(c) When a pressure exceeding 125 pounds per square inch (gage) is developed during explosion tests, MSHA reserves the right to reject an enclosure(s) unless (1) constructional changes are made that result in a reduction of pressure to 125 pounds per square inch (gage) or less, or (2) the enclosure withstands a dynamic pressure of twice the highest value recorded in the initial test.

[33 FR 4660, Mar. 19, 1968, as amended at 57 FR 61210, Dec. 23, 1992]

§ 18.63 [Reserved]

§ 18.65 Flame test of hose.

(a) *Size of test specimen.* (1) [Reserved]

(2) Hose—four specimens each 6 inches long by ½-inch wide by thickness of the hose.

(b) *Flame-test apparatus.* The principal parts of the apparatus within and/or appended to a 21-inch cubical test gallery are:

(1) A support stand with a ring clamp and wire gauze.

(2) A Pittsburgh-Universal Bunsen-type burner (inside diameter of burner tube 11 mm.), or equivalent, mounted in a burner placement guide in such a manner that the burner may be placed beneath the test specimen, or pulled away from it by an external knob on the front panel of the test gallery.

(3) A variable-speed electric fan and an ASME flow nozzle (16–8½ inches reduction) to attain constant air velocities at any speed between 50–500 feet a minute.

(4) An electric timer or stopwatch to measure the duration of the tests.

(5) A mirror mounted inside the test gallery to permit a rear view of the test specimen through the viewing door.

(c) *Mounting of test specimen.* The specimen shall be clamped in a support with its free end centered 1 inch above the burner top. The longitudinal axis shall be horizontal and the transverse axis inclined at 45° to the horizontal. Under the test specimen shall be clamped a piece of 20-mesh iron-wire gauze, 5 inches square, in a horizontal position ¼–inch below the pulley cover edge of the specimen and with about ½–inch of the specimen extending beyond the edge of the gauze.

(d) *Procedure for flame tests.* (1) The Bunsen burner, retracted from the test position, shall be adjusted to give a blue flame 3 inches in height with natural gas.

(2) The observation door of the gallery shall be closed for the entire test.

(3) The burner flame shall be applied to the free end of the specimen for 1 minute in still air.

(4) At the end of 1 minute the burner flame shall be removed, the ventilating fan turned on to give an air current having a velocity of 300 feet per minute, and the duration of flame measured.

(5) After the test specimen ceases to flame, it shall remain in the air current for at least 3 minutes to determine the presence and duration of afterglow. If a glowing specimen exhibits flame within 3 minutes the duration of flame shall be added to the duration of flame obtained according to paragraph (d) (4) of this section.

(e) *Test requirements.* The tests of the four specimens cut from any sample shall not result in either duration of flame exceeding an average of 1 minute after removal of the applied flame or afterglow exceeding an average of 3 minutes duration.

(f) *Acceptance markings.* (1) [Reserved]

(2) Hose—hose conduit accepted by MSHA as flame-resistant shall be marked as follows: Impressed letters, raised letters on depressed background, or printed letters with the words ''Flame-Resistant, USMSHA No. ____'' at intervals not exceeding 3 feet. This number will be assigned to the manufacturer after the sample has passed the tests. The letters and numbers shall be at least ¼-inch high.

[33 FR 4660, Mar. 19, 1968, as amended at 43 FR 12314, Mar. 24, 1978; 73 FR 80612, Dec. 31, 2008]

§ 18.66 Tests of windows and lenses.

(a) *Impact tests.* A 4-pound cylindrical weight with a 1-inch-diameter hemispherical striking surface shall be dropped (free fall) to strike the window or lens in its mounting, or the equivalent thereof, at or near the center. Three of four samples shall withstand without breakage the impact according to the following table:

Lens diameter, (D), inches	Height of fall, inches
D<4	6
4≤ D<5	9
5≤ D<6	15
6≤ D	24

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

(b) *Thermal-shock tests.* Four samples of the window or lens will be heated in an oven for 15 minutes to a temperature of 150 °C. (302 °F.) and immediately upon withdrawal of the samples from the oven they will be immersed in water having a temperature between 15 °C. (59 °F) and 20 °C. (68 °F.). Three of the four samples shall show no defect or breakage from this thermal-shock test.

§ 18.67 Static-pressure tests.

Static-pressure tests shall be conducted by the applicant on each enclosure of a specific design when MSHA determines that visual inspection will not reveal defects in castings or in single-seam welds. Such test procedure shall be submitted to MSHA for approval and the specifications on file with MSHA shall include a statement assuring that such tests will be conducted. The static pressure to be applied shall be 150 pounds per square inch (gage) or one and one-half times the maximum pressure recorded in MSHA's explosion tests, whichever is greater.

§ 18.68 Tests for intrinsic safety.

(a) General:

(1) Tests for intrinsic safety will be conducted under the general concepts of ''intrinsically safe'' as defined in Subpart A of this part. Further tests or requirements may be added at any time if features of construction or use or both indicate them to be necessary. Some tests included in these requirements may be omitted on the basis of previous experience.

(2) Intrinsically safe circuits and/or components will be subjected to tests consisting of making and breaking the intrinsically safe circuit under conditions judged to simulate the most hazardous probable faults or malfunctions. Tests will be made in the most easily ignitable mixture of methane or natural gas and air. The method of making and breaking the circuit may be varied to meet a particular condition.

(3) Those components which affect intrinsic safety must meet the following requirements:

(i) Current limiting components shall consist of two equivalent devices each of which singly will provide intrinsic safety. They shall not be operated at more than 50 percent of their ratings.

(ii) Components of reliable construction shall be used and they shall be so mounted as to provide protection against shock and vibration in normal use.

(iii) Semiconductors shall be amply sized. Rectifiers and transistors shall be operated at not more than two-thirds of their rated current and permissible peak inverse voltage. Zener diodes shall be operated at not more than one-half of their rated current and shall short under abnormal conditions.

(iv) Electrolytic capacitors shall be operated at not more than two-thirds of their rated voltage. They shall be designed to withstand a test voltage of 1,500 volts.

(4) Intrinsically safe circuits shall be so designed that after failure of a single component, and subsequent failures resulting from this first failure, the circuit will remain intrinsically safe.

(5) The circuit will be considered as intrinsically safe if in the course of testing no ignitions occur.

(b) Complete intrinsically safe equipment powered by low energy batteries:

(1) Short-circuit tests shall be conducted on batteries at normal operating temperature. Tests may be made on batteries at elevated temperature if such tests are deemed necessary.

(2) Resistance devices for limiting short-circuit current shall be an integral part of the battery, or installed as close to the battery terminal as practicable.

(3) Transistors of battery-operated equipment may be subjected to thermal ''run-away'' tests to determine that they will not ignite an explosive atmosphere.

(4) A minimum of 1,000 make-break sparks will be produced in each test for