

1.0 PURPOSE

The purpose of this document is to provide a procedure to be used by the Electrical Safety Division to determine if a representative sample of a methane monitoring system meets the performance requirements of 30 CFR 27.32(a).

2.0 SCOPE

This Standard Test Procedure (STP) applies to tests on all methane monitoring systems submitted for certification under 30 CFR Part 27. This STP will apply to tests on systems submitted for extension of certification and RAMPs if the changes would affect the performance of the monitor in accordance with 30 CFR 27.32(a).

3.0 REFERENCES

30 CFR 27.32(a) Laboratory tests for reliability and durability.

4.0 DEFINITIONS

- 4.1. Methane detector - A component of a methane monitoring system that functions in a gassy mine, tunnel, or other underground workings to sample the atmosphere continuously and responds to the presence of methane (27.2(d)).
- 4.2. Methane monitoring system - A complete assembly of one or more methane detectors and all other components required for measuring and signaling the presence of methane in the atmosphere of a mine, tunnel, or other underground workings, and shall include a power shutoff component (27.2(c)).
- 4.3. Power shutoff component - A component of a methane monitoring system, such as a relay, switch, or switching mechanism, that will cause a control circuit to deenergize a machine, equipment, or power circuit when actuated by the methane detector (27.2(e)).

5.0 TEST EQUIPMENT

- 5.1. Test gallery of sufficient volume to house the methane detector.

- 5.2. Test gases consisting of methane and air.
- 5.3. Gas mixing/measuring equipment (if not using pre-mixed test gas) with the capability to give mixtures of 1.5 and 2.1 (± 0.1) percent by volume. [Modular Dyna-Blenders Models 8250].
- 5.4. Thermometer. Minimum resolution: 0.1°C; minimum accuracy: $\pm 1^\circ\text{C}$. [Fluke Model 2170A Digital Thermometer]
- 5.5. Equipment to monitor the status of the power shut-off components
- 5.6. Gas analyzer with a range of at least 0 to 10 % volume methane-in-air; a resolution of at least 0.01 % volume methane-in-air, and accuracy of at least 0.05 % volume methane-in-air [Horiba Model VIA-510].

6.0 TEST SAMPLES

One complete methane monitoring system. The sample shall be of a quality consistent with that of the final manufactured product.

7.0 PROCEDURES

- 7.1. Conduct the test in an ambient temperature of $25 \pm 10^\circ\text{C}$. Record the ambient temperature on the test sheet.
- 7.2. Assemble and calibrate the methane monitoring system per the manufacturer's recommendations. Analyze the calibration gas with the gas analyzer. Record the reading.
- 7.3. Place the methane detector component of the assembled methane monitoring system in the test gallery with only air present. The detector should be placed in the gallery so as to minimize the effects of test gas velocity on the sensing head.
- 7.4. Record display reading, power shut-off component status, warning indicator status, and alarm indicator status on the test sheet.
- 7.5. Introduce a gas mixture of 1.5 percent methane-in-air into the test gallery.

- 7.6. Record the display reading when the warning indication activates. Once the display reaches its final reading, record the display reading, power shut-off component status, and alarm indicator status on the test sheet.
- 7.7. Increase the concentration of the gas mixture in the test gallery to 2.1 percent methane in air.
- 7.8. Record the display reading when the alarm indicator and the power shut-off component activates. Once the display reaches its final reading, record the display reading, power shut-off component status, and alarm indicator status on the test sheet.
- 7.9. Reduce the concentration of the gas mixture in the test gallery to 0.0 percent methane in air.
- 7.10. Repeat steps 7.5 through 7.9 fifty times, unless the monitoring system features two sensor heads. In that case, repeat steps 7.5 through 7.9 twenty-five times on each sensor head.
- 7.11. Remove the methane detector component of the assembled methane monitoring system from the test gallery.
- 7.12. Apply a gas mixture of 1.5 percent methane-in-air to the sensor head using the manufacturer's calibration adapter. The flow rate of the test gas should be the same as the recommended calibration gas flow rate.
- 7.13. Record the display reading when the warning indication activates. Once the display reaches its final reading, record the display reading, power shut-off component status, and alarm indicator status on the test sheet.
- 7.14. Apply a gas mixture of 2.1 percent methane-in-air to the sensor head using the manufacturer's calibration adapter. The flow rate of the test gas should be the same as the recommended calibration gas flow rate.
- 7.15. Record the display reading when the alarm indicator and the power shut-off component activates. Once the display reaches its final reading, record the display reading, power shut-off component status, and alarm indicator status on the test sheet.
- 7.16. Reduce the concentration of the gas mixture to 0.0 percent methane in air.

- 7.17. If the methane monitoring system features a single methane detection head, repeat Sections 7.12 through 7.16 four hundred fifty times. If it features two detection heads, repeat Sections 7.12 through 7.16 two hundred twenty-five times on each head.

8.0 TEST DATA

- 8.1. Test number.
- 8.2. Warning indicator status and display reading.
- 8.3. Alarm indicator status and display reading.
- 8.4. Power shut-off component status.
- 8.5. Test equipment with calibration due dates.
- 8.6. Description of methane monitoring system including manufacturer, model, or type number and serial number of unit tested.
- 8.7. Description of method used to monitor status of power shut-off component.
- 8.8. Test gas concentration. Minimum resolution: 0.1%; minimum accuracy: $\pm 0.1\%$.
- 8.9. Ambient temperature. Minimum resolution: 0.1° C; minimum accuracy: $\pm 1^\circ$ C.
- 8.10. Reference to the manufacturer's calibration procedure (document number, section, revision date, etc.).
- 8.11. The analyzed reading of the calibration gas.

9.0 PASS/FAIL CRITERIA

- 9.1. The methane monitor system shall provide a control signal to actuate a warning indicator device when 1.5 percent methane-in-air is applied to the methane detector.
- 9.2. The methane monitor system shall provide a control signal to actuate a warning indicator device and the power shutoff component when 2.1 percent methane-in-air is applied to the methane sensor.

- 9.3. Normal replacements and adjustments shall not constitute a failure.
Normal replacements and adjustments are considered to be replacement of components (sensor head, etc.).