

**(l) Insulation of power wires; exceptions**

Power wires and cables, except trolley wires, trolley feeder wires, and bare signal wires, shall be insulated adequately and fully protected.

**(m) Circuit breakers; overload protection for three-phase motors**

Automatic circuit-breaking devices or fuses of the correct type and capacity shall be installed so as to protect all electric equipment and circuits against short circuit and overloads. Three-phase motors on all electric equipment shall be provided with overload protection that will de-energize all three phases in the event that any phase is overloaded.

**(n) Disconnecting switches for main power circuits; location and installation**

In all main power circuits, disconnecting switches shall be installed underground within five hundred feet of the bottoms of shafts and boreholes through which main power circuits enter the underground area of the mine and within five hundred feet of all other places where main power circuits enter the underground area of the mine.

**(o) Switches**

All electric equipment shall be provided with switches or other controls that are safely designed, constructed, and installed.

**(p) Lightning arresters**

Each ungrounded, exposed power conductor that leads underground shall be equipped with suitable lightning arresters of approved type within one hundred feet of the point where the circuit enters the mine. Lightning arresters shall be connected to a low resistance grounding medium on the surface which shall be separated from neutral grounds by a distance of not less than twenty-five feet.

**(q) Nonapproved devices**

No device for the purpose of lighting any coal mine which has not been approved by the Secretary or his authorized representative shall be permitted in such mine.

**(r) Deenergizing of electric face equipment**

An authorized representative of the Secretary may require in any mine that electric face equipment be provided with devices that will permit the equipment to be deenergized quickly in the event of an emergency.

(Pub. L. 91-173, title III, §305, Dec. 30, 1969, 83 Stat. 775.)

## REFERENCES IN TEXT

For the operative date of this subchapter, referred to in subsecs. (a)(1), (2), (4) to (6), (10)(B), (C), (11), (12), and (c), see section 509 of Pub. L. 91-173, set out as an Effective Date note under section 801 of this title.

**§ 866. Trailing cables****(a) Requirements established for flame resistant cables**

Trailing cables used in coal mines shall meet the requirements established by the Secretary for flame-resistant cables.

**(b) Circuit breakers; markings and visual observation of position of disconnection devices**

Short-circuit protection for trailing cables shall be provided by an automatic circuit break-

er or other no less effective device approved by the Secretary of adequate current-interrupting capacity in each ungrounded conductor. Disconnecting devices used to disconnect power from trailing cables shall be plainly marked and identified and such devices shall be equipped or designed in such a manner that it can be determined by visual observation that the power is disconnected.

**(c) Distribution center junctions; safety connections**

When two or more trailing cables junction to the same distribution center, means shall be provided to assure against connecting a trailing cable to the wrong size circuit breaker.

**(d) Temporary splices; usable period; exceptions; quality**

One temporary splice may be made in any trailing cable. Such trailing cable may only be used for the next twenty-four hour period. No temporary splice shall be made in a trailing cable within twenty-five feet of the machine, except cable reel equipment. Temporary splices in trailing cables shall be made in a workmanlike manner and shall be mechanically strong and well insulated. Trailing cables or hand cables which have exposed wires or which have splices that heat or spark under load shall not be used. As used in this subsection, the term "splice" means the mechanical joining of one or more conductors that have been severed.

**(e) Permanent splices; quality**

When permanent splices in trailing cables are made, they shall be—

- (1) mechanically strong with adequate electrical conductivity and flexibility;
- (2) effectively insulated and sealed so as to exclude moisture; and
- (3) vulcanized or otherwise treated with suitable materials to provide flame-resistant qualities and good bonding to the outer jacket.

**(f) Clamping of cables**

Trailing cables shall be clamped to machines in a manner to protect the cables from damage and to prevent strain on the electrical connections. Trailing cables shall be adequately protected to prevent damage by mobile equipment.

**(g) Making and breaking of connections to junction boxes**

Trailing cable and power cable connections to junction boxes shall not be made or broken under load.

(Pub. L. 91-173, title III, §306, Dec. 30, 1969, 83 Stat. 779.)

**§ 867. Grounding of equipment****(a) Metallic enclosed power conductors; metallic frames and other equipment; methods**

All metallic sheaths, armors, and conduits enclosing power conductors shall be electrically continuous throughout and shall be grounded by methods approved by an authorized representative of the Secretary. Metallic frames, casings, and other enclosures of electric equipment that can become "alive" through failure of insulation or by contact with energized parts shall be

grounded by methods approved by an authorized representative of the Secretary. Methods other than grounding which provide no less effective protection may be permitted by the Secretary or his authorized representative.

**(b) Frames of offtrack direct current machines; enclosures of related detached components**

The frames of all offtrack direct current machines and the enclosures of related detached components shall be effectively grounded, or otherwise maintained at no less safe voltages, by methods approved by an authorized representative of the Secretary.

**(c) Stationary high-voltage equipment powered by underground delta systems**

The frames of all stationary high-voltage equipment receiving power from ungrounded delta systems shall be grounded by methods approved by an authorized representative of the Secretary.

**(d) Repairs of high-voltage lines; exceptions**

High-voltage lines, both on the surface and underground, shall be deenergized and grounded before work is performed on them, except that repairs may be permitted, in the case of energized surface high-voltage lines, if such repairs are made by a qualified person in accordance with procedures and safeguards, including, but not limited to a requirement that the operator of such mine provide, test, and maintain protective devices in making such repairs, to be prescribed by the Secretary prior to the operative date of this subchapter.

**(e) Deenergizing of underground power circuits on idle days; exceptions**

When not in use, power circuits underground shall be deenergized on idle days and idle shifts, except that rectifiers and transformers may remain energized.

(Pub. L. 91-173, title III, §307, Dec. 30, 1969, 83 Stat. 780.)

REFERENCES IN TEXT

For the operative date of this subchapter, referred to in subsec. (d), see section 509 of Pub. L. 91-173, set out as an Effective Date note under section 801 of this title.

**§ 868. Underground high-voltage distribution**

**(a) Circuits entering underground areas of mines; circuit breakers**

High-voltage circuits entering the underground area of any coal mine shall be protected by suitable circuit breakers of adequate interrupting capacity which are properly tested and maintained as prescribed by the Secretary. Such breakers shall be equipped with devices to provide protection against under-voltage, grounded phase, short circuit, and overcurrent.

**(b) Circuits extending underground and supplying equipment; direct neutral grounds; ground conductors for frames, exceptions; location of disconnection devices, exceptions**

High-voltage circuits extending underground and supplying portable, mobile, or stationary high-voltage equipment shall contain either a direct or derived neutral which shall be grounded through a suitable resistor at the source

transformers, and a grounding circuit, originating at the grounded side of the grounding resistor, shall extend along with the power conductors and serve as a grounding conductor for the frames of all high-voltage equipment supplied power from that circuit, except that the Secretary or his authorized representative may permit ungrounded high-voltage circuits to be extended underground to feed stationary electrical equipment if such circuits are either armored or installed in grounded, rigid steel conduit throughout their entire length, and upon his finding that such exception does not pose a hazard to the miners. Within one hundred feet of the point on the surface where high-voltage circuits enter the underground portion of the mine, disconnecting devices shall be installed and so equipped or designed in such a manner that it can be determined by visual observation that the power is disconnected, except that the Secretary or his authorized representative may permit such devices to be installed at a greater distance from such area of the mine if he determines, based on existing physical conditions, that such installation will be more accessible at a greater distance and will not pose any hazard to the miners.

**(c) Grounding resistors**

The grounding resistor, where required, shall be of the proper ohmic value to limit the voltage drop in the grounding circuit external to the resistor to not more than 100 volts under fault conditions. The grounding resistor shall be rated for maximum fault current continuously and insulated from ground for a voltage equal to the phase-to-phase voltage of the system.

**(d) Inclusion of fail safe ground check circuits in resistance grounded systems; operative functions; time extension**

Six months after the operative date of this subchapter, high-voltage, resistance grounded systems shall include a fail safe ground check circuit to monitor continuously the grounding circuit to assure continuity and the fail safe ground check circuit shall cause the circuit breaker to open when either the ground or pilot check wire is broken, or other no less effective device approved by the Secretary or his authorized representative to assure such continuity, except that an extension of time, not in excess of twelve months, may be permitted by the Secretary on a mine-by-mine basis if he determines that such equipment is not available.

**(e) Underground cables used in resistance grounded systems; metallic shields for power conductors; standards; splices**

(1) Underground high-voltage cables used in resistance grounded systems shall be equipped with metallic shields around each power conductor, with one or more ground conductors having a total cross-sectional area of not less than one-half the power conductor, and with an insulated internal or external conductor not smaller than No. 8 (AWG) for the ground continuity check circuit.

(2) All such cables shall be adequate for the intended current and voltage. Splices made in such cables shall provide continuity of all components.