

## § 15.20

(1) Fails to meet the applicable technical requirements; or

(2) Creates a hazard when used in a mine.

(b) Prior to revoking an approval, the approval-holder shall be informed in writing of MSHA's intention to revoke. The notice shall—

(1) Explain the specific reasons for the proposed revocation; and

(2) Provide the approval-holder an opportunity to demonstrate or achieve compliance with the product approval requirements.

(c) Upon request, the approval-holder shall be afforded an opportunity for a hearing.

(d) If an explosive or sheathed explosive unit poses an imminent hazard to the safety or health of miners, the approval may be immediately suspended without a written notice of the agency's intention to revoke. The suspension may continue until the revocation proceedings are completed.

### Subpart B—Requirements for Approval of Explosives

#### § 15.20 Technical requirements.

(a) *Chemical composition.* The chemical composition of the explosive shall be within the tolerances furnished by the applicant.

(b) *Rate-of-detonation test.* The explosive shall propagate completely in the rate-of-detonation test. The test is conducted at an ambient temperature between 68 and 86 °F. Nongelatinous explosives are initiated with a test detonator only, while gelatinous explosives are initiated with a test detonator and a 60-gram tetryl pellet booster. The test is conducted on—

(1) A 50-inch column of 1¼ inch diameter cartridges; and

(2) A 50-inch column of the smallest diameter cartridges less than 1¼ inches submitted for testing.

(c) *Air-gap sensitivity.* The air-gap sensitivity of the explosive shall be at least 2 inches at the minimum product firing temperature and 3 inches at a temperature between 68 and 86 °F, and the explosive shall propagate completely.

(1) Air-gap sensitivity of the explosive is determined in the explosion-by-influence test using the 7-inch car-

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tridge method. The air-gap sensitivity is determined for 1¼ inch diameter cartridges and each cartridge diameter smaller than 1¼ inches. Explosives are initiated with a test detonator.

(2) The 7-inch cartridge method is conducted with two 8-inch cartridges. One inch is cut off the end of each cartridge. The cartridges are placed in a paper tube, the cut ends facing each other, with the appropriate 2-inch or 3-inch air gap between them. The test is conducted at a temperature between 68 and 86 °F and at the minimum product firing temperature proposed by the applicant, or 41 °F, whichever is lower. The test temperature at which the explosive propagates completely will be specified in the approval as the minimum product firing temperature at which the explosive is approved for use.

(d) *Gallery Test 7.* The explosive shall yield a value of at least 450 grams for the lower 95 percent confidence limit ( $L_{95}$ ) on the weight for 50 percent probability of ignition ( $W_{50}$ ) in gallery test 7 and shall propagate completely. The  $L_{95}$  and  $W_{50}$  values for the explosive are determined by using the Bruceton up-and-down method. A minimum of 20 trials are made with explosive charges of varying weights, including wrapper and seals. Each charge is primed with a test detonator, then tamped and stemmed with one pound of dry-milled fire clay into the borehole of a steel cannon. The cannon is fired into air containing 7.7 to 8.3 percent of natural gas. The air temperature is between 68 and 86 °F.

(e) *Gallery Test 8.* The explosive shall yield a value of at least 350 grams for the weight for 50 percent probability of ignition ( $W_{CDG}$ ) in gallery test 8 and shall propagate completely. The ( $W_{CDG}$ ) value for the explosive is determined using the Bruceton up-and-down method. A minimum of 10 tests are made with explosive charges of varying weights, including wrapper and seals. Each charge is primed with a test detonator, then tamped into the borehole of a steel cannon. The cannon is fired into a mixture of 8 pounds of bituminous coal dust predispersed into 640 cubic feet of air containing 3.8 to 4.2 percent of natural gas. The air temperature is between 68 and 86 °F.

(f) *Pendulum-friction test.* The explosive shall show no perceptible reaction in the pendulum-friction test with the hard fiber-faced shoe. Ten trials of the test are conducted by releasing the steel shoe from a height of 59 inches. If there is evidence of sensitivity, the test is repeated with the hard fiber-faced shoe.

(g) *Toxic gases.* The total volume equivalent to carbon monoxide (CO) of toxic gases produced by detonation of the explosive shall not exceed 2.5 cubic feet per pound of explosive as determined in the large chamber test. The explosive shall propagate completely.

(1) The large chamber test is conducted with a one-pound explosive charge, including wrapper and seal, primed with a test detonator. The explosive charge is loaded into the borehole of a steel cannon, then tamped and stemmed with one pound of dry-milled fire clay. The cannon is fired into the large chamber and the gaseous products resulting from detonation of the explosive are collected and analyzed for toxic gases. At least two trials are conducted.

(2) The equivalent volume of each toxic gas produced, relative to CO, is determined by multiplying the measured volume of the gas by a conversion factor. The conversion factor is equal to the threshold limit value, time weighted average (TLV-TWA) in parts-per-million for CO divided by the TLV-TWA for the toxic gas. The TLV-TWA conversion factor for each gas for which MSHA shall test is specified in Table I of this subpart. The total volume equivalent to CO of the toxic gases produced by detonation of the explosive is the sum of the equivalent volumes of the individual toxic gases.

TABLE I—CONVERSION FACTORS FOR TOXIC GASES  
[For Equivalent Volume Relative to Carbon Monoxide]

	Toxic Gas	
	Conversion Factor	TLV-TWA (PPM)
Ammonia .....	2	25
Carbon Dioxide .....	0.01	5000
Carbon Monoxide .....	1	50
Hydrogen Sulfide .....	5	10
Nitric Oxide .....	2	25
Nitrogen Dioxide .....	17	3
Sulfur Dioxide .....	25	2

(h) *Cartridge diameter and length changes.* (1) For proposed changes to an approved explosive involving only cartridge diameter or length, MSHA will determine what tests, if any, will be required.

(2) When a proposed change to an approved explosive involves a smaller diameter than that specified in the approval, the rate-of-detonation and air-gap sensitivity tests will be conducted.

(3) No test will be conducted on cartridges with diameters the same as or smaller than those that previously failed to detonate in the rate-of-detonation test.

(i) *New technology.* MSHA may approve an explosive that incorporates technology for which the requirements of this subpart are not applicable if MSHA determines that the explosive is as safe as those which meet the requirements of this subpart.

§ 15.21 Tolerances for ingredients.

Tolerances for each ingredient in an explosive, which are expressed as a percentage of the total explosive, shall not exceed the following:

- (a) Physical sensitizers: The tolerances established by the applicant;
- (b) Aluminum: ±0.7 percent;
- (c) Carbonaceous materials: ±3 percent; and
- (d) Moisture and ingredients other than specified in paragraphs (a), (b), and (c) of this section: The tolerances specified in Table II.

TABLE II—TOLERANCES FOR MOISTURE AND OTHER INGREDIENTS

Quantity of ingredients (as percent of total explosive or sheath)	Tolerance percent
0 to 5.0 .....	1.2
5.1 to 10.0 .....	1.5
10.1 to 20.0 .....	1.7
20.1 to 30.0 .....	2.0
30.1 to 40.0 .....	2.3
40.1 to 50.0 .....	2.5
50.1 to 55.0 .....	2.8
55.1 to 100.0 .....	3.0

§ 15.22 Tolerances for performance, wrapper, and specific gravity.

(a) The rate of detonation of the explosive shall be within ±15 percent of that specified in the approval.

(b) The weight of wrapper per 100 grams of explosive shall be within ±2 grams of that specified in the approval.