range of 0.5 to 2.0 times the PEL have an accuracy range of plus or minus 25 percent of the results of sampling taken with the OSHA reference method at the 95 percent confidence level. Any method judged equivalent using the protocol can be used for conducting employee exposure monitoring if the employer documents the method used and maintains records of the comparability testing used to establish the method's equivalency with the OSHA reference method.

OSHA believes that providing this protocol for testing the equivalency of alternative monitoring methods will remove barriers to innovation and technological advancement while at the same time providing an equal level of protection for employees.

Precision of the NIOSH 7400 Method

NIOSH has estimated that the overall precision, expressed as the coefficient of variation (CV), of the 7400 method ranges from 0.115 to 0.13 for samples in which 80-100 fibers per 100 fields have been counted (Ex. 84-444). For optimally loaded filters (100 fibers/100 fields), the estimated CV of 0.115 yields a one-sided standard analytical error (SAE), which is used to determine the upper and lower 95 percent confidence limits of the sample results, of 18.9 percent. (The SAE is determined by multiplying the CV by 1.645; see Ex. 84-62.) The estimated SAE for optimally loaded filters analyzed by this method, 18.9 percent, is thus lower than the SAE of 25 percent currently listed for this method in OSHA's Industrial Hygiene Technical Manual.

The NIOSH estimates of the CV for the P&CAM 239 method reflect all random sources of variation in airborne asbestos measurement; specific sources of random variation that NIOSH considered to be important include intrafilter variations (which result because only a portion of a filter is examined for counting fibers), random intercounter variations (also referred to as intralaboratory variation), and random error in pump flow rate (Ex. 84-62). NIOSH's estimate of the overall precision of the 7400 method is the same as its estimate of the overall precision of the P&CAM 239 method; that is, NIOSH did not revise or adjust its precision estimates when developing the 7400 method, because NIOSH believes that the 7400 method is merely a revision of the P&CAM 239. Dr. David Taylor of NIOSH defended this position at the informal hearing:

. . . The reason [that the 7400 method is a revision of P&CAM 239] is because its the same analytical process . . . [, the] use of phase contrast microscope . . . [and] the same counting rules, the A rules. And the sampling media are the same. . . . So its a revision of 239, not a new method. (Tr. 6/21, p. 157)

To measure the degree of random variability of asbestos samples analyzed by the P&CAM 239 method, Busch et al. (Ex. 84-62, Appendix C) used data collected by Johns-Manville, in an in-house interlaboratory study of the P&CAM 239 method. Each of 109 filters was counted by two to five counters located in five Johns-Manville laboratories. Busch et al. determined unbiased CV's for each of the samples and fitted a regression curve to the CV estimates plotted against average total fiber count for each sample. The resulting curve, which is presented in the NIOSH publication that accompanies the 7400 method (Ex. 84-444) as well as in Busch et al. (Ex. 84-62, Appendix C), clearly shows that analytical precision improves as the total number of fibers counted increases. For a fiber count of 10 fibers per 100 fields, NIOSH estimated the CV to be 0.41; if 100 fibers are counted in 100 fields, the estimated CV decreases to 0.115. This relationship between analytical precision and number of fibers counted has been recognized by several other rulemaking participants (Exs. 84-447, 84-455, 93-3, 328; Tr. 6/20, p. 8; Tr. 7/6, p. 111; Tr. 7/6, p. 161), and has led NIOSH to recommend that

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