

MSHA does not frequently change an error factor, it retains that latitude should significant changes to either analytical or sampling technology occur.

The formula for the error factor was based on three factors included in the DPM settlement agreement and involved in an eight-hour equivalent full-shift measurement of EC concentration using Method 5040: (1) Variability in air volume (*i.e.*, pump performance relative to the nominal airflow of 1.7 L/min), (2) variability of the deposit area of particles on the filter (cm²), and (3) accuracy of the laboratory analysis of EC density within the deposit (µg/cm²). Modifications made to the sampler since the time of the 31-Mine Study have no bearing on the first and third of these factors. For the error factor specified in the settlement agreement, variability of the filter deposit area was represented by a 3.1 percent coefficient of variation, based on an experiment carried out before the foil filter capsule in the sampling cassette was replaced by a 32-mm ring. Measurements subsequent to introduction of the ring show that variability of the filter deposit area is now less than 3.1 percent (Noll, J. D., *et al.*, "Sampling Results of the Improved SKC Diesel Particulate Matter Cassette"). This change slightly reduces the error factor stipulated for EC measurements in the settlement agreement, but not by enough to be of any practical significance.

Another commenter, stressing the interdependence of inter- and intra-laboratory analytical variability, stated:

MSHA should create an error factor model that accounts for the joint and related variability in laboratory analysis, and then combine that variability with pump flow rate, sample collection size, other sampling and analytic variables * * * [t]hen, based upon a statistically strong database, determine the appropriate error factor for elemental carbon samples.

MSHA agrees and this was done for the error factor stipulated in the settlement agreement.

This commenter also suggested that the error factor should include a "component accounting for location on the filter from which the sample punch was collected." The analytical method (NIOSH 5040) relies on a punch taken from inside the deposit area on the sample filter. In effect, the punch is a sample of the dust sample. Presumably, the purpose of the suggested error factor component would be to account for uniformity in the distribution of DPM deposited on the filter, as reflected by different possible locations at which a punch might be extracted. MSHA agrees that uniformity of the DPM deposit should be included in the error factor.

The method MSHA used to evaluate the accuracy of the analytical method involved comparing two punches taken from different locations on the same filter. Therefore, variability between punch results due to their location on the filter is already included in the error factor as calculated by MSHA.

The commenter further recommended that MSHA implement sample review and chain of custody procedures, that MSHA retain a portion of each sample for further analysis by the operator, and that the Agency institute inter- and intra-lab analysis of spiked EC samples, along the lines of an AIHA PAT (American Industrial Hygiene Association Proficiency Analytical Testing) program, in order "to obtain reliable, reproducible information."

The MSHA Analytical Laboratory is AIHA (ISO 17025) accredited. As such, the Laboratory is required to develop and follow specified measurement assurance procedures. These procedures include calibration, assessing limits of detection, and determining sampling and analytical errors. These are done by standard laboratory methods, which are outside the scope of this rulemaking. MSHA would encourage the laboratories that would perform NIOSH 5040 analysis to develop and institute a PAT-like round-robin program. However, establishing such a program is not only outside the scope of this rulemaking but also outside MSHA's mandate.

MSHA will be extracting and analyzing a second punch from any sample filter that indicates an overexposure (the two punch results will be averaged for purposes of determining noncompliance). As a result, sufficient sample will not be available to send to other laboratories for analysis. The inter-laboratory paired punch comparison, conducted on data from the 31-Mine Study, provided a rigorous evaluation of intra- and inter-laboratory variability in EC analysis. Based on 642 matched pairs of punches analyzed at four laboratories, the coefficient of variation in analytical EC measurement error, reflecting the combination of intra- and inter-laboratory imprecision, was estimated to be 6.5 percent at filter loadings corresponding to an EC concentration at or above the proposed interim limit of 308_{EC} µg/m³. This is considered an excellent degree of agreement for an inter-laboratory comparison.

Sample collection procedures and chain of custody, along with other sampling issues, are addressed in the MSHA Metal and Nonmetal Health Inspection Procedures Handbook. Operators are aware that MSHA inspects without prior notice. Therefore,

operators who wish to collect side-by-side samples should have filter cassettes and other sampling equipment and supplies available.

Final Concentration Limit

B. Section 57.5060(c)

Existing § 57.5060(c) addresses application and approval requirements for an extension of time for mine operators to reduce the concentration of DPM to the final TC concentration limit of 160 micrograms per cubic meter of air. Mine operators seeking an extension must apply to the Secretary. Only consider technological constraints can be considered as a basis for approving an extension. The current rule allows only one special extension per mine, and this extension is limited to two years. Operators must certify that one copy of the application was posted at the mine site for at least 30 days prior to the date of application. Operators also must give the authorized representative of miners a copy of the plan. The current rule does not apply to the interim concentration limit.

In the settlement agreement, MSHA agreed to propose to adapt this provision to the interim limit, include consideration of economic feasibility, and allow for annual renewals of special extensions. Proposed § 57.5060(c) would apply to both the interim and the final DPM limits. The proposed section would add consideration of economic feasibility in weighing whether operators qualify for an extension. Economic constraints as well as technological constraints may limit a mine operator's ability to come into compliance with either the interim or the final DPM concentration limit. An example of such an economic limitation is the case where the cost of modification to a piece of diesel-powered equipment that would be required to bring the equipment operator's exposure into compliance with the PEL would exceed the value of the equipment. In such an instance, additional time may be required to purchase and implement other effective controls, such as newer equipment with engines that emit less DPM or changes in the ventilation system of the mine.

The proposed section would remove the limit on the number of extensions that may be granted to each mine, but would limit each extension to one year. The MSHA district manager, rather than the Secretary, could grant extensions. The application for an extension would include information that demonstrates how the economic or technological feasibility issues affect the mine operator's ability to comply with