

Other commenters maintained that the 31-Mine Study did not contain the necessary protocols to address all potential interferences. Thus, in their view, MSHA does not have all the data required to answer this question. More specifically, some commenters stated that carbonaceous particulate in host rock has a smaller diameter than the impactor cut point and so may contaminate EC samples. No data were presented to support this claim. These commenters concluded that MSHA should propose additional research and seek comments on the research before concluding that sampling EC with an impactor will eliminate all interference problems. On the other hand, NIOSH, in its response to the ANPRM, stated that the only non-diesel source of EC that is known to be present in a metal/non-metal mine is graphitic mineral ore dust. NIOSH further stated that collection of this dust on the sample filter is prevented by the impaction plate in the SKC DPM cassette.

## (2) Field Blanks

A field blank is an unexposed control filter meant to account for background interferences and systematic contamination in the field, spurious effects due to manufacturing and storage of the filter, and systematic analytical errors. The tandem filter arrangement in the sample cassette provides a primary filter for collecting an air sample and a second filter, behind (after) the primary, that provides a separate control filter for each sample. This is especially convenient for industry sampling, since it eliminates the need to send a separate control filter to the analytical lab. MSHA requests comments as to industry experience with this sampling equipment.

In its comments on the ANPRM, NIOSH noted that two types of blanks, media and field, are normally used for quality assurance purposes. A media blank accounts for systematic contamination that may occur during manufacturing or storage. A field blank accounts for possible systematic contamination in the field. NIOSH does not recommend use of field blanks when EC is the surrogate. This is because EC measurements are not subject to sources of contamination in the field that would affect OC and TC results. Quartz-fiber filters are prone to OC vapor contamination in the field and to contamination by less volatile OC (e.g., oils) during handling. However, such contamination is irrelevant when EC is the surrogate.

Several commenters supported the use of field blanks, even if EC is the surrogate. These commenters pointed

out that using field blanks is standard IH practice and stated that manufacturing problems with SKC impactor provide further justification. One commenter asked that we use one blank from the same and one from a different manufacturer lot.

MSHA agrees both media and field blanks are desirable, even when elemental carbon is used as the surrogate. The use of such blanks is standard laboratory procedure and adds credibility to sample results. Field blanks adjust for systematic laboratory errors and for systematic contamination of samples from unforeseen or uncontrollable sources. Accordingly, MSHA will adjust the EC result obtained for each sample by the result obtained for the corresponding media blank when a compliance concentration is measured and by the field blank (tandem filter) result when a noncompliance determination is made.

## (3) Error Factor

MSHA intends to cite a violation of the  $DPM_{EC}$  exposure limit only when there is validated evidence that a violation actually occurred. As with all other measurement-based metal/nonmetal compliance determinations, MSHA would issue a citation only if a measurement demonstrated noncompliance with at least 95-percent confidence. We would achieve this 95-percent confidence level by comparing each EC measurement to the EC exposure limit multiplied by an appropriate "error factor."

Most commenters concurred with MSHA's intention to apply such an error factor, though they differed as to how this error factor should be established. Some other commenters, however, recommended citing at a substantially lower confidence level, using the limit of detection of the sampling instrument as replacement for the error factor. These commenters gave two reasons in support of this recommendation: (1) In issuing a citation for noncompliance, the standard of proof should, according to this commenter, be preponderance of evidence rather than beyond a reasonable doubt. The preponderance of evidence indicates a violation whenever a measurement exceeds the exposure limit plus the limit of detection. (2) Conventional public health reasoning and legal precedents call for caution on the side of protecting health, rather than preventing unwarranted citations. In addition, commenters stated that if a measurement failed to demonstrate compliance at a 95-percent confidence level, then this should trigger some action such as additional sampling, *i.e.*,

the EC measurement should be divided, rather than multiplied, by MSHA's proposed error factor to provide an "action level."

Contrary to these commenters' suggestions, the historical and prevailing practice, in both OSHA and MSHA, traditionally has been to cite noncompliance only when noncompliance is indicated at a high level of confidence. Although, the citation threshold value suggested by these commenters accounts for some analytical imprecision, as quantified by the limit of detection, it fails to account for other sources of measurement uncertainty, such as random variability of airflow through the filter.

Another commenter questioned the use of any constant error factor, because of changes in the EC:OC ratio under varying maintenance and operating conditions. Although MSHA regards such variability as relevant to the issue of choosing an appropriate surrogate, it is not relevant to determining an appropriate error factor if EC is selected as the surrogate. EC is the quantity to be measured under the proposal, and variability in the EC:OC ratio has no known impact on the accuracy of an EC concentration measurement made using the SKC sampler and the NIOSH 5040 analytical method.

Among those commenters supporting MSHA's use of an error factor providing 95-percent confidence in each citation, some advocated continued use of the factor specified in the settlement agreement: 12.2% for an interim EC limit of  $308 \mu g/m^3$ . This value was based on the paired punch data obtained from the 31-Mine Study, combined with independent estimates of variability in airflow and the deposit area on the sample filter. Other commenters, noting changes in the design of the SKC sampler since the 31-Mine Study, stated that sampler accuracy should be re-evaluated based on the redesigned sampler and that establishment of the error factor should be made a part of the rulemaking process.

MSHA disagrees that the establishment of an error factor for an airborne contaminant should be part of the rulemaking process. MSHA is not proposing an error factor in this rulemaking, but rather, discussing the procedure used to obtain the error factor. This procedure is further discussed on the MSHA web site—Single Source Page for Metal and Nonmetal Diesel Particulate Matter Regulations. Error factors are based on sampling and analytic errors. The manufacturers of sampling devices thoroughly investigate and quantify the error factors for their devices. While