

## § 7.49

(3) After 7 days, record the condition of the samples.

(b) *Acceptable performance.* At the end of the test, the insulation shall not exhibit any blistering, discoloration, cracking, swelling, tackiness, rubberiness, or loss of bond.

[53 FR 23500, June 22, 1988, as amended at 60 FR 33723, June 29, 1995]

### § 7.49 Approval marking.

Each approved battery assembly shall be identified by a legible and permanent approval plate inscribed with the assigned MSHA approval number and securely attached to the battery box.

### § 7.50 Post-approval product audit.

Upon request by MSHA, but no more than once a year except for cause, the approval-holder shall make an approved battery assembly available for audit at no cost to MSHA.

### § 7.51 Approval checklist.

Each battery assembly bearing an MSHA approval plate shall be accompanied by a description of what is necessary to maintain the battery assembly as approved.

[53 FR 23500, June 22, 1988, as amended at 60 FR 33723, June 29, 1995]

### § 7.52 New technology.

MSHA may approve a battery assembly that incorporates technology for which the requirements of this subpart are not applicable, if the Agency determines that the battery assembly is as safe as those which meet the requirements of this subpart.

## Subpart D—Multiple-Shot Blasting Units

SOURCE: 54 FR 48210, Nov. 21, 1989, unless otherwise noted.

### § 7.61 Purpose and effective date.

This subpart establishes the specific requirements for MSHA approval of multiple-shot blasting units. It is effective January 22, 1990. Applications for approval or extensions of approval submitted after January 22, 1991 shall meet the requirements of this subpart.

## 30 CFR Ch. I (7–1–14 Edition)

### § 7.62 Definitions.

The following definitions apply in this subpart:

*Blasting circuit.* A circuit that includes one or more electric detonators connected in a single series and the firing cable used to connect the detonators to the blasting unit.

*Blasting unit.* An electric device used to initiate electric detonators.

*Normal operation.* Operation of the unit according to the manufacturer's instructions with fully-charged batteries, with electric components at any value within their specified tolerances, and with adjustable electric components set to any value within their range.

### § 7.63 Application requirements.

(a) Each application for approval of a blasting unit shall include the following:

(1) An overall assembly drawing showing the physical construction of the blasting unit.

(2) A schematic diagram of the electric circuit.

(3) A parts list specifying each electric component and its electrical ratings, including tolerances.

(4) A layout drawing showing the location of each component and wiring.

(5) The model number or other manufacturer's designation of the blasting unit.

(b) All drawings shall be titled, numbered, dated, and include the latest revision number. The drawings may be combined into one or more composite drawings.

(c) The application shall contain a list of all the drawings submitted, including drawing titles, numbers, and revisions.

(d) A detailed technical description of the operation and use of the blasting unit shall be submitted with the application.

[54 FR 48210, Nov. 21, 1989, as amended at 60 FR 33723, June 29, 1995]

### § 7.64 Technical requirements.

(a) *Energy output.* Blasting units shall meet the acceptable performance criteria of the output energy test in § 7.66.

(b) *Maximum blasting circuit resistance.* The maximum value of the resistance

of the blasting circuit that can be connected to the firing line terminals of the blasting unit, without exceeding its capacity, shall be specified by the applicant. The specified maximum blasting circuit resistance shall be at least 150 ohms.

(c) *Visual indicator.* The blasting unit shall provide a visual indication to the user prior to the operation of the firing switch when the voltage necessary to produce the required firing current is attained.

(d) *Firing switch.* The switch used to initiate the application of energy to the blasting circuit shall—

(1) Require deliberate action for its operation to prevent accidental firing; and

(2) Operate only when the voltage necessary to produce the required firing current is available to the blasting circuit.

(e) *Firing line terminals.* The terminals used to connect the blasting circuit to the blasting unit shall—

(1) Provide a secure, low-resistance connection to the blasting circuit as demonstrated by the firing line terminals test in § 7.68;

(2) Be corrosion-resistant;

(3) Be insulated to protect the user from electrical shock; and

(4) Be separated from each other by an insulated barrier.

(f) *Ratings of electric components.* No electric component of the blasting unit, other than batteries, shall be operated at more than 90 percent of any of its electrical ratings in the normal operation of the blasting unit.

(g) *Non-incendive electric contacts.* In the normal operation of a blasting unit, the electric energy discharged by making and breaking electric contacts shall not be capable of igniting a methane-air atmosphere, as determined by the following:

(1) The electric current through an electric contact shall not be greater than that determined from Figure D-1.

(2) The maximum voltage that can be applied across an electric contact that discharges a capacitor shall not be greater than that determined from Figure D-2.

(3) The electric current through an electric contact that interrupts a circuit containing inductive components shall not be greater than that determined from Figure D-3. Inductive components include inductors, chokes, relay coils, motors, transformers, and similar electric components that have an inductance greater than 100 microhenries. No inductive component in a circuit with making and breaking electric contacts shall have an inductance value greater than 100 millihenries.

FIGURE D-1

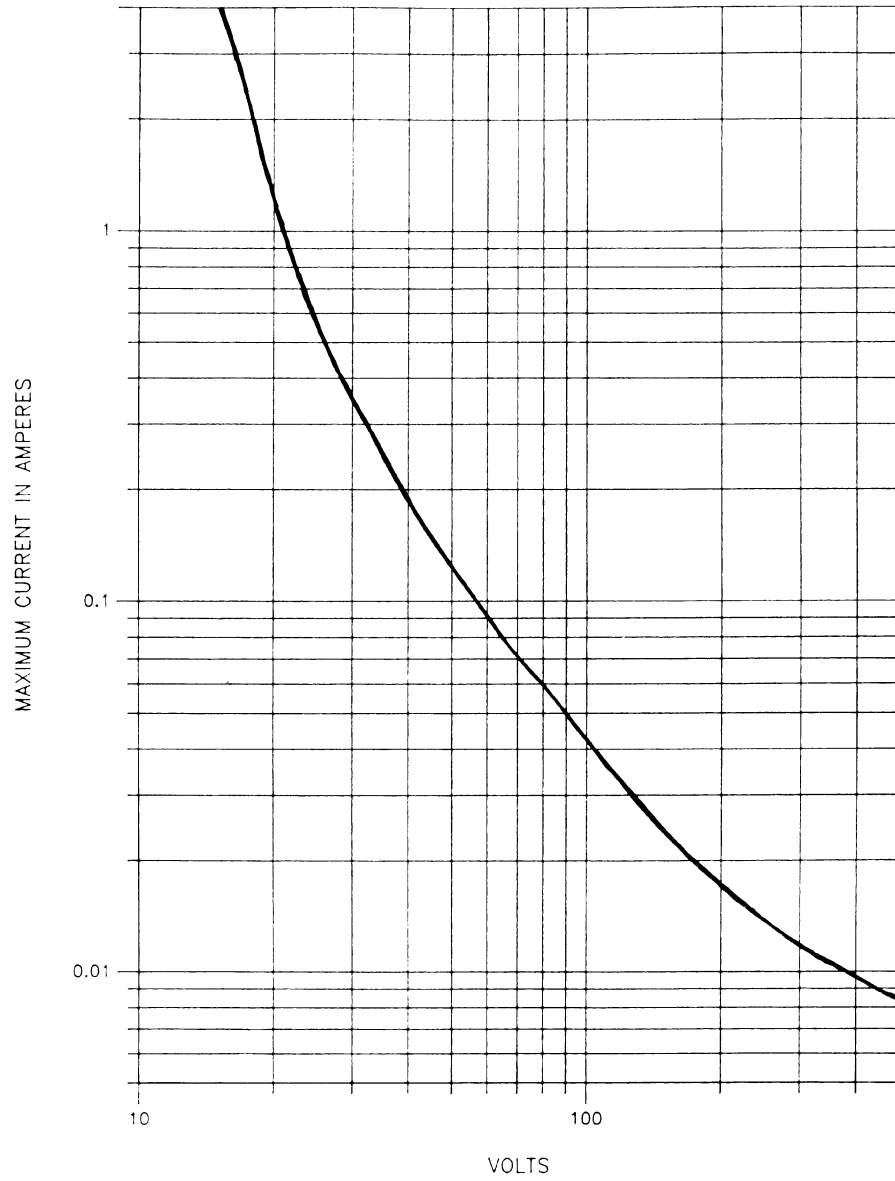


FIGURE D-2

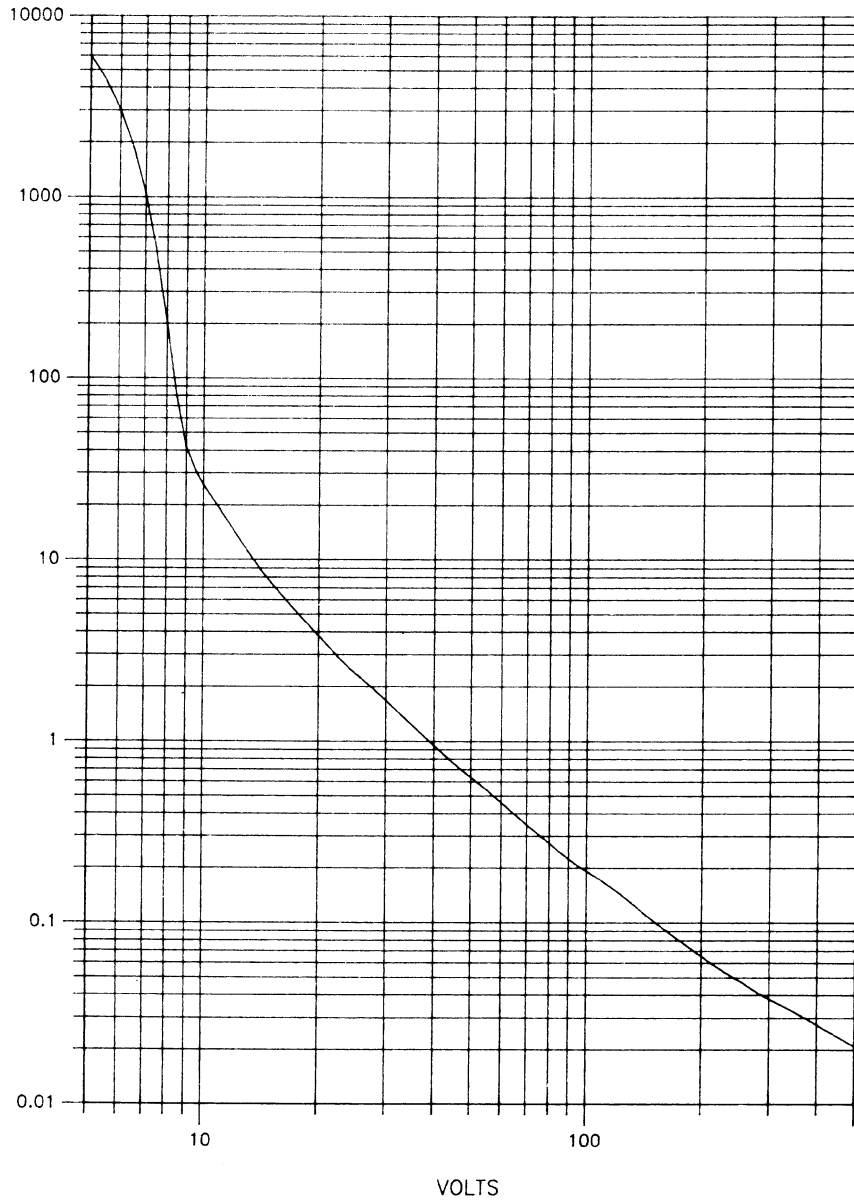
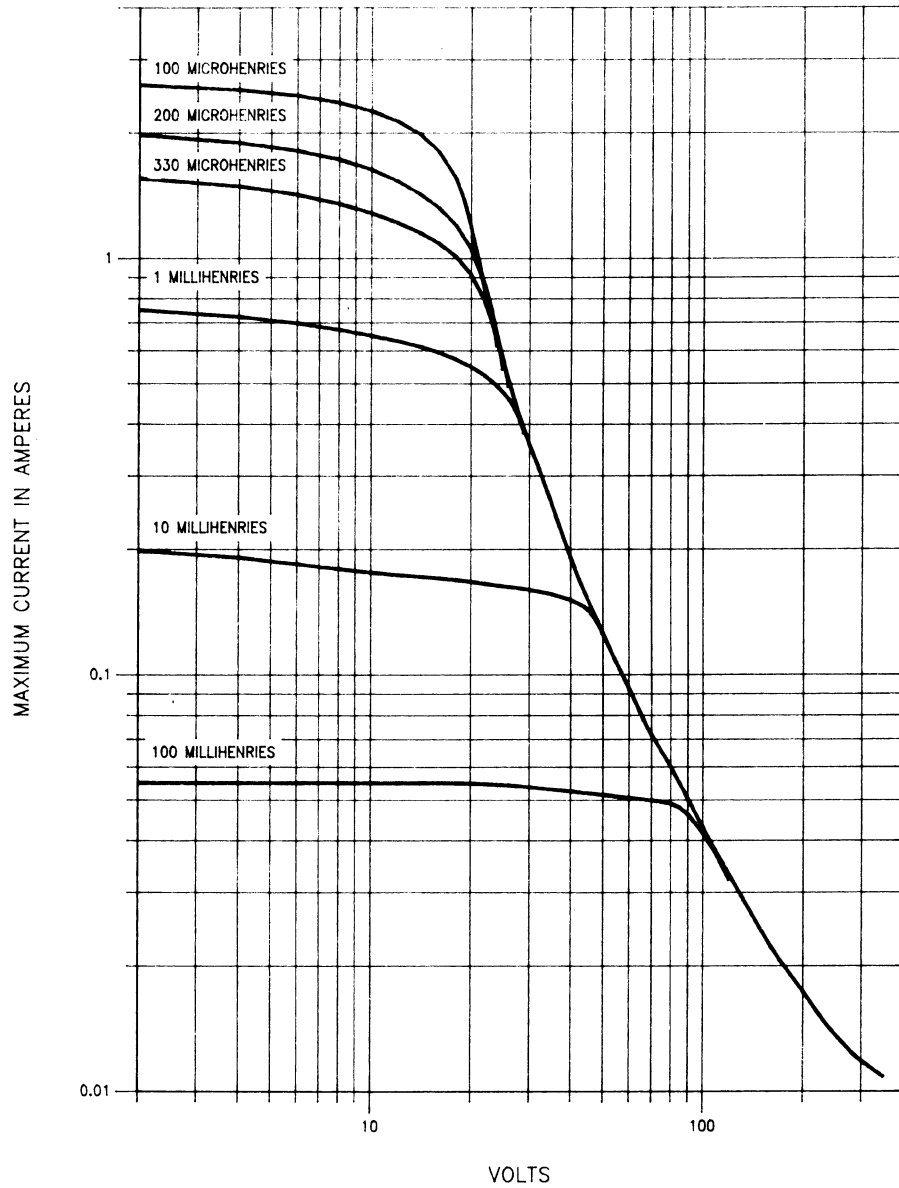


FIGURE D-3



(h) *Maximum temperature.* In the normal operation of the blasting unit, the maximum temperature of any electric

component shall not exceed 302 °F (150 °C).

(i) *Capacitor discharge.* The blasting unit shall include an automatic means

to dissipate any electric charge remaining in any capacitor after the blasting unit is deenergized and not in use.

(j) *Construction.* Blasting units shall meet the acceptable performance criteria of the construction test of §7.67.

(k) *Locking device.* The blasting unit shall be equipped with a locking device to prevent unauthorized use.

(l) *Enclosure.* The blasting unit enclosure shall be protected against tampering by—

(1) Sealing the enclosure, except the battery compartment, using continuous welding, brazing, soldering, or equivalent methods; or

(2) Sealing the electric components, other than batteries, in a solidified insulating material and assembling the enclosure with tamper-resistant hardware.

(m) *Battery charging.* Blasting units that contain rechargeable batteries shall have the following:

(1) A blocking diode, or equivalent device, in series with the battery to prevent electric energy in the battery from being available at the charging connector.

(2) The charging connector recessed into the enclosure.

**§7.65 Critical characteristics.**

The following critical characteristics shall be inspected or tested on each blasting unit to which an approval marking is affixed:

- (a) The output current.
- (b) The voltage cut-off time.
- (c) The components that control voltage and current through each making and breaking electric contact.
- (d) Operation of the visual indicator and the firing switch.

**§7.66 Output energy test.**

(a) *Test procedures.* The blasting unit shall be tested by firing into each of the following resistive loads, within a tolerance of ±1%:

- (1) The maximum blasting circuit resistance.
- (2) Any resistive load between 3 ohms and the maximum blasting circuit resistance.
- (3) One ohm.
- (b) *Acceptable performance.* (1) The voltage shall be zero at the firing line

terminals 10 milliseconds after operation of the firing switch.

(2) The electric current from the blasting unit shall be:

- (i) Less than 50 milliamperes except during firing of the blasting unit.
- (ii) Available only through the firing line terminals.
- (iii) At least an average of 2 amperes during the first 5 milliseconds following operation of the firing switch.
- (iv) Not exceed an average of 100 amperes during the first 10 milliseconds following operation of the firing switch.

**§7.67 Construction test.**

The construction test is to be performed on the blasting unit subsequent to the output energy test of §7.66.

(a) *Test procedures.* (1) The blasting unit shall be dropped 20 times from a height of 3 feet onto a horizontal concrete floor. When dropped, the orientation of the blasting unit shall be varied each time in an attempt to have a different surface, corner, or edge strike the floor first for each drop.

(2) After the blasting unit has been drop tested in accordance with paragraph (a)(1) above, it shall be submerged in 1 foot of water for 1 hour in each of 3 tests. The water temperature shall be maintained within ±5 °F (±2.8 °C) of 40 °F (4.4 °C), 70 °F (21.1 °C) and 100 °F (37.8 °C) during the tests.

(3) Immediately after removing the blasting unit from the water at each temperature, the unit shall be operated first with the firing line terminals open circuited, then operated again with the firing line terminals short circuited, and last, the output energy tested in accordance with the output energy test of §7.66.

- (b) *Acceptable performance.* (1) The blasting unit shall meet the acceptable performance criteria of the output energy test in §7.66 each time it is performed.
- (2) There shall be no damage to the firing line terminals that exposes an electric conductor.
- (3) The visual indicator shall be operational.
- (4) The batteries shall not be separated from the blasting unit.