

1.0 PURPOSE

The purpose of this document is to provide a procedure used by the Electrical Safety Division to determine if a representative sample of a methane monitoring system meets the requirements for resistance to moisture of 30 CFR 27.41.

2.0 SCOPE

This Standard Test Procedure (STP) applies to tests on all methane monitoring systems submitted for certification per 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 moisture resistance of the monitoring system.

3.0 REFERENCES

30 CFR 27.41 *Test to determine resistance to moisture.* Components, subassemblies, or assemblies, the normal functioning of which might be affected by moisture, shall be tested in atmospheres of high relative humidity (80 percent or more at 65° - 75°F.) for continuous operating and idle periods of 4 hours each. The component or subassembly or assembly shall function normally after being subjected to those tests.

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 (30 CFR 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 (30 CFR 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 (30 CFR 27.2(e)).

5.0 TEST EQUIPMENT

- 5.1. Test gases consisting of methane and air.
- 5.2. 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].
- 5.3. An environmental test chamber able to provide and measure 80 percent or more relative humidity at 65°- 75° F and sufficiently large to enclose the appropriate components, assemblies, and subassemblies of the methane monitoring system. [Tenney Environmental Chamber]
- 5.4. Equipment to monitor the status of the power shut-off component.
- 5.5. Manufacturers calibration cap (designed for use with the monitor), tubing, and flow meter set to the manufacturers specified calibration flow rate for introduction of the test gas mixtures to the sensor.
- 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 representative sample of a complete methane-monitoring system.

7.0 PROCEDURES

- 7.1. Adjust the chamber controls such that the temperature inside the chamber is maintained between 65°- 75° F and the relative humidity is at least 80%.
- 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 appropriate components, subassemblies, and assemblies in the environmental chamber in their normal operating positions, as described in the manufacturer's installation instructions.
- 7.4. Energize the methane monitoring system for four (4) hours, then deenergize it and allow it to remain in the chamber for four (4) additional hours.
- 7.5. Reenergize the methane monitoring system then apply a known gas mixture of 1.5 percent methane in air to the methane detector. Record the display reading and the status of each alarm and warning light and the power shut-off component. Record the time required for the display reading to increase from its quiescent reading to its ultimate reading.
- 7.6. Increase the gas mixture to 2.1 percent methane in air to the methane detector. Record the display reading and the status of each alarm and warning light and the power shut-off component. Record the time required for the display reading to increase from the value recorded in Section 7.5 to its ultimate reading.
- 7.7. Decrease the gas mixture to 0.0 percent methane in air to the methane detector. Record the display reading and the status of each alarm and warning light and the power shut-off component. Record the time required for the display reading to decrease from the value recorded in Section 7.6 to its ultimate reading.

8.0 TEST DATA

- 8.1. Temperature inside the environmental chamber throughout the course of the test.
- 8.2. Relative humidity inside the environmental chamber throughout the course of the test.
- 8.3. Power shut-off component status during Sections 7.5 through 7.7.
- 8.4. Alarm indicator status during Sections 7.5 through 7.7.
- 8.5. Response times recorded during Sections 7.5 through 7.7.
- 8.6. Test equipment with calibration due dates.

- 8.7. Description of methane monitoring system including position and orientation of the sensor during the test, manufacturer and model or type number.
- 8.8. Test gas concentration. Minimum precision: 0.1%; minimum accuracy: \pm 0.1%.
- 8.9. Reference to the manufacturer's calibration procedure and installation instructions (document number, section, revision date, etc.).
- 8.10 The analyzed reading of the calibration gas.

9.0 PASS/FAIL CRITERIA

Each component, subassembly, and assembly shall:

- 9.1 Actuate a warning device when 1.5 percent methane-in-air is applied to the methane detector;
- 9.2 Actuate a warning device and power shutoff component when 2.1 percent methane-in-air is applied to the methane detector;
- 9.3 Not actuate these devices in fresh air before and after the moisture test.