(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.