

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.

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(5) There shall be no water inside the blasting unit enclosure, except for the battery compartment.

### § 7.68 Firing line terminals test.

(a) *Test procedures.* (1) The contact resistance through each firing line terminal shall be determined.

(2) A 10-pound pull shall be applied to a No. 18 gauge wire that has been connected to each firing line terminal according to the manufacturer's instructions.

(b) *Acceptable performance.* (1) The contact resistance shall not be greater than 1 ohm.

(2) The No. 18 gauge wire shall not become disconnected from either firing line terminal.

### § 7.69 Approval marking.

Each approved blasting unit shall be identified as permissible by a legible and permanent marking securely attached, stamped, or molded to the outside of the unit. This marking shall include the following:

(a) The assigned MSHA approval number.

(b) The maximum blasting circuit resistance.

(c) A warning that the unit's components must not be disassembled or removed.

(d) The replacement battery types if the unit has replaceable batteries.

(e) A warning placed next to the charging connector that the battery only be charged in a fresh air location if rechargeable batteries are used.

(f) A warning that the unit is compatible only with detonators that will—

(1) Fire when an average of 1.5 amperes is applied for 5 milliseconds;

(2) Not misfire when up to an average 100 amperes is applied for 10 milliseconds; and

(3) Not fire when a current of 250 milliamperes or less is applied.

### § 7.70 Post-approval product audit.

Upon request by MSHA, but not more than once a year except for cause, the approval holder shall make an approved blasting unit available for audit at no cost to MSHA.

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### § 7.71 Approval checklist.

Each blasting unit bearing an MSHA approval marking shall be accompanied by a description of what is necessary to maintain the blasting unit as approved.

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

### § 7.72 New technology.

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

## Subpart E—Diesel Engines Intended for Use in Underground Coal Mines

SOURCE: 61 FR 55504, Oct. 25, 1996, unless otherwise noted.

### § 7.81 Purpose and effective date.

Subpart A general provisions of this part apply to this subpart E. Subpart E establishes the specific engine performance and exhaust emission requirements for MSHA approval of diesel engines for use in areas of underground coal mines where permissible electric equipment is required and areas where non-permissible electric equipment is allowed. It is effective November 25, 1996.

### § 7.82 Definitions.

In addition to subpart A definitions of this part, the following definitions apply in this subpart.

*Brake Power.* The observed power measured at the crankshaft or its equivalent when the engine is equipped only with standard auxiliaries necessary for its operation on the test bed.

*Category A engines.* Diesel engines intended for use in areas of underground coal mines where permissible electric equipment is required.

*Category B engines.* Diesel engines intended for use in areas of underground coal mines where nonpermissible electric equipment is allowed.