

TITLE: Use of Single Filter High-Efficiency Particulate Sample Media When Testing Diesel Engines**MSHA Mine Safety and Health Administration, Approval & Certification Center**

1.0 PURPOSE

To establish a policy that informs Part 7 testing laboratories and the A&CC that a single high-efficiency particulate sampling filter when used for conducting approval and audit testing of diesel engines meets alternative test equipment and specification requirements.

2.0 SCOPE

This document encompasses all applications for diesel engines submitted for approval and audit.

3.0 REFERENCES

- 3.1. 30 CFR Part 7, Subpart E.
- 3.2. 40 CFR Part 86.1310-2007
- 3.3. ASTM D2986-95a dioctylphthalate (DOP) test.
- 3.4. Mechanical and Engineering Safety Division (M&ESD) diesel particulate sampling issue review Part I and II (attached).

4.0 DEFINITIONS

- 4.1. Particulates - Any material collected on a specified filter medium after diluting exhaust gases with clean, filtered air at a temperature of less than or equal to 125 F (52 C), as measured at a point immediately upstream of the primary filter. This is primarily carbon, condensed hydrocarbons, sulfates, and associated water.
- 4.2. High-Efficiency Particulate Sampling Filter - Polytetrafluoroethylene (PTFE) coated borosilicate glass fiber high-efficiency filters or polytetrafluoroethylene (PTFE) high-efficiency membrane filters with an integral support ring of polymethylpentene (PMP) or equivalent inert material.
 - 4.2.1. Filters shall have a minimum clean filter efficiency of 99% as measured by the ASTM D2986-95a DOP test.

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- 4.2.2. Filters shall have a minimum diameter of 1.83 +/- 0.024 inches (46.50 +/- 0.6 mm), 1.46 inches (37 mm) stain diameter.
- 4.2.3. The face velocity through the sample filter shall not exceed 100 cm/s. The face velocity is the standard volumetric sample flow rate divided by the sample filter stain area.

5.0 POLICY**5.1. General**

- 5.1.1. Effective the date of this policy, all Part 7 testing laboratories and the A&CC may use a single high-efficiency particulate sampling filter as defined in 4.2, 4.2.1, 4.2.2 and 4.2.3 for all diesel engine approval and audit testing conducted under 30 CFR Part 7, Subpart E.
- 5.1.2. The single high-efficiency particulate sampling filter is not required but may replace the pair of filters in series in 30 CFR 7.86(c)(18)(v)(A), (B), and (C).

6.0 BACKGROUND

- 6.1. New technology in laboratory test methods created a necessity to reevaluate the test equipment and specifications in 30 CFR Part 7.86(c)(18). This policy was developed to allow Part 7 Subpart E, Diesel Engines Intended for Use in Underground Mines, testing to be conducted with the newest technology test equipment available for diesel particulate matter (DPM) measurements.
- 6.2. The 30 CFR Part 7.86(c)(18) particulate sampling filter specifications represented the available sample media when the regulation was promulgated, October 25, 1996. Current technology has increased particulate sampling filter efficiency from 95% to 99%.
- 6.3. The 30 CFR Part 7.86(c)(18)(v) requires a pair of filters be used for DPM measurements. Equipment manufacturers for DPM measurement systems have created newer technology to measure DPM with a single high-efficiency particulate sampling filter.
- 6.4. MSHA's M&ESD conducted both a literary review and laboratory testing of the single high-efficiency particulate sampling filter versus a pair of particulate sampling filters. The results are in the attached reports,

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Mechanical and Engineering Safety Division (M&ESD) diesel particulate sampling issue review Part I and II. The results verify that a single high-efficiency particulate sample filter will give equivalent results to a pair of 95% efficient particulate sample filters

- 6.5. Environmental Protection Agency (EPA) regulations changed in 2007, 40 CFR 86.1310-2007, to permit use of the newer technology single high-efficiency particulate sampling filter. Many engine manufacturers and third party testing laboratories are complying with these current EPA regulations.
- 6.6. This policy will allow diesel engine manufacturers to test DPM emissions with newer test equipment.