

**§ 27.22 Methane detector component.**

(a) A methane detector component shall be suitably constructed for incorporation in or with permissible and approved equipment that is operated in gassy mines and tunnels.

(b) A methane detector shall include:

(1) A method of continuous sampling of the atmosphere in which it functions.

(2) A method for actuating a warning device which shall function automatically at a methane content of the mine atmosphere between 1.0 to 1.5 volume percent. The warning device shall also function automatically at all higher concentrations of methane in the mine atmosphere.

(3) A method for actuating a power-shutoff component, which shall function automatically when the methane content of the mine atmosphere is 2.0 volume percent and at all higher concentrations of methane.

(4) A suitable filter on the sampling intake to prevent dust and moisture from entering and interfering with normal operation.

NOTE: This requirement for the methane detector may be waived if the design is such as to preclude the need of a filter.

(c) A methane detector may provide means for sampling at more than one point; provided, the methane detector shall separately detect the methane in the atmosphere at each sampling point with, in MSHA's opinion, sufficient frequency.

**§ 27.23 Automatic warning device.**

(a) An automatic warning device shall be suitably constructed for incorporation in or with permissible and approved equipment that is operated in gassy mines and tunnels.

(b) An automatic warning device shall include an alarm signal (audible or colored light), which shall be made to function automatically at a methane content of the mine atmosphere between 1.0 to 1.5 volume percent and at all higher concentrations of methane.

(c) It is recommended that the automatic warning device be supplemented by a meter calibrated in volume percent of methane.

**§ 27.24 Power-shutoff component.**

(a) A power-shutoff component shall be suitably constructed for incorporation in or with permissible and approved equipment that is operated in gassy mines and tunnels.

(b) The power-shutoff component shall include:

(1) A means which shall be made to function automatically to deenergize the machine or equipment when actuated by the methane detector at a methane concentration of 2.0 volume percent and at all higher concentrations in the mine atmosphere.

(i) For an electric-powered machine or equipment energized by means of a trailing cable, the power-shutoff component shall, when actuated by the methane detector, cause a control circuit to shut down the machine or equipment on which it is installed; or it shall cause a control circuit to deenergize both the machine or equipment and the trailing cable.

NOTE: It is not necessary that power be controlled both at the machine and at the outby end of the trailing cable.

(ii) For a battery-powered machine or equipment, the methane-monitor power-shutoff component shall, when actuated by the methane detector, cause a control circuit to deenergize the machine or equipment as near as possible to the battery terminals.

(iii) For a diesel-powered machine or equipment, the power-shutoff component, when actuated by the methane detector, shall shut down the prime mover and deenergize all electrical components of the machine or equipment. Batteries are to be disconnected as near as possible to the battery terminals. Headlights which are approved under Part 20 of this subchapter (Schedule 10, or any revision thereof) are specifically exempted from this requirement.

(2) An arrangement for testing the power-shutoff characteristic to determine whether the power-shutoff component is functioning properly.

**Subpart C—Test Requirements**

**§ 27.30 Inspection.**

A detailed inspection shall be made by MSHA of the equipment and all components and functions related to

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safety in operation, which shall include:

(a) Examining materials, workmanship, and design to determine conformance with paragraph (a) of § 27.20.

(b) Comparing components and sub-assemblies with the drawings and specifications to verify conformance with the requirements of this part.

### § 27.31 Testing methods.

A methane-monitoring system shall be tested by MSHA to determine its functional performance, and its explosion-proof and other safety characteristics. Since all possible designs, arrangements, or combinations cannot be foreseen, MSHA reserves the right to make any tests or to place any limitations on equipment, or components or subassemblies thereof, not specifically covered herein, to determine and assure the safety of such equipment with regard to explosion and fire hazards.

### § 27.32 Tests to determine performance of the system.

(a) *Laboratory tests for reliability and durability.* Five hundred successful consecutive tests<sup>2</sup> for gas detection, alarm action, and power shutoff in natural gas-air mixtures<sup>3</sup> shall be conducted to demonstrate acceptable performance as to reliability and durability of a methane-monitoring system. The tests shall be conducted as follows:

(1) The methane detector component shall be placed in a test gallery into which natural gas shall be made to enter at various rates with sufficient turbulence for proper mixing with the air in the gallery. To comply with the requirements of this test, the detector shall provide an impulse to actuate an alarm at a predetermined percentage of gas and also provide an impulse to actuate a power shutoff at a second predetermined percentage of gas. (See §§ 27.21, 27.22, 27.23, and 27.24.)<sup>4</sup>

<sup>2</sup> Normal replacements and adjustments shall not constitute a failure.

<sup>3</sup> Investigation has shown that, for practical purposes, natural gas (containing a high percentage of methane) is a satisfactory substitute for pure methane in these tests.

<sup>4</sup> At the option of MSHA, these tests will be conducted with dust or moisture added to the atmosphere within the gallery.

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(b) *Field tests.* MSHA reserves the right to conduct tests, similar to those stated in paragraph (a) of this section, in underground workings to verify reliability and durability of a methane-monitoring system installed in connection with a piece of mining equipment.

### § 27.33 Test to determine explosion-proof construction.

Any assembly, subassembly, or component which, in the opinion of MSHA, requires explosion-proof construction shall be tested in accordance with the procedures stated in Part 18 of this subchapter.

### § 27.34 Test for intrinsic safety.

Assemblies, subassemblies, or components that are designed for intrinsic safety shall be tested by introducing into the circuit(s) thereof a circuit-interrupting device which produces an electric spark from the current in the circuit. The circuit-interrupting device shall be placed in a gallery containing various flammable natural gas-air mixtures. To meet the requirements of this test, the spark shall not ignite the flammable mixture. For this test the circuit-interrupting device shall be operated not less than 100 times at 125 percent of the normal operating voltage of the particular circuit.

### § 27.35 Tests to determine life of critical components and subassemblies.

Replaceable components may be subjected to appropriate life tests at the discretion of MSHA.

### § 27.36 Test for adequacy of electrical insulation and clearances.

MSHA shall examine, and test in a manner it deems suitable, electrical insulation and clearances between electrical conductors to determine adequacy for the intended service.

### § 27.37 Tests to determine adequacy of safety devices for bulbs.

The glass envelope of bulbs with the filament incandescent at normal operating voltage shall be broken in flammable methane-air or natural gas-air mixtures in a gallery to determine that the safety device will prevent ignition of the flammable mixtures.