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to MSHA as part of the approval application:

(i) Written evidence of the laboratory's independence and current recognition by a laboratory accrediting organization;

(ii) Complete technical explanation of how the product complies with each requirement in the applicable MSHA product approval requirements;

(iii) Identification of components or features of the product that are critical to the safety of the product; and

(iv) All documentation, including drawings and specifications, as submitted to the independent laboratory by the applicant and as required by this part.

(b) MSHA will consider the application and inspect the drawings and parts to determine whether it will be necessary to make any tests.

(c) If no tests are necessary, and the change meets the requirements, the applicant will be officially advised by MSHA that his original approval has been extended to include the change.

(d) If tests are judged necessary, the applicant will be advised of the material that will be required. In this case extension of approval will be granted upon satisfactory completion of the tests and full compliance with the requirements.

[Sched. 9B, 4 FR 1555, Apr. 11, 1939, as amended by Supp. 1, 20 FR 2975, May 4, 1955; 43 FR 12315, Mar. 24, 1978; 52 FR 17514, May 8, 1987; 68 FR 36421, June 17, 2003; 73 FR 52212, Sept. 9, 2008]

**PART 27—METHANE-MONITORING SYSTEMS**

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AUTHORITY: 30 U.S.C. 957, 961.

SOURCE: 31 FR 10607, Aug. 9, 1966, unless otherwise noted.

**Subpart A—General Provisions**

**§ 27.1 Purpose.**

The regulations in this part set forth the requirements for methane-monitoring systems or components thereof to procure certification for their incorporation in or with permissible equipment that is used in gassy mines, tunnels, or other underground workings and procedures for applying for such certification.

[31 FR 10607, Aug. 9, 1966, as amended at 52 FR 17515, May 8, 1987]

**§ 27.2 Definitions.**

As used in this part:

(a) *MSHA* means the United States Department of Labor, Mine Safety and Health Administration.

(b) *Applicant* means an individual, partnership, company, corporation, association, or other organization that designs, manufactures, or assembles

and that seeks certification or preliminary testing of a methane-monitoring system or component.

(c) *Methane-monitoring system* means a complete assembly of one or more methane detectors and all other components required for measuring and signalling the presence of methane in the atmosphere of a mine, tunnel, or other underground workings, and shall include a power-shutoff component.

(d) *Methane detector* means a component for 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.

(e) *Power-shutoff component* means 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.

(f) *Flammable mixture* means a mixture of a gas, such as methane, natural gas, or similar hydrocarbon gas with normal air, that can be ignited.

(g) *Gassy mine or tunnel* means a mine, tunnel, or other underground workings in which a flammable mixture has been ignited, or has been found with a permissible flame safety lamp, or has been determined by air analysis to contain 0.25 percent or more (by volume) of methane in any open workings when tested at a point not less than 12 inches from the roof, face, or rib.

(h) *Letter of certification* means a formal document issued by MSHA stating that a methane-monitoring system or subassembly or component thereof:

(1) Has met the requirements of this part, and

(2) Is certified for incorporation in or with permissible or approved equipment that is used in gassy mines and tunnels.

(i) *Component* means a part of a methane-monitoring system that is essential to its operation as a certified methane-monitoring system.

(j) *Explosion-proof* means that a component or group of components (subassembly) is so constructed and protected by an enclosure with or without a flame arrester(s) that, if a flammable

mixture of gas is ignited within the enclosure, it will withstand the resultant pressure without damage to the enclosure and/or flame arrester(s). Also the enclosure and/or flame arrester(s) shall prevent the discharge of flame from within either the enclosure or the flame arrester, or the ignition of any flammable mixture that surrounds the enclosure and/or flame arrester.<sup>1</sup>

(k) *Normal operation* means that performance of each component as well as of the entire assembly of the methane-monitoring system is in conformance with the functions for which it was designed and for which it was tested by MSHA.

(l) *Flame arrester* means a device so constructed that it will prevent propagation of flame or explosion from within the unit of which it is part to a surrounding flammable mixture.

(m) *Intrinsically safe equipment and circuitry* means equipment and circuitry that are incapable of releasing enough electrical or thermal energy under normal or abnormal conditions to cause ignition of a flammable mixture of the most easily ignitable composition.

(n) *Fail safe* means that the circuitry of a methane-monitoring system shall be so designed that electrical failure of a component which is critical in MSHA's opinion will result in deenergizing the methane-monitoring system and the machine or equipment of which it is a part.

[31 FR 10607, Aug. 9, 1966, as amended at 39 FR 24003, June 28, 1974; 43 FR 12316, Mar. 24, 1978]

**§ 27.3 Consultation.**

By appointment, applicants or their representatives may visit the U.S. Department of Labor, Mine Safety and Health Administration, Approval and Certification Center, 765 Technology Drive, Triadelphia, WV 26059, to discuss with qualified MSHA personnel proposed methane-monitoring systems to be submitted in accordance with the regulations of this part. No charge is made for such consultation and no

<sup>1</sup>Explosion-proof components or subassemblies shall be constructed in accordance with the requirements of Part 18 of this subchapter.

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written report thereof will be made to the applicant.

[31 FR 10607, Aug. 9, 1966, as amended at 43 FR 12316, Mar. 24, 1978; 60 FR 35694, July 11, 1995; 73 FR 52212, Sept. 9, 2008]

### § 27.4 Application procedures and requirements.

(a)(1) No investigation or testing for certification will be undertaken by MSHA except pursuant to a written application, accompanied by all drawings, specifications, descriptions, and related materials. The application and all related matters and correspondence shall be addressed to: U.S. Department of Labor, Mine Safety and Health Administration, Approval and Certification Center, 765 Technology Drive, Triadelphia, WV 26059. Fees calculated in accordance with part 5 of this title shall be submitted in accordance with § 5.40.

(2) Where the applicant for approval has used an independent laboratory under part 6 of this chapter to perform, in whole or in part, the necessary testing and evaluation for approval under this part, the applicant must provide to MSHA as part of the approval application:

(i) Written evidence of the laboratory's independence and current recognition by a laboratory accrediting organization;

(ii) Complete technical explanation of how the product complies with each requirement in the applicable MSHA product approval requirements;

(iii) Identification of components or features of the product that are critical to the safety of the product; and

(iv) All documentation, including drawings and specifications, as submitted to the independent laboratory by the applicant and as required by this part.

(3) An applicant may request testing and evaluation to non-MSHA product safety standards which have been determined by MSHA to be equivalent, under § 6.20 of this chapter, to the product approval requirements under this part.

(b) Drawings, specifications, and descriptions shall be adequate in detail to identify fully all components and sub-assemblies that are submitted for investigation, and shall include wiring

and block diagrams. All drawings shall include title, number, and date; any revision dates and the purpose of each revision shall also be shown on the drawing.

(c) For a complete investigation leading to certification, the applicant shall furnish all necessary components and material to MSHA. MSHA reserves the right to require more than one of each component, subassembly, or assembly for the investigation. Spare parts and expendable components, subject to wear in normal operation, shall be supplied by the applicant to permit continuous operation during test periods. The applicant shall furnish special tools necessary to assemble or disassemble any component or sub-assembly for inspection or test.

(d) The applicant shall submit a plan of inspection of components at the place of manufacture or assembly. The applicant shall furnish to MSHA a copy of any factory-inspection form or equivalent with the application. The form shall direct attention to the points that must be checked to make certain that all components or sub-assemblies of the complete assembly are in proper condition, complete in all respects, and in agreement with the drawings, specifications, and descriptions filed with MSHA.

(e) The applicant shall furnish to MSHA complete instructions for operating the assembly and servicing components. After completion of MSHA's investigation, and before certification, if any revision of the instructions is required, a revised copy thereof shall be submitted to MSHA for inclusion with the drawings and specifications.

[31 FR 10607, Aug. 9, 1966, as amended at 43 FR 12316, Mar. 24, 1978; 60 FR 35694, July 11, 1995; 68 FR 36421, June 17, 2003; 70 FR 46343, Aug. 9, 2005; 73 FR 52212, Sept. 9, 2008]

### § 27.5 Letter of certification.

(a) Upon completion of investigation of a methane-monitoring system, or component or subassembly thereof, MSHA will issue to the applicant either a letter of certification or a written notice of disapproval, as the case may require. If a letter of certification is issued, no test data or detailed results of tests will accompany it. If a notice of disapproval is issued, it will

be accompanied by details of the defects, with a view to possible correction. MSHA will not disclose except to the applicant or his authorized representative, any information because of which a notice of disapproval has been issued.

(b) A letter of certification will be accompanied by an appropriate cautionary statement specifying the conditions to be observed for operating and maintaining the device(s) and to preserve its certified status.

**§ 27.6 Certification of components.**

In accordance with § 27.4, manufacturers of components may apply to MSHA to issue a letter of certification. To qualify for certification, electrical components shall conform to the prescribed inspection and test requirements and the construction thereof shall be adequately covered by specifications officially recorded and filed with MSHA. Letters of certification may be cited to fabricators of equipment intended for use in a certified methane-monitoring system as evidence that further inspection and test of the components will not be required.

**§ 27.7 Certification plate or label.**

A certified methane-monitoring system or component thereof shall be identified with a certification plate or label which is attached to the system or component in a manner acceptable to MSHA. The method of attachment shall not impair the explosion-proof characteristics of any enclosure. The plate or label shall be of serviceable material, acceptable to MSHA, and shall contain the following inscription with spaces for appropriate identification of the system or component and assigned certificate number:

Manufacturer's Name \_\_\_\_\_  
 Description \_\_\_\_\_ (Name)  
 Model or Type No \_\_\_\_\_  
 Certified as complying with the applicable requirements of Schedule 32A. \_\_\_\_\_  
 Certificate No \_\_\_\_\_

**§ 27.8 [Reserved]**

**§ 27.9 Date for conducting tests.**

The date of receipt of an application will determine the order of precedence

for investigation and testing. The applicant will be notified of the date on which tests will begin.

NOTE: If an assembly, subassembly, or component fails to meet any of the requirements, testing of it may be suspended and other items may be tested. However, if the cause of failure is corrected, testing will be resumed after completing such other test work as may be in progress.

[31 FR 10607, Aug. 9, 1966, as amended at 70 FR 46343, Aug. 9, 2005]

**§ 27.10 Conduct of investigations, tests, and demonstrations.**

MSHA shall hold as confidential and shall not disclose principles or patentable features, nor shall it disclose any details of drawings, specifications, or related materials. The conduct of all investigations, tests, and demonstrations shall be under the direction and control of MSHA, and any other persons shall be present only as observers, except as noted in paragraph (b) of this section.

(a) Prior to the issuance of a letter of certification, necessary Government personnel, representatives of the applicant, and such other persons as are mutually agreed upon may observe the investigations or tests.

(b) When requested by MSHA the applicant shall provide assistance in assembling or disassembling components, subassemblies, or assemblies for testing, preparing components, subassemblies, or assemblies for testing, and operating the system during the tests.

(c) After the issuance of a letter of certification, MSHA may conduct such public demonstrations and tests of the certified methane-monitoring system or components as it deems appropriate.

[31 FR 10607, Aug. 9, 1966, as amended at 39 FR 24003, June 28, 1974]

**§ 27.11 Extension of certification.**

If an applicant desires to change any feature of a certified system or component, he shall first obtain MSHA's approval of the change, pursuant to the following procedure:

(a)(1) Application shall be made as for an original certification, requesting that the existing certification be extended to cover the proposed changes. The application shall include complete

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drawings, specifications, and related data, showing the changes in detail.

(2) Where the applicant for approval has used an independent laboratory under part 6 of this chapter to perform, in whole or in part, the necessary testing and evaluation for approval of changes to an approved product under this part, the applicant must provide to MSHA as part of the approval application:

(i) Written evidence of the laboratory's independence and current recognition by a laboratory accrediting organization;

(ii) Complete technical explanation of how the product complies with each requirement in the applicable MSHA product approval requirements;

(iii) Identification of components or features of the product that are critical to the safety of the product; and

(iv) All documentation, including drawings and specifications, as submitted to the independent laboratory by the applicant and as required by this part.

(b) The application will be examined by MSHA to determine whether inspection and testing of the modified system or component or of a part will be required. MSHA will inform the applicant whether testing is required and the component or components and related material to be submitted for that purpose.

(c) If the proposed modification meets the requirements of this part, a formal extension of certification will be issued, accompanied by a list of revised drawings and specifications which MSHA has added to those already on file.

[31 FR 10607, Aug. 9, 1966, as amended at 52 FR 17515, May 8, 1987; 68 FR 36421, June 17, 2003]

### § 27.12 Withdrawal of certification.

MSHA reserves the right to rescind for cause any certification issued under this part.

## Subpart B—Construction and Design Requirements

### § 27.20 Quality of material, workmanship, and design.

(a) MSHA will test only equipment that, in its opinion, is constructed of

suitable materials, is of good workmanship, is based on sound engineering principles, and is safe for its intended use. Since all possible designs, arrangements, or combinations of components cannot be foreseen, MSHA reserves the right to modify the construction and design requirements of components or subassemblies and the tests to obtain the degree of protection intended by the tests described in Subpart C of this part.

(b) Unless otherwise noted, the requirements stated in this part shall apply to explosion-proof enclosures and intrinsically safe circuits.

(c) All components, subassemblies, and assemblies shall be designed and constructed in a manner that will not create an explosion or fire hazard.

(d) All assemblies or enclosures—explosion-proof or intrinsically safe—shall be so designed that the temperatures of the external surfaces, during continuous operation, do not exceed 150 °C. (302 °F.) at any point.

(e) Lenses or globes shall be protected against damage by guards or by location.

(f) If MSHA determines that an explosion hazard can be created by breakage of a bulb having an incandescent filament, the bulb mounting shall be so constructed that the bulb will be ejected if the bulb glass enclosing the filament is broken.

NOTE: Other methods that provide equivalent protection against explosion hazards from incandescent filaments may be considered satisfactory at the discretion of MSHA.

### § 27.21 Methane-monitoring system.

(a) A methane-monitoring system shall be so designed that any machine or equipment, which is controlled by the system, cannot be operated unless the electrical components of the methane-monitoring system are functioning normally.

(b) A methane-monitoring system shall be rugged in construction so that its operation will not be affected by vibration or physical shock, such as normally encountered in mining operations.

(c) Insulating materials that give off flammable or explosive gases when decomposed shall not be used within enclosures where they might be subjected to destructive electrical action.

(d) An enclosure shall be equipped with a lock, seal, or acceptable equivalent when MSHA deems such protection necessary for safety.

(e) A component or subassembly of a methane-monitoring system shall be constructed as a package unit or otherwise in a manner acceptable to MSHA. Such components or subassemblies shall be readily replaceable or removable without creating an ignition hazard.

(f) The complete system shall "fail safe" in a manner acceptable to MSHA.

**§ 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 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

<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.

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>

(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.

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

**§ 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.

**§ 27.38 Tests to determine adequacy of windows and lenses.**

*Impact tests.* A 4-pound cylindrical weight with a one-inch diameter hemispherical striking surface will be dropped (free fall) to strike the window or lens in its mounting or the equivalent thereof at or near the center. At least three out of four samples shall withstand the impact according to the following table:

| Overall lens diameter (inches) | Height of fall (inches) |
|--------------------------------|-------------------------|
| Less than 4 .....              | 6                       |
| 4 to 5 .....                   | 9                       |
| 5 to 6 .....                   | 15                      |
| Greater than 6 .....           | 24                      |

Lenses or windows of smaller diameter than 1 inch may be tested by alternate methods at the discretion of MSHA.

**§ 27.39 Tests to determine resistance to vibration.**

(a) *Laboratory tests for reliability and durability.* Components, subassemblies, or assemblies that are to be mounted on permissible and approved equipment shall be subjected to two separate vibration tests, each of one-hour duration. The first test shall be conducted at a frequency of 30 cycles per second with a total movement per cycle of 1/16-

inch. The second test shall be conducted at a frequency of 15 cycles per second with a total movement per cycle of 1/8-inch. Components, subassemblies, and assemblies shall be secured to the vibration testing equipment in their normal operating positions (with shock mounts, if regularly provided with shock mounts). Each component, subassembly and assembly shall function normally during and after each vibration test.

NOTE: The vibrating equipment is designed to impart a circular motion in a plane inclined 45° to the vertical or horizontal.

(b) *Field tests.* MSHA reserves the right to conduct tests to determine resistance to vibration in underground workings to verify the reliability and durability of a methane-monitoring system or component(s) thereof where installed in connection with a piece of mining equipment.

**§ 27.40 Test to determine resistance to dust.**

Components, subassemblies, or assemblies, the normal functioning of which might be affected by dust, such as coal or rock dust, shall be tested in an atmosphere containing an average concentration (50 million minus 40 micron particles per cubic foot) of such dust(s) for a continuous period of 4 hours. The component, subassembly, or assembly shall function normally after being subjected to this test.

NOTE: Dust measurements, when necessary, shall be made by impinger sampling and light-field counting technique.

**§ 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.