Sec. 75.500 Permissible electric equipment.

[Statutory Provision]

On and after March 30, 1971:
(a) All junction or distribution boxes used for making multiple power connections inby the last open crosscut shall be permissible;

(b) All handheld electric drills, blower and exhaust fans, electric pumps, and such other low horsepower electric face equipment as the Secretary may designate on or before May 30, 1970, which are taken into or used inby the last open crosscut of any coal mine shall bepermissible;
(c) All electric face equipment which is taken into or used inby the last open crosscut of any coal mine classified under any provision of law as gassy prior to March 30, 1970, shall be permissible; and
(d) All other electric face equipment which is taken into or used inby the last crosscut of any coal mine, except a coal mine referred to in Sec. 75.501, which has not been classified under any provision of law as a gassy mine prior to March 30, 1970, shall be permissible.

Sec. 75.500-1 Other low horsepower electric face equipment.

Other low horsepower electric face equipment designated pursuant to the provisions of Sec. 75.500(b) is all other electric-driven mine equipment, except low horsepower rock dusting equipment, and employs an electric current supplied by either a power conductor or battery and consumes not more than 2,250 watts of electricity and which is taken into or used inby the last open crosscut.

Sec. 75.501 Permissible electric face equipment; coal seams above water table.

[Statutory Provision]

On and after March 30, 1974, all electric face equipment, other than equipment referred to in paragraph (b) of Sec. 75.500, which is taken into and used inby the last open crosscut of any coal mine which is operated entirely in coal

seams located above the water table and which has not been classified under any provision of law as a gassy mine prior to March 30, 1970, and in which one or more openings were made prior to December 30, 1969, shall be permissible.

Sec. 75.501-1 Coal seams above the water table.

As used in Sec. 75.501, the phrase ``coal seams above the water

table" means coal seams in a mine which are located at an elevation above a river or the tributary of a river into which a local surface water system naturally drains.

Sec. 75.501-2 Permissible electric face equipment.

(a) On and after March 30, 1971, in mines operated entirely in coal seams which are located at elevations above the water table:

(1) All junction or distribution boxes used for making multiple power connections inby the last open crosscut shall be permissible; and

(2) All handheld electric drills, blower and exhaust fans, electric pumps, and all other electric-driven mine equipment, except low horsepower rock dusting equipment, that employs an electric current supplied by either a power conductor or battery and consumes not more than 2,250 watts of electricity, which is taken into or used inby the last open crosscut shall be permissible.

(b) On and after March 30, 1974, in mines operated entirely in coal seams which are located at elevations above the water table, all electric face equipment which is taken into or used inby the last crosscut shall be permissible.

Sec. 75.501-3 New openings; mines above water table and never classed gassy.

(a) Where a new opening(s) is proposed to be developed by shaft, slope, or drift from the surface to, or in, any coalbed and the operator considers such proposed new opening(s) to be a part of a mine coming under section 305(a)(2) of the Act and Sec. 75.501 the operator shall so notify the District Manager for the District in which the mine is located in writing prior to the date any actual development (in coal) through such opening(s) is undertaken. Such notification shall include the following information:

(1) Name, address, and identification number of the existing mine.

(2) A current map of the existing mine clearly setting out the proposed new opening(s), mining plan and planned interconnection, if any, with existing workings.

(3) A statement as to when the operator obtained the right to mine the coal which the proposed new opening(s) will traverse.

(4) The name of the coalbeds currently being mined and those which the new opening(s) will traverse.

(5) The expected life of the mine.

(6) The reason(s) for the proposed new opening(s) (for example, haulage, ventilation, drainage, to avoid bad roof, escapeway).

The District Manager shall require submission of any additional

information he considers pertinent.
(b) The District Manager shall make a determination based on all of the information submitted by the operator as to whether the proposed new opening(s) will be considered as a part of the existing mine or as a new mine. The following guidelines and criteria shall be used by the District Manager in making his determination:
(1) The effect that the proposed new opening(s) will have on the safety of the men working in the existing mine shall be considered of primary importance.
(2) Whether the operator had a right to mine the coal which the proposed new openings will traverse prior to the date of enactment of the Act (December 30, 1969) and whether the original mining plan included mining such coal.
(3) Whether, in accordance with the usual mining practices common to the particular district, the proposed new openings would have been considered a new mine or part of the existing mine. A number of factors will be considered including, but not limited to:
(i) The relationship between the coalbeds currently being mined, and those proposed to be mined;
(ii) The distance between existing openings and the proposed new opening(s);

[[Page 516]]

(iii) The projected time elapsing between the start of the new opening(s) and planned interconnection, if any, with the existing mine; and
(iv) The projected tonnage of coal which is expected to be mined prior to interconnection where interconnection is planned.

The District Manager shall notify the operator in writing within 30 days of receiving all of the information, required and requested, of his determination. No informal notification shall be given.
(c) All new opening(s) shall be operated as a new mine prior to receiving a written notification from the District Manager that such new opening(s) will be considered part of an existing mine coming under section 305(a)(2) of the Act and Sec. 75.501.
(d) Nothing in this Sec. 75.501-3 shall be construed to relieve the operator from compliance with any of the mandatory standards contained in this Part 75.

[37 FR 8949, May 3, 1972]

Sec. 75.502 Permits for noncompliance.

An operator need not comply with paragraph (d) of Sec. 75.500 or with Sec. 75.501 during the period of time specified in a permit issued by the Interim Compliance Panel established by the Act.

Sec. 75.503 Permissible electric face equipment; maintenance.

[Statutory Provisions]

The operator of each coal mine shall maintain in permissible condition all electric face equipment required by Sec. Sec. 75.500, 75.501, 75.504 to be permissible which is taken into or used inby the last open crosscut of any such mine.

Sec. 75.503-1 Statement listing all electric face equipment.

Each operator of a coal mine shall complete and file Mine Safety and Health Administration Form No. 6-1496 entitled ``Coal Operator's Electrical Survey'' and Form 6-1496 Supplemental entitled ``Operator's Survey of Electrical Face Equipment.'' Forms may be obtained from any Coal Mine Safety District Office or Subdistrict Office of the Mine Safety and Health Administration. Separate forms shall be filed for each mine. Copies one and two of the completed form shall be filed with the Coal Mine District or Subdistrict Manager for the district in which each mine is located on or before May 30, 1970. An operator must list all electric face equipment being used at each mine as of the time of filing, all such equipment being repaired, and all standby electric equipment stored at or in the mine which the operator intends to use as face equipment.

Sec. 75.504 Permissibility of new, replacement, used, reconditioned, additional, and rebuilt electric face equipment.

On and after March 30, 1971, all new, replacement, used, reconditioned, and additional electric face equipment used in any mine referred to in Sec. Sec. 75.500, 75.501, and 75.503 shall be permissible and shall be maintained in a permissible condition, and in the event of any major overhaul of any item of electric face equipment in use on or after March 30, 1971, such equipment shall be put in, and thereafter maintained in, a permissible condition, unless in the opinion of the Secretary, such equipment or necessary replacement parts are not available.

[38 FR 4975, Feb. 23, 1973]

Sec. 75.505 Mines classed gassy; use and maintenance of permissible electric face equipment.

[Statutory Provision]

Any coal mine which, prior to March 30, 1970, was classed gassy under any provision of law and was required to use permissible electric

face equipment and to maintain such equipment in a permissible condition shall continue to use such equipment and to maintain such equipment in such condition.

Sec. 75.506 Electric face equipment; requirements for permissibility.

(a) Electric-driven mine equipment and accessories manufactured on or after March 30, 1973, will be permissible electric face equipment only (1) if they are fabricated, assembled, or built under an approval, or any extension thereof, issued by the Bureau of Mines or the Mine Safety and Health Administration in accordance with schedule

[[Page 517]]

2G, or any subsequent Bureau of Mines schedule promulgated by the Secretary after March 30, 1970, which amends, modifies, or supersedes the permissibility requirements of schedule 2G, and (2) if they are maintained in a permissible condition.

(b) Except as provided in paragraph (c) of this Sec. 75.506 electric-driven mine equipment and accessories manufactured prior to March 30, 1973, will be permissible electric face equipment (1) if they were fabricated, assembled, or built under an approval, or any extension thereof, issued by the Bureau of Mines in accordance with the schedules set forth below, and (2) if they are maintained in a permissible condition.

Bureau of Mines Schedule 2D, May 23, 1936;
Bureau of Mines Schedule 2E, February 15, 1945;
Bureau of Mines Schedule 2F, August 3, 1955; and
Bureau of Mines Schedule 2G, March 19, 1968.

Copies of these schedules are available at all Coal Mine Safety District and Subdistrict Offices of the Bureau of Mines.

(c) Electric driven mine equipment and accessories bearing the Bureau of Mines approval numbers listed in Appendix A to this subpart are permissible electric face equipment only if they are maintained in a permissible condition.

(d) The following equipment will be permissible electric face equipment only if it is approved under the appropriate parts of this chapter, or former Bureau of Mines' approval schedules, and if it is in permissible condition:

(1) Multiple-Shot Blasting Units, part 7 subpart D;
(2) Electric Cap Lamps, part 19;
(3) Electric Mine Lamps Other than Standard Cap Lamps, part 20;
(4) Flame Safety Lamps;
(5) Portable Methane Detectors, part 22;
(6) Telephone and Signaling Devices, part 23;

(7) Single-Shot Blasting Units;
(8) Lighting Equipment for Illuminating Underground Workings;
(9) Methane-Monitoring Systems, part 27; and
(10) Continuous Duty, Warning Light, Portable Methane Detectors, 30 CFR part 29 contained in the 30 CFR, parts 1-199, edition, revised as of July 1, 1999.

[35 FR 17890, Nov. 20, 1970, as amended at 63 FR 47119, Sept. 3, 1998; 64 FR 43283, Aug. 10, 1999]

Sec. 75.506-1 Electric face equipment; permissible condition; maintenance requirements.

(a) Except as provided in paragraph (b) of this section, electric face equipment which meets the requirements for permissibility set forth in Sec. 75.506 will be considered to be in permissible condition only if it is maintained so as to meet the requirements for permissibility set forth in the Bureau of Mines schedule under which such electric face equipment was initially approved, or, if the equipment has been modified, it is maintained so as to meet the requirements of the schedule under which such modification was approved.
(b) Electric face equipment bearing the Bureau of Mines approval number listed in Appendix A of this subpart will be considered to be in permissible condition only if it is maintained so as to meet the requirements for permissibility set forth in Bureau of Mines Schedule 2D or, if such equipment has been modified, it is maintained so as to meet the requirements of the schedule under which the modification was approved.
(c) Notwithstanding the provisions of paragraphs (a) and (b) of this section, where the minimum requirements for permissibility set forth in the appropriate Bureau of Mines schedule under which such equipment or modifications were approved have been superseded by the requirements of this Part 75, the latter requirements shall be applicable.

Sec. 75.507 Power connection points.

[Statutory Provisions]

Except where permissible power connection units are used, all power-connection points outby the last open crosscut shall be in intake air.

[[Page 518]]

Sec. 75.507-1 Electric equipment other than power-connection points; outby the last open crosscut; return air; permissibility requirements.

(a) All electric equipment, other than power-connection points, used

in return air outby the last open crosscut in any coal mine shall be permissible except as provided in paragraphs (b) and (c) of this section.

(b) Notwithstanding the provisions of paragraph (a) of this section, in any coal mine where nonpermissible electric face equipment may be taken into or used inby the last open crosscut until March 30, 1974, such nonpermissible electric face equipment may be used in return air outby the last open crosscut.

(c) Notwithstanding the provisions of paragraph (a) of this section, in any coal mine where a permit for noncompliance is in effect, nonpermissible electric face equipment specified in such permit for noncompliance may be used in return air outby the last open crosscut for the duration of such permit.

[38 FR 4975, Feb. 23, 1973]

Sec. 75.508 Map of electrical system.

[Statutory Provisions]

The location and the electrical rating of all stationary electric apparatus in connection with the mine electric system, including permanent cables, switchgear, rectifying substations, transformers, permanent pumps, and trolley wires and trolley feeder wires, and settings of all direct-current circuit breakers protecting underground trolley circuits, shall be shown on a mine map. Any changes made in a location, electric rating, or setting shall be promptly shown on the map when the change is made. Such map shall be available to an authorized representative of the Secretary and to the miners in such mine.

Sec. 75.508-1 Mine tracks.

When mine track is used as a conductor of a trolley system, the location of such track shall be shown on the map required by Sec. 75.508, with a notation of the number of rails and the size of such track expressed in pounds per yard.

Sec. 75.508-2 Changes in electric system map; recording.

Changes made in the location, electrical rating or setting within the mine electrical system shall be recorded on the map of such system no later than the end of the next workday following completion of such changes.

Sec. 75.509 Electric power circuit and electric equipment; deenergization.

[Statutory Provisions]

All power circuits and electric equipment shall be deenergized before work is done on such circuits and equipment, except when necessary for trouble shooting or testing.

Sec. 75.510 Energized trolley wires; repair.

[Statutory Provisions]

Energized trolley wires may be repaired only by a person trained to perform electrical work and to maintain electrical equipment and the operator of a mine shall require that such person wear approved and tested insulated shoes and wireman's gloves.

Sec. 75.510-1 Repair of energized trolley wires; training.

The training referred to in Sec. 75.510 must include training in the repair and maintenance of live trolley wires, and in the hazards involved in making such repairs, and in the limitations of protective clothing used to protect against such hazards.

Sec. 75.511 Low-, medium-, or high-voltage distribution circuits and equipment; repair.

[Statutory Provision]

No electrical work shall be performed on low-, medium-, or high-voltage distribution circuits or equipment, except by a qualified person or by a person trained to perform electrical work and to maintain electrical equipment under the direct supervision of a qualified person. Disconnecting devices shall be locked out and suitably tagged by the persons who perform such work, except

[[Page 519]]

that in cases where locking out is not possible, such devices shall be opened and suitably tagged by such persons. Locks or tags shall be removed only by the persons who installed them or, if such persons are unavailable, by persons authorized by the operator or his agent.

Sec. 75.511-1 Qualified person.

To be a qualified person within the meaning of Sec. 75.511, an individual must meet the requirements of Sec. 75.153.

Sec. 75.512 Electric equipment; examination, testing and maintenance.

[Statutory Provision]

All electric equipment shall be frequently examined, tested, and properly maintained by a qualified person to assure safe operating conditions. When a potentially dangerous condition is found on electric equipment, such equipment shall be removed from service until such condition is corrected. A record of such examinations shall be kept and made available to an authorized representative of the Secretary and to the miners in such mine.

[35 FR 17890, Nov. 20, 1970, as amended at 60 FR 33723, June 29, 1995]

Sec. 75.512-1 Qualified person.

To be a qualified person within the meaning of Sec. 75.512, an individual must meet the requirements of Sec. 75.153.

Sec. 75.512-2 Frequency of examinations.

The examinations and tests required by Sec. 75.512 shall be made at least weekly. Permissible equipment shall be examined to see that it is in permissible condition.

Sec. 75.513 Electric conductor; capacity and insulation.

[Statutory Provision]

All electric conductors shall be sufficient in size and have adequate current carrying capacity and be of such construction that a rise in temperature resulting from normal operation will not damage the insulating materials.

Sec. 75.513-1 Electric conductor; size.

An electric conductor is not of sufficient size to have adequate carrying capacity if it is smaller than is provided for in the National Electric Code, 1968. In addition, equipment and trailing cables that are required to be permissible must meet the requirements of the appropriate schedules of the Bureau of Mines.

Sec. 75.514 Electrical connections or splices; suitability.

[Statutory Provision]

All electrical connections or splices in conductors shall be mechanically and electrically efficient, and suitable connectors shall be used. All electrical connections or splices in insulated wire shall be reinsulated at least to the same degree of protection as the remainder of the wire.

Sec. 75.515 Cable fittings; suitability.

[Statutory Provision]

Cables shall enter metal frames of motors, splice boxes, and electric compartments only through proper fittings. When insulated wires other than cables pass through metal frames, the holes shall be substantially bushed with insulated bushings.

Sec. 75.516 Power wires; support.

[Statutory Provision]

All power wires (except trailing cables on mobile equipment, specially designed cables conducting high-voltage power to underground rectifying equipment or transformers, or bare or insulated ground and return wires) shall be supported on well-insulated insulators and shall not contact combustible material, roof, or ribs.

Sec. 75.516-1 Installed insulators.

Well-insulated insulators is interpreted to mean well-installed insulators. Insulated J-hooks may be used to suspend insulated power cables for temporary installation not exceeding 6 months and for permanent installation of control cables such as may be used along belt conveyors.

[[Page 520]]

Sec. 75.516-2 Communication wires and cables; installation; insulation; support.

(a) All communication wires shall be supported on insulated hangers or insulated J-hooks.
(b) All communication cables shall be insulated as required by Sec. 75.517-1, and shall either be supported on insulated or uninsulated hangers or J-hooks, or securely attached to messenger wires, or buried, or otherwise protected against mechanical damage in a manner approved by the Secretary or his authorized representative.
(c) All communication wires and cables installed in track entries shall, except when a communication cable is buried in accordance with paragraph (b) of this section, be installed on the side of the entry opposite to trolley wires and trolley feeder wires. Additional insulation shall be provided for communication circuits at points where they pass over or under any power conductor.
(d) For purposes of this section, communication cable means two or more insulated conductors covered by an additional abrasion-resistant

covering.

[38 FR 4975, Feb. 23, 1973]

Sec. 75.517 Power wires and cables; insulation and protection.

[Statutory Provisions]

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

Sec. 75.517-1 Power wires and cables; insulation and protection.

Power wires and cables installed on or after March 30, 1970, shall have insulation with a dielectric strength at least equal to the voltage of the circuit.

Sec. 75.517-2 Plans for insulation of existing bare power wires and cables.

(a) On or before December 31, 1970, plans for the insulation of existing bare power wires and cables installed prior to March 30, 1970, shall be filed with the District Manager of the Coal Mine Safety District in which the mine is located to permit approval and prompt implementation of such plans.
(b) The appropriate District Manager shall notify the operator in writing of the approval of a proposed insulation plan. If revisions are required for approval, the changes required will be specified.
(c) An insulation plan shall include the following information:
(1) Name and address of the company, the mine and the responsible officials;
(2) Map or diagram indicating location of power wires and cables required to be insulated;
(3) Total length of bare power wires and cables required to be insulated;
(4) Schedule for the replacement or insulation of bare power wires and cables;
(5) Type of insulation to be used and the voltage rating as indicated by the manufacturer.
(d) The District Manager shall be guided by the following criteria in approving insulation plans on a mine-by-mine basis. Insulation not conforming to these criteria may be approved provided the operator can satisfy the Mine Safety and Health Administration that the insulation will provide no less than the same measure of protection.
(1) Insulation shall be adequate for the applied voltage of the circuit.
(2) When tubing is used to insulate existing power wires and cables,

it shall have a dielectric strength at least equal to the voltage of the circuit. When the tubing is split for purposes of installation, the joints shall be effectively sealed. The butt ends may be sealed with a moisture resistant insulating tape.
(3) When tape is used to insulate existing power wires and cables, it shall be applied half-lapped and one thickness of the tape shall have a dielectric strength at least equal to the voltage of the circuit. The tape shall be self-adhesive and moisture resistant.

Sec. 75.518 Electric equipment and circuits; overload and short circuit protection.

[Statutory Provision]

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.

[[Page 521]]

Three-phase motors on all electric equipment shall be provided with overload protection that will deenergize all three phases in the event that any phase is overloaded.

Sec. 75.518-1 Electric equipment and circuits; overload and short circuit protection; minimum requirements.

A device to provide either short circuit protection or protection against overload which does not conform to the provisions of the National Electric Code, 1968, does not meet the requirement of Sec. 75.518. In addition, such devices on electric face equipment and trailing cables that are required to be permissible must meet the requirements of the applicable schedules of the Bureau of Mines.

Sec. 75.518-2 Incandescent lamps, overload and short circuit protection.

Incandescent lamps installed along haulageways and at other locations, not contacting combustible material, and powered from trolley or direct current feeder circuits, need not be provided with separate short circuit or overload protection, if the lamp is not more than 8 feet in distance from such circuits.

Sec. 75.519 Main power circuits; disconnecting switches.

[Statutory Provision]

In all main power circuits, disconnecting switches shall be

installed underground within 500 feet of the bottoms of shafts and boreholes through which main power circuits enter the underground area of the mine and within 500 feet of all other places where main power circuits enter the underground area of the mine.

Sec. 75.519-1 Main power circuits; disconnecting switches; locations.

Section 75.519 requires (a) that a disconnecting switch be installed on the surface at a point within 500 feet of the place where the main power circuit enters the underground area of a mine, and (b) that, in an instance on which a main power circuit enters the underground area through a shaft or borehole, a disconnecting switch be installed underground within 500 feet of the bottom of the shaft or borehole.

Sec. 75.520 Electric equipment; switches.

[Statutory Provision]

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

Sec. 75.521 Lightning arresters; ungrounded and exposed power conductors and telephone wires.

Each ungrounded, exposed power conductor and each ungrounded, exposed telephone wire that leads underground shall be equipped with suitable lightning arresters of approved type within 100 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 25 feet.

[38 FR 4975, Feb. 23, 1973]

Sec. 75.522 Lighting devices.

[Statutory Provision]

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.

Sec. 75.522-1 Incandescent and fluorescent lamps.

(a) Except for areas of a coal mine inby the last open crosscut, incandescent lamps may be used to illuminate underground areas. When incandescent lamps are used in a track entry or belt entry or near track entries to illuminate special areas other than structures, the lamps

shall be installed in weather-proof sockets located in positions such that the lamps will not come in contact with any combustible material. Lamps used in all other places must be of substantial construction and be fitted with a glass enclosure.

(b) Incandescent lamps within glass enclosures or fluorescent lamps may be used inside underground structures (except magazines used for the storage of

[[Page 522]]

explosives and detonators). In underground structures lighting circuits shall consist of cables installed on insulators or insulated wires installed in metallic conduit or metallic armor.

Sec. 75.523 Electric face equipment; deenergization.

[Statutory Provision]

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.

Sec. 75.523-1 Deenergization of self-propelled electric face equipment installation requirements.

(a) Except as provided in paragraphs (b) and (c) of this section, all self-propelled electric face equipment which is used in the active workings of each underground coal mine on and after March 1, 1973, shall, in accordance with the schedule of time specified in paragraphs (a) (1) and (2) of this section, be provided with a device that will quickly deenergize the tramming motors of the equipment in the event of an emergency. The requirements of this paragraph (a) shall be met as follows:

(1) On and after December 15, 1974, for self-propelled cutting machines, shuttle cars, battery-powered machines, and roof drills and bolters;

(2) On and after February 15, 1975, for all other types of self-propelled electric face equipment.

(b) Self-propelled electric face equipment that is equipped with a substantially constructed cab which meets the requirements of this part, shall not be required to be provided with a device that will quickly deenergize the tramming motors of the equipment in the event of an emergency.

(c) An operator may apply to the Director of Technical Support, Mine Safety and Health Administration, Department of Labor, 1100 Wilson Blvd., Room 2329, Arlington, Virginia 22209-3939 for approval of the installation of devices to be used in lieu of devices that will quickly

deenergize the tramming motors of self-propelled electric face equipment in the event of an emergency. The Director of Technical Support may approve such devices if he determines that the performance thereof will be no less effective than the performance requirements specified in Sec. 75.523-2.

[38 FR 3407, Feb. 6, 1973, as amended at 39 FR 27557, July 30, 1974; 43 FR 12320, Mar. 24, 1978; 47 FR 28096, June 29, 1982; 67 FR 38386, June 4, 2002]

Sec. 75.523-2 Deenergization of self-propelled electric face equipment; performance requirements.

(a) Deenergization of the tramming motors of self-propelled electric face equipment, required by paragraph (a) of Sec. 75.523-1, shall be provided by:
(1) Mechanical actuation of an existing pushbutton emergency stopswitch,
(2) Mechanical actuation of an existing lever emergency stopswitch, or
(3) The addition of a separate electromechanical switch assembly.
(b) The existing emergency stopswitch or additional switch assembly shall be actuated by a bar or lever which shall extend a sufficient distance in each direction to permit quick deenergization of the tramming motors of self-propelled electric face equipment from all locations from which the equipment can be operated.
(c) Movement of not more than 2 inches of the actuating bar or lever resulting from the application of not more than 15 pounds of force upon contact with any portion of the equipment operator's body at any point along the length of the actuating bar or lever shall cause deenergization of the tramming motors of the self-propelled electric face equipment.

[38 FR 3406, Feb. 6, 1973; 38 FR 4394, Feb. 14, 1973]

Sec. 75.523-3 Automatic emergency-parking brakes.

(a) Except for personnel carriers, rubber-tired, self-propelled electric haulage equipment used in the active workings of underground coal mines shall be equipped with automatic emergency-parking brakes in accordance with the following schedule.
(1) On and after May 23, 1989--
(i) All new equipment ordered; and

[[Page 523]]

(ii) All equipment originally furnished with or retrofitted with automatic emergency-parking brakes which meet the requirements of this

section.
(2) On and after May 23, 1991, all other equipment.
(b) Automatic emergency-parking brakes shall--
(1) Be activated immediately by the emergency deenergization device required by 30 CFR 75.523-1 and 75.523-2;
(2) Engage automatically within 5.0 seconds when the equipment is deenergized;
(3) Safely bring the equipment when fully loaded to a complete stop on the maximum grade on which it is operated;
(4) Hold the equipment stationary despite any contraction of brake parts, exhaustion of any non-mechanical source of energy, or leakage; and
(5) Release only by a manual control that does not operate any other equipment function.
(c) Automatic emergency-parking brakes shall include a means in the equipment operator's compartment to--
(1) Apply the brakes manually without deenergizing the equipment; and
(2) Release and reengage the brakes without energizing the equipment.
(d) On and after November 24, 1989, rubber-tired, self-propelled electric face equipment not covered by paragraph (a) of this section shall be equipped with a means incorporated on the equipment and operable from each tramming station to hold the equipment stationary--
(1) On the maximum grade on which it is operated; and
(2) Despite any contraction of components, exhaustion of any non-mechanical source of energy, or leakage.
(e) The brake systems required by paragraphs (a) or (d) of this section shall be applied when the equipment operator is not at the controls of the equipment, except during movement of disabled equipment.

[54 FR 12412, Mar. 24, 1989]

Sec. 75.524 Electric face equipment; electric equipment used in return air outby the last open crosscut; maximum level of alternating or direct electric current between frames of equipment.

The maximum level of alternating or direct electric current that exists between the frames of any two units of electric face equipment that come in contact with each other in the working places of a coal mine, or between the frames of any two units of electric equipment that come in contact with each other in return air outby the last open crosscut, shall not exceed one ampere as determined from the voltage measured across a 0.1 ohm resistor connected between the frames of such equipment.

[38 FR 29998, Oct. 31, 1973]

Appendix A to Subpart F of Part 75--List of Permissible Electric Face Equipment Approved by the Bureau of Mines Prior to May 23, 1936

Motor-Driven Mine Equipment
(Approved Under Schedules 2, 2A, 2B, and 2C)

Approval No.	Date
Air Compressors	
128	March 21, 1927.
128A	July 16, 1926.
Coal Drills and Drilling Machines	
Hand Drills	
109	September 19, 1922.
154	August 1, 1928.
184	February 7, 1930.
227	July 29, 1931.
254	July 15, 1933.
Post Drills	
119	April 15, 1925.
119A	Do.
225	July 10, 1931.
225A	Do.
228	August 12, 1931.
228A	February 17, 1932.
230	August 20, 1931.
230A	Do.
237	December 1, 1931.
237A	Do.
Drilling Machines	
147	February 8, 1928.
147A	Do.
176	September 9, 1929.
176A	Do.

[[Page 524]]

Loading and Conveying Equipment

loading machines

Unmounted Type

122..... January 8, 1926.
122A..... Do.

Caterpillar-Mounted Type

150..... May 11, 1928.
186..... March 15, 1930.
222..... May 8, 1931.
222A..... July 28, 1931.
229..... August 17, 1931.
229A..... Do.
235..... November 27, 1931.
235A..... October 29, 1931.
278..... January 17, 1935.
278A..... Do.
283A..... March 12, 1935.
284A..... Do.
285A..... Do.
294..... September 18, 1935.
300A..... May 6, 1936.
127..... July 16, 1926.
127A..... September 23, 1927.

Track-Mounted Type

194..... June 6, 1930.
194A..... Do.
217..... February 27, 1931.
217A..... Do.
276..... January 11, 1935.
277..... January 17, 1935.
282A..... March 12, 1935.
291A..... July 3, 1935.

Pit-Car Loaders

167..... March 27, 1929.
167A..... Do.
175..... July 26, 1929.
175A..... June 24, 1929.
250..... December 10, 1932.
250A..... Do.
252A..... February 20, 1933.

Conveyors

Belt Type

236..... November 19, 1931.
287A..... March 12, 1935.
296A..... January 6, 1936.

Chain Type

151..... May 19, 1928.
209..... December 2, 1930.
240..... March 12, 1932.
240A..... Do.
298A..... March 3, 1936.

Power Units for Conveyors

265..... February 12, 1934.
265A..... March 19, 1934.
390A..... March 23, 1934.

Shaker Type

247..... October 21, 1932.
257A..... August 11, 1933.
262A..... December 8, 1933.
271..... May 20, 1935.
271A..... October 17, 1934.
274A..... December 13, 1934.
286A..... March 12, 1935.
295..... September 20, 1935.
299A..... April 9, 1936.

Scraper-type Loaders

138..... August 5, 1927.
138A..... Do.
196..... September 29, 1930.
196A..... July 26, 1930.
226..... July 27, 1931.
255..... July 31, 1933.
256..... Do.

Mining Machines, Machinery-Moving Equipment, Miscellaneous Trucks, and Water Spray Supply Units

Shortwall Machines

103	November 2, 1917.
103A	Do.
105	February 9, 1922.
105A	Do.
106	Do.
106A	Do.
107	Do.
107A	Do.
108	Do.
108A	Do.
111	October 16, 1922.
111A	Do.
113	November 4, 1924.
113A	Do.
114	February 7, 1925.
114A	Do.
115	Do.
115A	Do.
153	July 31, 1928.
153A	Do.
193	June 3, 1930.
193A	Do.
197	July 31, 1930.
197A	Do.
198	August 1, 1930.
198A	Do.
201	September 8, 1930.
201A	Do.
204	October 13, 1930.
204A	December 13, 1930.
223	May 13, 1931.
223A	Do.
241	March 18, 1932.
241A	Do.
258	August 15, 1933.
259A	August 16, 1933.
260A	August 17, 1933.
273	November 30, 1934.
288	March 27, 1935.
288A	Do.
292	September 11, 1935.
292A	Do.
293A	Do.

Longwall Machines

185..... February 24, 1930.

[[Page 525]]

185A..... Do.
218..... March 10, 1931.
218A..... Do.
246..... August 19, 1932.
246A..... Do.
261..... September 12, 1933.

Track or caterpillar mounted

112..... March 13, 1924.
112A..... Do.
118..... March 12, 1925.
118A..... Do.
125..... April 26, 1926.
125A..... Do.
172..... April 30, 1929.
172A..... Do.
188..... April 15, 1930.
188A..... Do.
207..... November 14, 1930.
207A..... Do.
216..... February 12, 1931.
216A..... Do.
231..... August 31, 1931.
231A..... Do.
242..... April 7, 1932.
244..... June 18, 1932.
244A..... September 20, 1932.
253A..... February 25, 1933.
267..... June 27, 1934.
268A..... July 25, 1934.
269A..... September 24, 1934.
280A..... March 4, 1935.
297..... January 27, 1936.
297A..... Do.

Mine Pumps

140..... November 1, 1927.
140A..... Do.
143..... Do.

143A..... Do.
144..... Do.
144A..... Do.
199..... August 18, 1930.
199A..... Do.
208..... November 29, 1930.
210..... December 15, 1930.
210A..... Do.
211..... December 17, 1930.
211A..... Do.
213..... December 29, 1930.
213A..... Do.
214..... January 2, 1931.
214A..... Do.
215..... Do.
215A..... Do.
248..... October 31, 1932.
248A..... November 23, 1932.
264..... January 31, 1934.
264A..... Do.
272..... October 23, 1934.
272A..... Do.

Rock-Dusting Machines

130..... November 5, 1926.
137..... July 2, 1927.
146..... January 20, 1928.
146A..... April 3, 1928.
180..... October 30, 1929.
180A..... January 17, 1930.
206..... November 12, 1930.
279..... February 14, 1935.

Room and Car-Spotting Hoists

116..... February 13, 1925.
116A..... Do.
164..... January 21, 1931.
164A..... Do.
165..... Do.
165A..... Do.
169..... April 5, 1929.
169A..... February 26, 1934.
190..... April 20, 1930.
251A..... January 16, 1933.
263..... January 11, 1934.
266A..... February 27, 1934.

Storage-Battery Locomotives and Power Trucks

(Approved under Schedules 15, 2C, 2D, and 2E)

Gathering Locomotives

1501..... October 11, 1921.
1502..... November 13, 1922.
1503..... March 24, 1923.
1505..... April 5, 1924.
1507..... August 20, 1925.
1508..... March 21, 1925.
1509..... September 25, 1925.
1511..... November 10, 1925.
1512..... November 11, 1925.
1513..... February 25, 1926.
1516..... December 28, 1926.
1517..... February 10, 1927.
1520..... May 27, 1929.
1521..... June 13, 1930.
1522..... September 12, 1930.
1523..... December 19, 1930.
1525..... July 25, 1934.
1526..... December 20, 1935.

Tandem Locomotive

1518..... November 21, 1927.

Power Trucks

1506..... May 5, 1924.
1505A..... June 21, 1926.
1510C..... December 31, 1926.
1514..... December 18, 1926.
1515..... December 28, 1926.
1512C..... September 13, 1928.
1519C..... April 6, 1929.
1524C..... June 25, 1934.

Junction, Distribution, and Splice Boxes

(Approved under Schedules 2D and 2E)

Junction Boxes

400..... June 16, 1928.

400A..... August 5, 1925.
401..... May 11, 1927.
401A..... Do.
402..... Do.
402A..... Do.
403..... April 14, 1931.
403A..... Do.
405A..... December 4, 1933.

[[Page 526]]

Subpart G_Trailing Cables

Sec. 75.600 Trailing cables; flame resistance.

[Statutory Provisions]

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

Sec. 75.600-1 Approved cables; flame resistance.

Cables shall be accepted or approved by MSHA as flame resistant.

[57 FR 61223, Dec. 23, 1992]

Sec. 75.601 Short circuit protection of trailing cables.

[Statutory Provisions]

Short circuit protection for trailing cables shall be provided by an automatic circuit breaker 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.

Sec. 75.601-1 Short circuit protection; ratings and settings of circuit breakers.

Circuit breakers providing short circuit protection for trailing cables shall be set so as not to exceed the maximum allowable instantaneous settings specified in this section; however, higher settings may be permitted by an authorized representative of the Secretary when he has determined that special applications are

justified:

Conductor size AWG or MGM	Maximum allowable circuit breaker instantaneous setting (amperes)
14	50
12	75
10	150
8	200
6	300
4	500
3	600
2	800
1	1,000
1/0	1,250
2/0	1,500
3/0	2,000
4/0	2,500
250	2,500
300	2,500
350	2,500
400	2,500
450	2,500
500	2,500

Sec. 75.601-2 Short circuit protection; use of fuses; approval by the Secretary.

Fuses shall not be employed to provide short circuit protection for trailing cables unless specifically approved by the Secretary.

Sec. 75.601-3 Short circuit protection; dual element fuses; current ratings; maximum values.

Dual element fuses having adequate current-interrupting capacity shall meet the requirements for short circuit protection of trailing cables as provided in Sec. 75.601, however, the current ratings of such devices shall not exceed the maximum values specified in this section:

Single conductor	Two conductor

Conductor size (AWG or MGM)	Max. cable Ampacity	Max. cable fuse rating	Max. Ampacity	Max. fuse rating
14	.....	.....	.....	15	15
12	.....	.....	.....	20	20
10	.....	.....	.....	25	25
8	.....	60	60	50	50
6	.....	85	90	65	70
4	.....	110	110	90	90
3	.....	130	150	105	110
2	.....	150	150	120	125
1	.....	170	175	140	150
1/0	.....	200	200	170	175
2/0	.....	235	250	195	200
3/0	.....	275	300	225	225
4/0	.....	315	350	260	300
250	.....	350	350	285	300
300	.....	395	400	310	350
350	.....	445	450	335	350
400	.....	480	500	360	400
450	.....	515	600	385	400
500	.....	545	600	415	450

[[Page 527]]

Sec. 75.602 Trailing cable junctions.

[Statutory Provision]

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.

Sec. 75.603 Temporary splice of trailing cable.

[Statutory Provision]

One temporary splice may be made in any trailing cable. Such trailing cable may only be used for the next 24-hour period. No temporary splice shall be made in a trailing cable within 25 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 section, the term ``splice'' means the mechanical joining of one or more conductors that have been severed.

Sec. 75.604 Permanent splicing of trailing cables.

[Statutory Provisions]

When permanent splices in trailing cables are made, they shall be:
(a) Mechanically strong with adequate electrical conductivity and flexibility;
(b) Effectively insulated and sealed so as to exclude moisture; and
(c) Vulcanized or otherwise treated with suitable materials to provide flame-resistant qualities and good bonding to the outer jacket.
(d) Made using splice kits accepted or approved by MSHA as flame resistant.

[35 FR 17890, Nov. 20, 1970, as amended at 57 FR 61223, Dec. 23, 1992]

Sec. 75.605 Clamping of trailing cables to equipment.

[Statutory Provisions]

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

Sec. 75.606 Protection of trailing cables.

[Statutory Provisions]

Trailing cables shall be adequately protected to prevent damage by mobile equipment.

Sec. 75.607 Breaking trailing cable and power cable connections.

[Statutory Provisions]

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

Subpart H_Grounding

Sec. 75.700 Grounding metallic sheaths, armors, and conduits enclosing power conductors.

[Statutory Provisions]

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.

Sec. 75.700-1 Approved methods of grounding.

Metallic sheaths, armors and conduits in resistance grounded systems where the enclosed conductors are a part of the system will be approved if a solid connection is made to the neutral conductor; in all other systems, the following methods of grounding will be approved:
(a) A solid connection to a borehole casing having low resistance to earth;
(b) A solid connection to metal waterlines having low resistance to earth;
(c) A solid connection to a grounding conductor, other than the neutral conductor of a resistance grounded system, extending to a low resistance ground field located on the surface;
(d) Any other method of grounding, approved by an authorized representative of the Secretary, which ensures that there is no difference in potential between such metallic enclosures and the earth.

[[Page 528]]

Sec. 75.701 Grounding metallic frames, casings, and other enclosures of electric equipment.

[Statutory Provisions]

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.

Sec. 75.701-1 Approved methods of grounding of equipment receiving power from ungrounded alternating current power systems.

For purposes of grounding metallic frames, casings and other enclosures of equipment receiving power from ungrounded alternating current power systems, the following methods of grounding will be approved:
(a) A solid connection between the metallic frame, casing, or other metal enclosure and the grounded metallic sheath, armor, or conduit enclosing the power conductor feeding the electrical equipment enclosed;
(b) A solid connection to a borehole casing having low resistance to earth;
(c) A solid connection to metal waterlines having low resistance to earth;

(d) A solid connection to a grounding conductor extending to a low resistance ground field located on the surface;
(e) Any other method of grounding, approved by an authorized representative of the Secretary, which ensures that there is no difference in potential between such metal enclosures and the earth.

Sec. 75.701-2 Approved method of grounding metallic frames, casings and other enclosures receiving power from single-phase 110-220-volt circuit.

In instances where single-phase 110-220-volt circuits are used to feed electrical equipment, the only method of grounding that will be approved is the connection of all metallic frames, casings and other enclosures of such equipment to a separate grounding conductor which establishes a continuous connection to a grounded center tap of the transformer.

Sec. 75.701-3 Approved methods of grounding metallic frames, casings and other enclosures of electric equipment receiving power from direct current power systems with one polarity grounded.

For the purpose of grounding metallic frames, casings and enclosures of any electric equipment or device-receiving power from a direct-current power system with one polarity grounded, the following methods of grounding will be approved:
(a) A solid connection to the mine track;
(b) A solid connection to the grounded power conductor of the system;
(c) Silicon diode grounding; however, this method shall be employed only when such devices are installed in accordance with the requirements set forth in paragraph (d) of Sec. 75.703-3; and
(d) Any other method, approved by an authorized representative of the Secretary, which insures that there is no difference in potential between such metal enclosures and the earth.

Sec. 75.701-4 Grounding wires; capacity of wires.

Where grounding wires are used to ground metallic sheaths, armors, conduits, frames, casings, and other metallic enclosures, such grounding wires will be approved if:
(a) The cross-sectional area (size) of the grounding wire is at least one-half the cross-sectional area (size) of the power conductor where the power conductor used is No. 6 A.W.G., or larger.
(b) Where the power conductor used is less than No. 6 A.W.G., the cross-sectional area (size) of the grounding wire is equal to the cross-sectional area (size) of the power conductor.

Sec. 75.701-5 Use of grounding connectors.

The attachment of grounding wires to a mine track or other grounded power conductor will be approved if separate clamps, suitable for such purpose, are used and installed to provide a solid connection.

[[Page 529]]

Sec. 75.702 Protection other than grounding.

[Statutory Provisions]

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

Sec. 75.702-1 Protection other than grounding; approved by an authorized representative of the Secretary.

Under this subpart no method other than grounding may be used to ensure against a difference in potential between metallic sheaths, armors and conduits, enclosing power conductors and frames, casings and metal enclosures of electric equipment, and the earth, unless approved by an authorized representative of the Secretary.

Sec. 75.703 Grounding offtrack direct-current machines and the enclosures of related detached components.

[Statutory Provisions]

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.

Sec. 75.703-1 Approved method of grounding.

In instances where the metal frames both of an offtrack direct-current machine and of the metal frames of its component parts are grounded to the same grounding medium the requirements of Sec. 75.703 will be met.

Sec. 75.703-2 Approved grounding mediums.

For purposes of grounding offtrack direct-current machines, the following grounding mediums are approved:
(a) The grounded polarity of the direct-current power system feeding such machines; or,
(b) The alternating current grounding medium where such machines are

fed by an ungrounded direct-current power system originating in a portable rectifier receiving its power from a section power center. However, when such a medium is used, a separate grounding conductor must be employed.

Sec. 75.703-3 Approved methods of grounding offtrack mobile, portable and stationary direct-current machines.

In grounding offtrack direct-current machines and the enclosures of their component parts, the following methods of grounding will meet the requirements of Sec. 75.703:

(a) The use of a separate grounding conductor located within the trailing cable of mobile and portable equipment and connected between such equipment and the direct-current grounding medium;

(b) The use of a separate ground conductor located within the direct-current power cable feeding stationary equipment and connected between such stationary equipment and the direct-current grounding medium;

(c) The use of a separate external ground conductor connected between stationary equipment and the direct-current grounding medium; or,

(d) The use of silicon diodes; however, the installation of such devices shall meet the following minimum requirements:

(1) Installation of silicon diodes shall be restricted to electric equipment receiving power from a direct-current system with one polarity grounded;

(2) Where such diodes are used on circuits having a nominal voltage rating of 250, they must have a forward current rating of 400 amperes or more, and have a peak inverse voltage rating of 400 or more;

(3) Where such diodes are used on circuits having a nominal voltage rating of 550, they must have a forward current rating of 250 amperes or more, and have a peak inverse voltage rating of 800 or more;

(4) Where fuses approved by the Secretary are used at the outby end of a trailing cable connected to electrical equipment employing silicon diodes, the rating of such fuses must not exceed 150 percent of the nominal current rating of the grounding diodes;

(5) Where circuit breakers are used at the outby end of a trailing cable connected to electrical equipment employing silicon diodes, the instantaneous

[[Page 530]]

trip setting shall not exceed 300 percent of the nominal current rating of the grounding diode;

(6) Overcurrent devices must be used and installed in such a manner that the operating coil circuit of the main contactor will open when a fault current with a value of 25 percent or less of the diode rating flows through the diode;

(7) The silicon diode installed must be suitable to the grounded polarity of the power system in which it is used and its threaded base must be solidly connected to the machine frame on which it is installed;
(8) In addition to the grounding diode, a polarizing diode must be installed in the machine control circuit to prevent operation of the machine when the polarity of a trailing cable is reversed;
(9) When installed on permissible equipment, all grounding diodes, overcurrent devices, and polarizing diodes must be placed in explosion proof compartments;
(10) When grounding diodes are installed on a continuous miner, their nominal diode current rating must be at least 750 amperes or more; and,
(11) All grounding diodes shall be tested, examined and maintained as electrical equipment in accordance with the provisions of Sec. 75.512.

Sec. 75.703-4 Other methods of protecting offtrack direct-current equipment; approved by an authorized representative of the Secretary.

Other methods of maintaining safe voltage by preventing a difference between the frames of offtract direct-current machines and the earth must be approved by an authorized representative of the Secretary.

Sec. 75.704 Grounding frames of stationary high-voltage equipment receiving power from ungrounded delta systems.

[Statutory Provisions]

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.

Sec. 75.704-1 Approved methods of grounding.

The methods of grounding stated in Sec. 75.701-1 will also be approved with respect to the grounding of frames of high-voltage equipment referred to in Sec. 75.704.

Sec. 75.705 Work on high-voltage lines; deenergizing and grounding.

[Statutory Provisions]

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 March 30, 1970.

Sec. 75.705-1 Work on high-voltage lines.

(a) Section 75.705 specifically prohibits work on energized high-voltage lines underground;
(b) No high-voltage line, either on the surface or underground, shall be regarded as deenergized for the purpose of performing work on it, until it has been determined by a qualified person (as provided in Sec. 75.153) that such high-voltage line has been deenergized and grounded. Such qualified person shall by visual observation (1) determine that the disconnecting devices on the high-voltage circuit are in open position and (2) ensure that each ungrounded conductor of the high-voltage circuit upon which work is to be done is properly connected to the system-grounding medium. In the case of resistance grounded or solid wye-connected systems, the neutral wire is the system-grounding medium. In the case of an ungrounded power system, either the steel armor or conduit enclosing the system or a surface grounding field is a system grounding medium;
(c) No work shall be performed on any high-voltage line on the surface which is supported by any pole or structure which also supports other high-voltage lines until: (1) All lines

[[Page 531]]

supported on the pole or structure are deenergized and grounded in accordance with all of the provisions of this section which apply to the repair of energized surface high-voltage lines; or (2) the provisions of Sec. Sec. 75.705-2 through 75.705-10 have been complied with, with respect to all lines, which are supported on the pole or structure.
(d) Work may be performed on energized surface high-voltage lines only in accordance with the provisions of Sec. Sec. 75.705-2 through 75.705-10, inclusive.

Sec. 75.705-2 Repairs to energized surface high-voltage lines.

An energized high-voltage surface line may be repaired only when
(a) The operator has determined that:
(1) Such repairs cannot be scheduled during a period when the power circuit could be properly deenergized and grounded;
(2) Such repairs will be performed on power circuits with a phase-to-phase nominal voltage no greater than 15,000 volts;
(3) Such repairs on circuits with a phase-to-phase nominal voltage of 5,000 volts or more will be performed only with the use of live line tools;
(4) Weather conditions will not interfere with such repairs or

expose those persons assigned to such work to an imminent danger; and

(b) The operator has designated a person qualified under the provisions of Sec. 75.154 as the person responsible for carrying out such repairs and such person, in order to ensure protection for himself and other qualified persons assigned to perform such repairs from the hazards of such repair, has prepared and filed with the operator:

(1) A general description of the nature and location of the damage or defect to be repaired;

(2) The general plan to be followed in making such repairs;

(3) A statement that a briefing of all qualified persons assigned to make such repairs was conducted informing them of the general plan, their individual assignments, and the dangers inherent in such assignments;

(4) A list of the proper protective equipment and clothing that will be provided; and

(5) Such other information as the person designated by the operator feels necessary to describe properly the means or methods to be employed in such repairs.

Sec. 75.705-3 Work on energized high-voltage surface lines; reporting.

Any operator designating and assigning qualified persons to perform repairs on energized high-voltage surface lines under the provisions of Sec. 75.705-2 shall maintain a record of such repairs. Such record shall contain a notation of the time, date, location, and general nature of the repairs made, together with a copy of the information filed with the operator by the qualified person designated as responsible for performing such repairs.

Sec. 75.705-4 Simultaneous repairs.

When two or more persons are working on an energized high-voltage surface line simultaneously, and any one of them is within reach of another, such persons shall not be allowed to work on different phases or on equipment with different potentials.

Sec. 75.705-5 Installation of protective equipment.

Before repair work on energized high-voltage surface lines is begun, protective equipment shall be used to cover all bare conductors, ground wires, guys, telephone lines, and other attachments in proximity to the area of planned repairs. Such protective equipment shall be installed from a safe position below the conductors or other apparatus being covered. Each rubber protective device employed in the making of repairs shall have a dielectric strength of 20,000 volts, or more.

Sec. 75.705-6 Protective clothing; use and inspection.

All persons performing work on energized high-voltage surface lines shall wear protective rubber gloves, sleeves, and climber guards if climbers are worn. Protective rubber gloves shall not be worn wrong side out or without protective leather gloves. Protective devices worn by a person assigned to perform repairs on high-voltage surface lines shall be worn continuously from the time he leaves the ground until he

[[Page 532]]

returns to the ground, and, if such devices are employed for extended periods, such person shall visually inspect the equipment assigned him for defects before each use and, in no case, less than twice each day.

Sec. 75.705-7 Protective equipment; inspection.

Each person shall visually inspect protective equipment and clothing provided him in connection with work on high-voltage surface lines before using such equipment and clothing, and any equipment or clothing containing any defect or damage shall be discarded and replaced with proper protective equipment or clothing prior to the performance of any electrical work on such lines.

Sec. 75.705-8 Protective equipment; testing and storage.

(a) All rubber protective equipment used on work on energized high-voltage surface lines shall be electrically tested by the operator in accordance with ASTM standards, Part 28, published February 1968, and such testing shall be conducted in accordance with the following schedule:

(1) Rubber gloves, once each month;
(2) Rubber sleeves, once every 3 months;
(3) Rubber blankets, once every 6 months;
(4) Insulator hoods and line hose, once a year; and
(5) Other electric protective equipment, once a year.

(b) Rubber gloves shall not be stored wrong side out. Blankets shall be rolled when not in use, and line hose and insulator hoods shall be stored in their natural position and shape.

Sec. 75.705-9 Operating disconnecting or cutout switches.

Disconnecting or cutout switches on energized high-voltage surface lines shall be operated only with insulated sticks, fuse tongs, or pullers which are adequately insulated and maintained to protect the operator from the voltage to which he is exposed. When such switches are operated from the ground, the person operating such devices shall wear protective rubber gloves.

Sec. 75.705-10 Tying into energized high-voltage surface circuits.

If the work of forming an additional circuit by tying into an energized high-voltage surface line is performed from the ground, any person performing such work must wear and employ all of the protective equipment and clothing required under the provisions of Sec. Sec. 75.705-5 and 75.705-6. In addition, the insulated stick used by such person must have been designed for such purpose and must be adequately insulated and be maintained to protect such person from the voltage to which he is exposed.

Sec. 75.705-11 Use of grounded messenger wires; ungrounded systems.

Solely for purposes of grounding ungrounded high-voltage power systems, grounded messenger wires used to suspend the cables of such systems may be used as a grounding medium.

Sec. 75.706 Deenergized underground power circuits; idle days--idle shifts.

[Statutory Provisions]

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

Subpart I_Underground High-Voltage Distribution

Sec. 75.800 High-voltage circuits; circuit breakers.

[Statutory Provisions]

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.

Sec. 75.800-1 Circuit breakers; location.

Circuit breakers protecting high-voltage circuits entering an underground area of any coal mine shall be located on the surface and in no case

[[Page 533]]

installed either underground or within a drift.

Sec. 75.800-2 Approved circuit schemes.

The following circuit schemes will be regarded as providing the necessary protection to the circuits required by Sec. 75.800:
(a) Ground check relays may be used for undervoltage protection if the relay coils are designed to trip the circuit breaker when line voltage decreases to 40 percent to 60 percent of the nominal line voltage;
(b) Ground trip relays on resistance grounded systems will be acceptable as grounded phase protection;
(c) One circuit breaker may be used to protect two or more branch circuits, if the circuit breaker is adjusted to afford overcurrent protection for the smallest conductor.

Sec. 75.800-3 Testing, examination and maintenance of circuit breakers; procedures.

(a) Circuit breakers and their auxiliary devices protecting underground high-voltage circuits shall be tested and examined at least once each month by a person qualified as provided in Sec. 75.153;
(b) Tests shall include: (1) Breaking continuity of the ground check conductor, where ground check monitoring is used; and
(2) Actuating at least two (2) of the auxiliary protective relays.
(c) Examination shall include visual observation of all components of the circuit breaker and its auxiliary devices, and such repairs or adjustments as are indicated by such tests and examinations shall be carried out immediately.

Sec. 75.800-4 Testing, examination, and maintenance of circuit breakers; record.

(a) Recordkeeping. The operator shall make a record of each test, examination, repair, or adjustment of all circuit breakers protecting high-voltage circuits which enter any underground area of the mine.
(b) Record security. These records shall be made in a secure book that is not susceptible to alteration or electronically in a computer system so as to be secure and not susceptible to alteration.
(c) Retention and access. These records shall be retained at a surface location at the mine for at least one year and shall be made available to authorized representatives of the Secretary, the representative of miners, and other interested persons.

[64 FR 43287, Aug. 10, 1999]

Sec. 75.801 Grounding resistors.

[Statutory Provisions]

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.

Sec. 75.802 Protection of high-voltage circuits extending underground.

(a) Except as provided in paragraph (b) of this section, 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.
(b) Notwithstanding the requirements of paragraph (a) of this section, the Secretary or his authorized representative may permit ungrounded high-voltage circuits to be extended underground to feed stationary electric equipment if:
(1) Such circuits are either steel armored or installed in grounded, rigid steel conduit throughout their entire length; or,
(2) The voltage of such circuits is nominally 2,400 volts or less phase-to-phase and the cables used in such circuits are equipped with metallic shields around each power conductor,

[[Page 534]]

and contain one or more ground conductors having a total cross sectional area of not less than one-half the power conductor; and,
(3) Upon a finding by the Secretary or his authorized representative that the use of the circuits described in paragraphs (b) (1) and (2) of this section does not pose a hazard to the miners.
(c) Within 100 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.

[38 FR 4975, Feb. 23, 1973]

Sec. 75.803 Fail safe ground check circuits on high-voltage resistance grounded systems.

[Statutory Provisions]

On and after September 30, 1970, 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 12 months, may be permitted by the Secretary on a mine-by-mine basis if he determines that such equipment is not available.

Sec. 75.803-1 Maximum voltage ground check circuits.

The maximum voltage used for ground check circuits under Sec. 75.803 shall not exceed 96 volts.

Sec. 75.803-2 Ground check systems not employing pilot check wires; approval by the Secretary.

Ground check systems not employing pilot check wires will be approved only if it is determined that the system includes a fail safe design causing the circuit breaker to open when ground continuity is broken.

Sec. 75.804 Underground high-voltage cables.

(a) 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 external conductor not smaller than No. 8 (A.W.G.) or an insulated internal ground check conductor not smaller than No. 10 (A.W.G.) for the ground continuity check circuit.
(b) All such cables shall be adequate for the intended current and voltage. Splices made in such cables shall provide continuity of all components.

[38 FR 4976, Feb. 23, 1973]

Sec. 75.805 Couplers.

[Statutory Provisions]

Couplers that are used with medium-voltage or high-voltage power circuits shall be of the three-phase type with a full metallic shell,

except that the Secretary may permit, under such guidelines as he may prescribe, no less effective couplers constructed of materials other than metal. Couplers shall be adequate for the voltage and current expected. All exposed metal on the metallic couplers shall be grounded to the ground conductor in the cable. The coupler shall be constructed so that the ground check continuity conductor shall be broken first and the ground conductors shall be broken last when the coupler is being uncoupled.

[[Page 535]]

Sec. 75.806 Connection of single-phase loads.

[Statutory Provisions]

Single-phase loads, such as transformer primaries, shall be connected phase-to-phase.

Sec. 75.807 Installation of high-voltage transmission cables.

[Statutory Provisions]

All underground high-voltage transmission cables shall be installed only in regularly inspected air courses and haulageways, and shall be covered, buried, or placed so as to afford protection against damage, guarded where men regularly work or pass under them unless they are 6\1/2\ feet or more above the floor or rail, securely anchored, properly insulated, and guarded at ends, and covered, insulated, or placed to prevent contact with trolley wires and other low-voltage circuits.

Sec. 75.808 Disconnecting devices.

[Statutory Provisions]

Disconnecting devices shall be installed at the beginning of branch lines in high-voltage circuits and equipped or designed in such a manner that it can be determined by visual observation that the circuit is deenergized when the switches are open.

Sec. 75.809 Identification of circuit breakers and disconnecting switches.

[Statutory Provisions]

Circuit breakers and disconnecting switches underground shall be marked for identification.

Sec. 75.810 High-voltage trailing cables; splices.

[Statutory Provisions]

In the case of high-voltage cables used as trailing cables, temporary splices shall not be used and all permanent splices shall be made in accordance with Sec. 75.604. Terminations and splices in all other high-voltage cables shall be made in accordance with the manufacturer's specifications.

Sec. 75.811 High-voltage underground equipment; grounding.

[Statutory Provisions]

Frames, supporting structures and enclosures of stationary, portable, or mobile underground high-voltage equipment and all high-voltage equipment supplying power to such equipment receiving power from resistance grounded systems shall be effectively grounded to the high-voltage ground.

Sec. 75.812 Movement of high-voltage power centers and portable transformers; permit.

[Statutory Provisions]

Power centers and portable transformers shall be deenergized before they are moved from one location to another, except that, when equipment powered by sources other than such centers or transformers is not available, the Secretary may permit such centers and transformers to be moved while energized, if he determines that another equivalent or greater hazard may otherwise be created, and if they are moved under the supervision of a qualified person, and if such centers and transformers are examined prior to such movement by such person and found to be grounded by methods approved by an authorized representative of the Secretary and otherwise protected from hazards to the miner. A record shall be kept of such examinations. High-voltage cables, other than trailing cables, shall not be moved or handled at any time while energized, except that, when such centers and transformers are moved while energized as permitted under this section, energized high-voltage cables attached to such centers and transformers may be moved only by a qualified person and the operator of such mine shall require that such person wear approved and tested insulated wireman's gloves.

[35 FR 17890, Nov. 20, 1970, as amended at 60 FR 33723, June 29, 1995]

Sec. 75.812-1 Qualified person.

A person who meets the requirements of Sec. 75.153 is a qualified person within the meaning of Sec. 75.812.

Sec. 75.812-2 High-voltage power centers and transformers; record of examination.

The operator shall maintain a record of all examinations conducted in accordance with Sec. 75.812. Such record shall be kept in a book approved by the Secretary.

High-Voltage Longwalls

Source: 67 FR 11001, Mar. 11, 2002, unless otherwise noted.

Sec. 75.813 High-voltage longwalls; scope.

Sections 75.814 through 75.822 of this part are electrical safety standards that apply to high-voltage longwall circuits and equipment. All other existing standards in 30 CFR must also apply to these longwall circuits and equipment where appropriate.

Sec. 75.814 Electrical protection.

(a) High-voltage circuits must be protected against short circuits, overloads, ground faults, and undervoltages by circuit-interrupting devices of adequate interrupting capacity as follows:

(1) Current settings of short-circuit protective devices must not exceed the setting specified in approval documentation, or seventy-five percent of the minimum available phase-to-phase short-circuit current, whichever is less.

(2) Time-delay settings of short-circuit protective devices used to protect any cable extending from the section power center to a motor-starter enclosure must not exceed the settings specified in approval documentation, or 0.25-second, whichever is less. Time delay settings of short-circuit protective devices used to protect motor and shearer circuits must not exceed the settings specified in approval documentation, or 3 cycles, whichever is less.

(3) Ground-fault currents must be limited by a neutral grounding resistor to not more than--

(i) 6.5 amperes when the nominal voltage of the power circuit is 2,400 volts or less; or

(ii) 3.75 amperes when the nominal voltage of the power circuit exceeds 2,400 volts.

(4) High-voltage circuits extending from the section power center must be provided with--

(i) Ground-fault protection set to cause deenergization at not more than 40 percent of the current rating of the neutral grounding resistor;

(ii) A backup ground-fault detection device to cause deenergization

when a ground fault occurs with the neutral grounding resistor open; and

(iii) Thermal protection for the grounding resistor that will deenergize the longwall power center if the resistor is subjected to a sustained ground fault. The thermal protection must operate at either 50 percent of the maximum temperature rise of the grounding resistor, or 150 [deg]C (302 [deg]F), whichever is less, and must open the ground-wire monitor circuit for the high-voltage circuit supplying the section power center. The thermal protection must not be dependent upon control power and may consist of a current transformer and overcurrent relay.

(5) High-voltage motor and shearer circuits must be provided with instantaneous ground-fault protection set at not more than 0.125-ampere.

(6) Time-delay settings of ground-fault protective devices used to provide coordination with the instantaneous ground-fault protection of motor and shearer circuits must not exceed 0.25-second.

(7) Undervoltage protection must be provided by a device which operates on loss of voltage to cause and maintain the interruption of power to a circuit to prevent automatic restarting of the equipment.

(b) Current transformers used for the ground-fault protection specified in paragraphs (a)(4)(i) and (5) of this section must be single window-type and must be installed to encircle all three phase conductors. Equipment safety grounding conductors must not pass through or be connected in series with ground-fault current transformers.

(c) Each ground-fault current device specified in paragraphs (a)(4)(i) and (5) of this section must be provided with a test circuit that will inject a primary current of 50 percent or less of the current rating of the grounding resistor through the current transformer and

[[Page 537]]

cause each corresponding circuit-interrupting device to open.

(d) Circuit-interrupting devices must not reclose automatically.

(e) Where two or more high-voltage cables are used to supply power to a common bus in a high-voltage enclosure, each cable must be provided with ground-wire monitoring. The ground-wire monitoring circuits must cause deenergization of each cable when either the ground-monitor or grounding conductor(s) of any cable become severed or open. On or after May 10, 2002, parallel connected cables on newly installed longwalls must be protected as follows:

(1) When one circuit-interrupting device is used to protect parallel connected cables, the circuit-interrupting device must be electrically interlocked with the cables so that the device will open when any cable is disconnected; or

(2) When two or more parallel circuit-interrupting devices are used to protect parallel connected cables, the circuit-interrupting devices must be mechanically and electrically interlocked. Mechanical interlocking must cause all devices to open simultaneously and electrical interlocking must cause all devices to open when any cable is disconnected.

Sec. 75.815 Disconnect devices.

(a) The section power center must be equipped with a main disconnecting device installed to deenergize all cables extending to longwall equipment when the device is in the ``open'' position. See Figures I-1 and I-2 in Appendix A to this subpart I.

(b) Disconnecting devices for motor-starter enclosures must be maintained in accordance with the approval requirements of paragraph (f) of Sec. 18.53 of part 18 of this chapter. The compartment for the disconnect device must be provided with a caution label to warn miners against entering the compartment before deenergizing the incoming high-voltage circuits to the compartment.

(c) Disconnecting devices must be rated for the maximum phase-to-phase voltage of the circuit in which they are installed, and for the full-load current of the circuit that is supplied power through the device.

(d) Each disconnecting device must be designed and installed so that --

(1) Visual observation determines that the contacts are open without removing any cover;

(2) All load power conductors can be grounded when the device is in the ``open'' position; and

(3) The device can be locked in the ``open'' position.

(e) Disconnecting devices, except those installed in explosion-proof enclosures, must be capable of interrupting the full-load current of the circuit or designed and installed to cause the current to be interrupted automatically prior to the opening of the contacts of the device. Disconnecting devices installed in explosion-proof enclosures must be maintained in accordance with the approval requirements of paragraph (f)(2)(iv) of Sec. 18.53 of part 18 of this chapter.

Sec. 75.816 Guarding of cables.

(a) High-voltage cables must be guarded at the following locations:

(1) Where persons regularly work or travel over or under the cables.

(2) Where the cables leave cable handling or support systems to extend to electric components.

(b) Guarding must minimize the possibility of miners contacting the cables and protect the cables from damage. The guarding must be made of grounded metal or nonconductive flame-resistant material.

Sec. 75.817 Cable handling and support systems.

Longwall mining equipment must be provided with cable-handling and support systems that are constructed, installed and maintained to minimize the possibility of miners contacting the cables and to protect the high-voltage cables from damage.

Sec. 75.818 Use of insulated cable handling equipment.

(a) Energized high-voltage cables must not be handled except when motor or shearer cables need to be trained. When cables need to be trained, high-voltage insulated gloves, mitts, hooks, tongs, slings, aprons, or

[[Page 538]]

other personal protective equipment capable of providing protection against shock hazard must be used to prevent direct contact with the cable.

(b) High-voltage insulated gloves, sleeves, and other insulated personal protective equipment must--

(1) Have a voltage rating of at least Class 1 (7,500 volts) that meets or exceeds ASTM F496-97, ``Standard Specification for In-Service Care of Insulating Gloves and Sleeves'' (1997).

(2) Be examined before each use for visible signs of damage;

(3) Be removed from the underground area of the mine or destroyed when damaged or defective; and

(4) Be electrically tested every 6 months in accordance with publication ASTM F496-97. ASTM F496-97 (Standard Specification for In-Service Care of Insulating Gloves and Sleeves, 1997) is incorporated by reference and may be inspected at any Coal Mine Health and Safety District and Subdistrict Office, or at MSHA's Office of Standards, 1100 Wilson Blvd., Room 2352, Arlington, Virginia 22209-3939, and at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: http://www.archives.gov/federal--register/code--of--federal--regulations/ibr--locations.html.In addition, copies of the document can be purchased from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428-2959. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51.

[67 FR 11001, Mar. 11, 2002, as amended at 67 FR 38386, June 4, 2002]

Sec. 75.819 Motor-starter enclosures; barriers and interlocks.

Compartment separation and cover interlock switches for motor-starter enclosures must be maintained in accordance with the approval requirements of paragraphs (a) and (b) of Sec. 18.53 of part 18 of this chapter.

Sec. 75.820 Electrical work; troubleshooting and testing.

(a) Electrical work on all circuits and equipment associated with

high-voltage longwalls must be performed only by persons qualified under Sec. 75.153 to perform electrical work on all circuits and equipment.

(b) Prior to performing electrical work, except for troubleshooting and testing of energized circuits and equipment as provided for in paragraph (d) of this section, a qualified person must do the following:

(1) Deenergize the circuit or equipment with a circuit-interrupting device.

(2) Open the circuit disconnecting device. On high-voltage circuits, ground the power conductors until work on the circuit is completed.

(3) Lock out the disconnecting device with a padlock. When more than one qualified person is performing work, each person must install an individual padlock.

(4) Tag the disconnecting device to identify each person working and the circuit or equipment on which work is being performed.

(c) Each padlock and tag must be removed only by the person who installed them, except that, if that person is unavailable at the mine, the lock and tag may be removed by a person authorized by the operator, provided--

(1) The authorized person is qualified under paragraph (a) of this section; and

(2) The operator ensures that the person who installed the lock and tag is aware of the removal before that person resumes work on the affected circuit or equipment.

(d) Troubleshooting and testing of energized circuits must be performed only--

(1) On low- and medium-voltage circuits;

(2) When the purpose of troubleshooting and testing is to determine voltages and currents; and

(3) By persons qualified to perform electrical work and who wear protective gloves on circuits that exceed 40 volts in accordance with the following table:

[[Page 539]]

Circuit voltage	Type of glove required
Greater than 120 volts (nominal) (not intrinsically safe).	Rubber insulating gloves with leather protectors.
40 volts to 120 volts (nominal) (both intrinsically safe and non-intrinsically safe).	Either rubber insulating gloves with leather protectors or dry work gloves.
Greater than 120 volts (nominal) (intrinsically safe).	Either rubber insulating gloves with leather protectors or dry work

gloves.

---

(4) Rubber insulating gloves must be rated at least for the nominal voltage of the circuit when the voltage of the circuit exceeds 120 volts nominal and is not intrinsically safe.

(e) Before troubleshooting and testing a low- or medium-voltage circuit contained in a compartment with a high-voltage circuit, the high-voltage circuit must be deenergized, disconnected, grounded, locked out and tagged in accordance with paragraph (b) of this section.

(f) Prior to the installation or removal of conveyor belt structure, high-voltage cables extending from the section power center to longwall equipment and located in the belt entries must be:

(1) Deenergized; or

(2) Guarded in accordance with Sec. 75.816 of this part, at the location where the belt structure is being installed or removed; or

(3) Located at least 6.5 feet above the mine floor.

Sec. 75.821 Testing, examination and maintenance.

(a) At least once every 7 days, a person qualified in accordance with Sec. 75.153 to perform electrical work on all circuits and equipment must test and examine each unit of high-voltage longwall equipment and circuits to determine that electrical protection, equipment grounding, permissibility, cable insulation, and control devices are being properly maintained to prevent fire, electrical shock, ignition, or operational hazards from existing on the equipment. Tests must include activating the ground-fault test circuit as required by Sec. 75.814(c).

(b) Each ground-wire monitor and associated circuits must be examined and tested at least once each 30 days to verify proper operation and that it will cause the corresponding circuit-interrupting device to open.

(c) When examinations or tests of equipment reveal a fire, electrical shock, ignition, or operational hazard, the equipment must be removed from service immediately or repaired immediately.

(d) At the completion of examinations and tests required by this section, the person who makes the examinations and tests must certify by signature and date that they have been conducted. A record must be made of any unsafe condition found and any corrective action taken. Certifications and records must be kept for at least one year and must be made available for inspection by authorized representatives of the Secretary and representatives of miners.

Sec. 75.822 Underground high-voltage longwall cables.

In addition to the high-voltage cable design specifications in Sec. 75.804 of this part, high-voltage cables for use on longwalls may be a

type SHD cable with a center ground-check conductor no smaller than a No. 16 AWG stranded conductor. The cables must be MSHA accepted as flame-resistant under part 18 or approved under subpart K of part 7.

[[Page 540]]

Appendix A to Subpart I to Part 75--Diagrams of Inby and Outby Switching
[GRAPHIC] [TIFF OMITTED] TR17AP02.030

[67 FR 11001, Mar. 11, 2002; 67 FR 18823, Apr. 17, 2002]

[[Page 541]]

Subpart J_Underground Low- and Medium-Voltage Alternating Current Circuits

Sec. 75.900 Low- and medium-voltage circuits serving three-phase alternating current equipment; circuit breakers.

[Statutory Provisions]

Low- and medium-voltage power circuits serving three-phase alternating current equipment 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 undervoltage, grounded phase, short circuit, and overcurrent.

Sec. 75.900-1 Circuit breakers; location.

Circuit breakers used to protect low-and medium-voltage circuits underground shall be located in areas which are accessible for inspection, examination, and testing, have safe roofs, and are clear of any moving equipment used in haulageways.

Sec. 75.900-2 Approved circuit schemes.

The following circuit schemes will be regarded as providing the necessary protection to the circuit required by Sec. 75.900:
(a) Ground check relays may be used for undervoltage protection if the relay coils are designed to trip the circuit breaker when line voltage decreases to 40 to 60 percent of the nominal line voltage.
(b) One undervoltage device installed in the main secondary circuit at the source transformer may be used to provide undervoltage protection for each circuit that receives power from that transformer.
(c) One circuit breaker may be used to protect two or more branch circuits if the circuit breaker is adjusted to afford overcurrent

protection for the smallest conductor.
(d) Circuit breakers with shunt trip, series trip or undervoltage release devices may be used if the tripping elements of such devices are selected or adjusted in accordance with the settings listed in the tables of the National Electric Code, 1968.

Sec. 75.900-3 Testing, examination, and maintenance of circuit breakers; procedures.

Circuit breakers protecting low- and medium-voltage alternating current circuits serving three-phase alternating current equipment and their auxiliary devices shall be tested and examined at least once each month by a person qualified as provided in Sec. 75.153. In performing such tests, actuating any of the circuit breaker auxiliaries or control circuits in any manner which causes the circuit breaker to open, shall be considered a proper test. All components of the circuit breaker and its auxiliary devices shall be visually examined and such repairs or adjustments as are indicated by such tests and examinations shall be carried out immediately.

Sec. 75.900-4 Testing, examination, and maintenance of circuit breakers; record.

The operator of any coal mine shall maintain a written record of each test, examination, repair, or adjustment of all circuit breakers protecting low- and medium-voltage circuits serving three-phase alternating current equipment used in the mine. Such record shall be kept in a book approved by the Secretary.

[35 FR 17890, Nov. 20, 1970, as amended at 60 FR 33723, June 29, 1995]

Sec. 75.901 Protection of low- and medium-voltage three-phase circuits used underground.

[Statutory Provisions]

(a) Low- and medium-voltage three-phase alternating-current circuits used underground shall contain either a direct or derived neutral which shall be grounded through a suitable resistor at the power center, 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 the electrical equipment supplied power from that circuit, except that the Secretary or his authorized representative may permit

[[Page 542]]

ungrounded low- and medium-voltage circuits to be used underground to

feed such stationary electrical equipment if such circuits are either steel armored or installed in grounded rigid steel conduit throughout their entire length. The grounding resistor, where required, shall be of the proper ohmic value to limit the ground fault current to 25 amperes. 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.

Sec. 75.902 Low- and medium-voltage ground check monitor circuits.

[Statutory Provisions]

On or before September 30, 1970, low- and medium-voltage resistance grounded systems shall include a fail-safe ground check circuit to monitor continuously the grounding circuit to assure continuity which 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 extention of time, not in excess of 12 months, may be permitted by the Secretary on a mine-by-mine basis if he determines that such equipment is not available. Cable couplers shall be constructed so that the ground check continuity conductor shall be broken first and the ground conductors shall be broken last when the coupler is being uncoupled.

Sec. 75.902-1 Maximum voltage ground check circuits.

The maximum voltage used for such ground check circuits shall not exceed 40 volts.

Sec. 75.902-2 Approved ground check systems not employing pilot check wires.

Ground check systems not employing pilot check wires will be approved only if it is determined that the system includes a fail safe design causing the circuit breaker to open when ground continuity is broken.

Sec. 75.902-4 Attachment of ground conductors and ground check wires to equipment frames; use of separate connections.

In grounding equipment frames of all stationary, portable or mobile equipment receiving power from resistance grounded systems separate connections shall be used when practicable.

Sec. 75.903 Disconnecting devices.

[Statutory Provisions]

Disconnecting devices shall be installed in conjunction with the circuit breaker to provide visual evidence that the power is disconnected.

Sec. 75.904 Identification of circuit breakers.

[Statutory Provisions]

Circuit breakers shall be marked for identification.

Sec. 75.905 Connection of single-phase loads.

[Statutory Provisions]

Single-phase loads shall be connected phase-to-phase.

Sec. 75.906 Trailing cables for mobile equipment, ground wires, and ground check wires.

[Statutory Provisions]

Trailing cables for mobile equipment shall contain one or more ground conductors having a cross-sectional area of not less than one-half the power conductor, and, on September 30, 1970, an insulated conductor for the ground continuity check circuit 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 12 months may be permitted by the Secretary on a mine-by-mine basis if he determines that such equipment is not available. Splices made in the cables shall provide continuity of all components.

[[Page 543]]

Sec. 75.907 Design of trailing cables for medium-voltage circuits.

[Statutory Provisions]

Trailing cables for medium-voltage circuits shall include grounding conductors, a ground check conductor, and grounded metallic shields around each power conductor or a ground metallic shield over the assembly, except that on equipment employing cable reels, cables without shields may be used if the insulation is rated 2,000 volts or more.

Subpart K_Trolley Wires and Trolley Feeder Wires

Sec. 75.1000 Cutout switches.

[Statutory Provisions]

Trolley wires and trolley feeder wires, shall be provided with cutout switches at intervals of not more than 2,000 feet and near the beginning of all branch lines.

Sec. 75.1001 Overcurrent protection.

[Statutory Provisions]

Trolley wires and trolley feeder wires shall be provided with overcurrent protection.

Sec. 75.1001-1 Devices for overcurrent protection; testing and calibration requirements; records.

(a) Automatic circuit interrupting devices that will deenergize the affected circuit upon occurrence of a short circuit at any point in the system will meet the requirements of Sec. 75.1001.
(b) Automatic circuit interrupting devices described in paragraph (a) of this section shall be tested and calibrated at intervals not to exceed six months. Testing of such devices shall include passing the necessary amount of electric current through the device to cause activation. Calibration of such devices shall include adjustment of all associated relays to <plus-minus<ls-thn-eq>15 percent of the indicated value. An authorized representative of the Secretary may require additional testing or calibration of these devices.
(c) A record of the tests and calibrations required by paragraph (b) of this section shall be kept, and shall be made available, upon request, to an authorized representative of the Secretary.

[38 FR 29998, Oct. 31, 1973, as amended at 60 FR 33723, June 29, 1995]

Sec. 75.1002 Installation of electric equipment and conductors; permissibility.

(a) Electric equipment must be permissible and maintained in a permissible condition when such equipment is located within 150 feet of pillar workings or longwall faces.
(b) Electric conductors and cables installed in or inby the last open crosscut or within 150 feet of pillar workings or longwall faces must be--
(1) Shielded high-voltage cables supplying power to permissible longwall equipment;
(2) Interconnecting conductors and cables of permissible longwall equipment;
(3) Conductors and cables of intrinsically safe circuits; and

(4) Cables and conductors supplying power to low- and medium-voltage permissible equipment.

[67 FR 11004, Mar. 11, 2002]

Sec. 75.1003 Insulation of trolley wires, trolley feeder wires and bare signal wires; guarding of trolley wires and trolley feeder wires.

[Statutory Provisions]

Trolley wires, trolley feeder wires, and bare signal wires shall be insulated adequately where they pass through doors and stoppings, and where they cross other power wires and cables. Trolley wires and trolley feeder wires shall be guarded adequately:
(a) At all points where men are required to work or pass regularly under the wires;
(b) On both sides of all doors and stoppings; and
(c) At man-trip stations.

The Secretary or his authorized representatives shall specify other conditions where trolley wires and trolley

[[Page 544]]

feeder wires shall be adequately protected to prevent contact by any person, or shall require the use of improved methods to prevent such contact. Temporary guards shall be provided where trackmen and other persons work in proximity to trolley wires and trolley feeder wires.

Sec. 75.1003-1 Other requirements for guarding of trolley wires and trolley feeder wires.

Adequate precaution shall be taken to insure that equipment being moved along haulageways will not come in contact with trolley wires or trolley feeder wires.

Sec. 75.1003-2 Requirements for movement of off-track mining equipment in areas of active workings where energized trolley wires or trolley feeder wires are present; pre-movement requirements; certified and qualified persons.

(a) Prior to moving or transporting any unit of off-track mining equipment in areas of the active workings where energized trolley wires or trolley feeder wires are present:
(1) The unit of equipment shall be examined by a certified person to ensure that coal dust, float coal dust, loose coal oil, grease, and other combustible materials have been cleaned up and have not been

permitted to accumulate on such unit of equipment; and,

(2) A qualified person, as specified in Sec. 75.153 of this part, shall examine the trolley wires, trolley feeder wires, and the associated automatic circuit interrupting devices provided for short circuit protection to ensure that proper short circuit protection exists.

(b) A record shall be kept of the examinations required by paragraph (a) of this section, and shall be made available, upon request, to an authorized representative of the Secretary.

(c) Off-track mining equipment shall be moved or transported in areas of the active workings where energized trolley wires or trolley feeder wires are present only under the direct supervision of a certified person who shall be physically present at all times during moving or transporting operations.

(d) The frames of off-track mining equipment being moved or transported, in accordance with this section, shall be covered on the top and on the trolley wire side with fire-resistant material which has met the applicable requirements of Part 18 of Subchapter D of this chapter (Bureau of Mines Schedule 2G).

(e) Electrical contact shall be maintained between the mine track and the frames of off-track mining equipment being moved in-track and trolley entries, except that rubber-tired equipment need not be grounded to a transporting vehicle if no metal part of such rubber-tired equipment can come into contact with the transporting vehicle.

(f) A minimum vertical clearance of 12 inches shall be maintained between the farthest projection of the unit of equipment which is being moved and the energized trolley wires or trolley feeder wires at all times during the movement or transportation of such equipment; provided, however, that if the height of the coal seam does not permit 12 inches of vertical clearance to be so maintained, the following additional precautions shall be taken:

(1)(i) Except as provided in paragraph (f)(1)(ii) of this section electric power shall be supplied to the trolley wires or trolley feeder wires only from outby the unit of equipment being moved or transported.

(ii) Where direct current electric power is used and such electric power can be supplied only from inby the equipment being moved or transported, power may be supplied from inby such equipment provided a miner with the means to cut off the power, and in direct communication with persons actually engaged in the moving or transporting operation, is stationed outby the equipment being moved.

(2) The settings of automatic circuit interrupting devices used to provide short circuit protection for the trolley circuit shall be reduced to not more than one-half of the maximum current that could flow if the equipment being moved or transported were to come into contact with the trolley wire or trolley feeder wire;

(3) At all times the unit of equipment is being moved or transported, a miner shall be stationed at the first automatic circuit breaker outby the equipment being moved and such miner shall be: (i) In

direct communication with

[[Page 545]]

persons actually engaged in the moving or transporting operation, and (ii) capable of communicating with the responsible person on the surface required to be on duty in accordance with Sec. 75.1600-1 of this part;
(4) Where trolley phones are utilized to satisfy the requirements of paragraph (f)(3) of this section, telephones or other equivalent two-way communication devices that can readily be connected with the mine communication system shall be carried by the miner stationed at the first automatic circuit breaker outby the equipment being moved and by a miner actually engaged in the moving or transporting operation; and,
(5) No person shall be permitted to be inby the unit of equipment being moved or transported, in the ventilating current of air that is passing over such equipment, except those persons directly engaged in moving such equipment.
(g) The provisions of paragraphs (a) through (f) of this section shall not apply to units of mining equipment that are transported in mine cars, provided that no part of the equipment extends above or over the sides of the mine car.

CFR PART 77

Sec. 75.1100 Requirements.

Each coal mine shall be provided with suitable firefighting equipment adapted for the size and conditions of the mine. The Secretary shall establish minimum requirements of the type, quality, and quantity of such equipment.

Sec. 75.1100-1 Type and quality of firefighting equipment.

Firefighting equipment required under this subpart shall meet the following minimum requirements:
(a) Waterlines: Waterlines shall be capable of delivering 50 gallons of water a minute at a nozzle pressure of 50 pounds per square inch.
(b) Portable water cars: A portable water car shall be of at least

1,000 gallons capacity (500 gallons capacity for anthracite mines) and shall have at least 300 feet of fire hose with nozzles. A portable water car shall be capable of providing a flow through the hose of 50 gallons of water per minute at a nozzle pressure of 50 pounds per square inch.

(c) A portable chemical car shall carry enough chemicals to provide a fire extinguishing capacity equivalent to that of a portable water car.

(d) Portable foam-generating machines or devices: A portable foam-generating machine or device shall have facilities and equipment for supplying the machine with 30 gallons of water per minute at 30 pounds per square inch for a period of 35 minutes.

(e) Portable fire extinguisher: A portable fire extinguisher shall be either (1) a multipurpose dry chemical type containing a nominal weight of 5 pounds of dry powder and enough expellant to apply the powder or (2) a foam-producing type containing at least 2\1/2\ gallons of foam-producing liquids and enough expellant to supply the foam. Only fire extinguishers approved by the Underwriters Laboratories, Inc., or Factory Mutual Research Corp., carrying appropriate labels as to type and purpose, shall be used. After March 30, 1971, all new portable fire extinguishers acquired for use in a coal mine shall have a 2A 10 BC or higher rating.

(f)(1) Except as provided in paragraph (f)(2) of this section, the fire hose shall be lined with a material having flame resistant qualities meeting requirements for hose in Bureau of Mines' Schedule 2G. The cover shall be polyester, or other material with flame-spread qualities and mildew resistance equal or superior to polyester. The bursting pressure shall be at least 4 times the water pressure at the valve to the hose inlet with the valve closed; the maximum water pressure in the hose nozzle shall not exceed 100 p.s.i.g.

(2) Fire hose installed for use in underground coal mines prior to December 30, 1970, shall be mildew-proof and have a bursting pressure at least 4 times the water pressure at the valve to the hose inlet with the valve closed, and the maximum water pressure in the hose nozzle with water flowing shall not exceed 100 p.s.i.g.

[[Page 546]]

Sec. 75.1100-2 Quantity and location of firefighting equipment.

(a) Working sections. (1) Each working section of coal mines producing 300 tons or more per shift shall be provided with two portable fire extinguishers and 240 pounds of rock dust in bags or other suitable containers; waterlines shall extend to each section loading point and be equipped with enough fire hose to reach each working face unless the section loading point is provided with one of the following:

(i) Two portable water cars; or

(ii) Two portable chemical cars; or

(iii) One portable water car or one portable chemical car, and

either (a) a portable foam-generating machine or (b) a portable high-pressure rock-dusting machine fitted with at least 250 feet of hose and supplied with at least 60 sacks of rock dust.

(2) Each working section of coal mines producing less than 300 tons of coal per shift shall be provided with two portable fire extinguishers, 240 pounds of rock dust in bags or other suitable containers, and at least 500 gallons of water and at least 3 pails of 10 quart capacity. In lieu of the 500 gallon water supply a waterline with sufficient hose to reach the working places, a portable water car (500 gallons capacity) or a portable all-purpose dry powder chemical car of at least 125-pounds capacity may be provided.

(b) Belt conveyors. In all coal mines, waterlines shall be installed parallel to the entire length of belt conveyors and shall be equipped with firehose outlets with valves at 300-foot intervals along each belt conveyor and at tailpieces. At least 500 feet of firehose with fittings suitable for connection with each belt conveyor waterline system shall be stored at strategic locations along the belt conveyor. Waterlines may be installed in entries adjacent to the conveyor entry belt as long as the outlets project into the belt conveyor entry.

(c) Haulage tracks. (1) In mines producing 300 tons of coal or more per shift waterlines shall be installed parallel to all haulage tracks using mechanized equipment in the track or adjacent entry and shall extend to the loading point of each working section. Waterlines shall be equipped with outlet valves at intervals of not more than 500 feet, and 500 feet of firehose with fittings suitable for connection with such waterlines shall be provided at strategic locations. Two portable water cars, readily available, may be used in lieu of waterlines prescribed under this paragraph.

(2) In mines producing less than 300 tons of coal per shift, there shall be provided at 500-foot intervals in all main and secondary haulage roads:

(i) A tank of water of at least 55-gallon capacity with at least 3 pails of not less than 10-quart capacity; or

(ii) Not less than 240 pounds of bagged rock dust.

(d) Transportation. Each track or off-track locomotive, self-propelled man-trip car, or personnel carrier shall be equipped with one portable fire extinguisher.

(e) Electrical installations. (1) Two portable fire extinguishers or one extinguisher having at least twice the minimum capacity specified for a portable fire extinguisher in Sec. 75.1100-1(e) shall be provided at each permanent electrical installation.

(2) One portable fire extinguisher and 240 pounds of rock dust shall be provided at each temporary electrical installation.

(f) Oil storage stations. Two portable fire extinguishers and 240 pounds of rock dust, shall be provided at each permanent underground oil storage station. One portable fire extinguisher shall be provided at each working section where 25 gallons or more of oil are stored in addition to extinguishers required under paragraph (a) of this section.

(g) Welding, cutting, soldering. One portable fire extinguisher or 240 pounds of rock dust shall be provided at locations where welding, cutting, or soldering with arc or flame is being done.
(h) Powerlines. At each wooden door through which powerlines pass there shall be one portable fire extinguisher or 240 pounds of rock dust within 25 feet of the door on the intake air side.
(i) Emergency materials. (1) At each mine producing 300 tons of coal or more per shift there shall be readily available the following materials at locations not exceeding 2 miles from each working section:

1,000 board feet of brattice boards

[[Page 547]]

2 rolls of brattice cloth
2 hand saws
25 pounds of 8\d\ nails
25 pounds of 10\d\R17*nails
25 pounds of 16\d\ nails
3 claw hammers
25 bags of wood fiber plaster or 10 bags of cement (or equivalent material for stoppings)
5 tons of rock dust

(2) At each mine producing less than 300 tons of coal per shift the above materials shall be available at the mine, provided, however, that the emergency materials for one or more mines may be stored at a central warehouse or building supply company and such supply must be the equivalent of that required for all mines involved and within 1-hour's delivery time from each mine. This exception shall not apply where the active working sections are more than 2 miles from the surface.

Sec. 75.1100-3 Condition and examination of firefighting equipment.

All firefighting equipment shall be maintained in a usable and operative condition. Chemical extinguishers shall be examined every 6 months and the date of the examination shall be written on a permanent tag attached to the extinguisher.

[35 FR 17890, Nov. 20, 1970, as amended at 60 FR 33723, June 29, 1995]

Sec. 75.1101 Deluge-type water sprays, foam generators; main and secondary belt-conveyor drives.

[Statutory Provisions]

Deluge-type water sprays or foam generators automatically actuated by rise in temperature, or other no less effective means approved by the

Secretary of controlling fire, shall be installed at main and secondary belt-conveyor drives.

Sec. 75.1101-1 Deluge-type water spray systems.

(a) Deluge-type spray systems shall consist of open nozzles attached to branch lines. The branch lines shall be connected to a waterline through a control valve operated by a fire sensor. Actuation of the control valve shall cause water to flow into the branch lines and discharge from the nozzles.
(b) Nozzles attached to the branch lines shall be full cone, corrosion resistant and provided with blow-off dust covers. The spray application rate shall not be less than 0.25 gallon per minute per square foot of the top surface of the top belt and the discharge shall be directed at both the upper and bottom surfaces of the top belt and to the upper surface of the bottom belt.

Sec. 75.1101-2 Installation of deluge-type sprays.

Deluge-type water spray systems shall provide protection for the belt drive and 50 feet of fire-resistant belt or 150 feet of nonfire-resistant belt adjacent to the belt drive.

Sec. 75.1101-3 Water requirements.

Deluge-type water spray systems shall be attached to a water supply. Water so supplied shall be free of excessive sediment and noncorrosive to the system Water pressure shall be maintained consistent with the pipe, fittings, valves, and nozzles at all times. Water systems shall include strainers with a flush-out connection and a manual shut-off valve. The water supply shall be adequate to provide flow for 10 minutes except that pressure tanks used as a source of water supply shall be of 1,000-gallon capacity for a fire-resistant belt and 3,000 gallons for a nonfire-resistant belt may be provided.

Sec. 75.1101-4 Branch lines.

As a part of the deluge-type water spray system, two or more branch lines of nozzles shall be installed. The maximum distance between nozzles shall not exceed 8 feet.

Sec. 75.1101-5 Installation of foam generator systems.

(a) Foam generator systems shall be located so as to discharge foam to the belt drive, belt takeup, electrical controls, gear reducing unit and the conveyor belt.
(b) Foam generator systems shall be equipped with a fire sensor which actuates the system, and each system shall be capable of producing

and delivering the following amounts of foam within 5 minutes:

[[Page 548]]

(1) At fire-resistant belt installations, an amount which will fully envelop the belt drive, belt takeup, electrical controls, gear reducing unit, and the conveyor belt over a distance of 50 feet; and,
(2) At nonfire-resistant belt installations, an amount which will fully envelop the belt drive, belt takeup electrical controls, gear reducing unit, and the conveyor belt over a distance of 150 feet.
(c) The foam generator shall be equipped with a warning device designed to stop the belt drive when a fire occurs and all such warning devices shall be capable of giving both an audible and visual signal when actuated by fire.
(d) Water, power, and chemicals required shall be adequate to maintain water or foam flow for no less than 25 minutes.
(e) Water systems shall include strainers with a flush-out connection and a manual shut-off valve.

Sec. 75.1101-6 Water sprinkler systems; general.

Water sprinkler systems may be installed to protect main and secondary belt-conveyor drives, however, where such systems are employed, they shall be installed and maintained in accordance with Sec. Sec. 75.1101-7 through 75.1101-11.

Sec. 75.1101-7 Installation of water sprinkler systems; requirements.

(a) The fire-control components of each water sprinkler system shall be installed, as far as practicable in accordance with the recommendations set forth in National Fire Protection Association 1968-69 edition, Code No. 13, ``Installation of Sprinkler Systems'' and such systems' components shall be of a type approved by the Underwriters' Laboratories, Inc., Factory Mutual Research Corp.
(b) Each sprinkler system shall provide protection for the motor drive belt takeup, electrical controls, gear reducing unit, and the 50 feet of fire-resistant belt, or 150 feet of nonfire-resistant belt adjacent to the belt drive.
(c) The components of each water sprinkler system shall be located so as to minimize the possibility of damage by roof fall or by the moving belt and its load.

Sec. 75.1101-8 Water sprinkler systems; arrangement of sprinklers.

(a) At least one sprinkler shall be installed above each belt drive, belt take-up, electrical control, and gear-reducing unit, and individual sprinklers shall be installed at intervals of no more than 8 feet along all conveyor branch lines.

(b) Two or more branch lines, at least one of which shall be above the top belt and one between the top and bottom belt, shall be installed in each sprinkler system to provide a uniform discharge of water to the belt surface.

(c) The water discharge rate from the sprinkler system shall not be less than 0.25 gallon per minute per square foot of the top surface of the top belt and the discharge shall be directed at both the upper and bottom surfaces of the top belt and to the upper surface of the bottom belt. The supply of water shall be adequate to provide a constant flow of water for 10 minutes with all sprinklers functioning.

(d) Each individual sprinkler shall be activated at a temperature of not less than 150 [deg]F. and not more than 300 [deg]F.

(e) Water systems shall include strainers with a flush-out connection and a manual shut-off valve.

Sec. 75.1101-9 Back-up water system.

One fire hose outlet together with a length of hose capable of extending to the belt drive shall be provided within 300 feet of each belt drive.

Sec. 75.1101-10 Water sprinkler systems; fire warning devices at belt drives.

Each water sprinkler system shall be equipped with a device designed to stop the belt drive in the event of a rise in temperature and each such warning device shall be capable of giving both an audible and visual warning when a fire occurs.

Sec. 75.1101-11 Inspection of water sprinkler systems.

Each water sprinkler system shall be examined weekly and a functional test of the complete system shall be conducted at least once each year.

[[Page 549]]

Sec. 75.1101-12 Equivalent dry-pipe system.

Where water sprinkler systems are installed to protect main and secondary belt conveyor drives and freezing temperatures prevail, an equivalent dry-pipe system may be installed.

Sec. 75.1101-13 Dry powder chemical systems; general.

Self-contained dry powder chemical systems may be installed to protect main and secondary belt conveyor drives, however, where such systems are employed, they shall be installed and maintained in

accordance with the provisions of Sec. Sec. 75.1101-14 through 75.1101-22.

Sec. 75.1101-14 Installation of dry powder chemical systems.

(a) Self-contained dry powder chemical systems shall be installed to protect each belt-drive, belt takeup, electrical-controls, gear reducing units and 50 feet of fire-resistant belt or 150 feet of non-fire-resistant belt adjacent to the belt drive.
(b) The fire-control components of each dry powder chemical system shall be a type approved by the Underwriters' Laboratories, Inc., or Factory Mutual Engineering Corp.
(c) The components of each dry powder chemical system shall be located so as to minimize the possibility of damage by roof fall or by the moving belt and its load.

Sec. 75.1101-15 Construction of dry powder chemical systems.

(a) Each self-contained dry powder system shall be equipped with hose or pipe lines which are no longer than necessary.
(b) Metal piping and/or hose between control valves and nozzles shall have a minimum bursting pressure of 500 p.s.i.g.
(c) Hose shall be protected by wire braid or its equivalent.
(d) Nozzles and reservoirs shall be sufficient in number to provide maximum protection to each belt, belt takeup, electrical controls, and gear reducing unit.
(e) Each belt shall be protected on the top surface of both the top and bottom belts and the bottom surface of the top belt.

Sec. 75.1101-16 Dry powder chemical systems; sensing and fire-suppression devices.

(a) Each self-contained dry powder chemical system shall be equipped with sensing devices which shall be designed to activate the fire-control system, sound an alarm and stop the conveyor drive motor in the event of a rise in temperature, and provision shall be made to minimize contamination of the lens of any optical sensing device installed in such system.
(b) Where sensors are operated from the same power source as the belt drive, each sensor shall be equipped with a standby power source which shall be capable of remaining operative for at least 4 hours after a power cutoff.
(c) Sensor systems shall include a warning indicator (or test circuit) which shows it is operative.
(d) Each fire-suppression system shall be equipped with a manually operated control valve which shall be independent of the sensor.

Sec. 75.1101-17 Sealing of dry powder chemical systems.

Each dry powder chemical system shall be adequately sealed to protect all components of the system from moisture dust, and dirt.

Sec. 75.1101-18 Dry powder requirements.

Each dry powder chemical system shall contain the following minimum amounts of multipurpose dry powder:

Belt	Dry powder, pounds
Fire resistant	125
Non-fire resistant	250

Sec. 75.1101-19 Nozzles; flow rate and direction.

The nozzles of each dry powder chemical system shall be capable of discharging all powder within 1 minute after actuation of the system and such nozzles shall be directed so as to minimize the effect of ventilation upon fire control.

[[Page 550]]

Sec. 75.1101-20 Safeguards for dry powder chemical systems.

Adequate guards shall be provided along all belt conveyors in the vicinity of each dry powder chemical system to protect persons whose vision is restricted by a discharge of powder from the system. In addition, hand-rails shall be installed in such areas to provide assistance to those passing along the conveyor after a powder discharge.

Sec. 75.1101-21 Back-up water system.

One fire hose outlet together with a length of hose capable of extending to the belt drive shall be provided within 300 feet of each belt drive.

Sec. 75.1101-22 Inspection of dry powder chemical systems.

(a) Each dry powder chemical system shall be examined weekly and a functional test of the complete system shall be conducted at least once each year.
(b) Where the dry powder chemical system has been actuated, all components of the system shall be cleaned immediately by flushing all

powder from pipes and hoses and all hose damaged by fire shall be replaced.

Sec. 75.1102 Slippage and sequence switches.

[Statutory Provisions]

Underground belt conveyors shall be equipped with slippage and sequence switches.

Sec. 75.1103 Automatic fire warning devices.

[Statutory Provisions]

On or before May 29, 1970, devices shall be installed on all such belts which will give a warning automatically when a fire occurs on or near such belt. The Secretary shall prescribe a schedule for installing fire suppression devices on belt haulageways.

Sec. 75.1103-1 Automatic fire sensors.

A fire sensor system shall be installed on each underground belt conveyor. Sensors so installed shall be of a type which will (a) give warning automatically when a fire occurs on or near such belt; (b) provide both audible and visual signals that permit rapid location of the fire.

Sec. 75.1103-2 Automatic fire sensors; approved components; installation requirements.

(a) The components of each automatic fire sensor required to be installed in accordance with the provisions of Sec. 75.1103-1 shall be of a type and installed in a manner approved by the Secretary, or the components shall be of a type listed, approved and installed in accordance with the recommendations of a nationally recognized testing laboratory approved by the Secretary.
(b) Where applicable, and not inconsistent with these regulations, automatic fire sensors shall be installed in accordance with the recommendations set forth in National Fire Code No. 72A ``Local Protective Signaling Systems'' (NFPA No. 72A-1967). National Fire Code No. 72A (1967) is hereby incorporated by reference and made a part hereof. National Fire Code No. 72A is available for examination at each Coal Mine Health and Safety District and Subdistrict Office of the Mine Safety and Health Administration, and may be obtained from the National Fire Protection Association, 60 Batterymarch Street, Boston, MA 02110.

[37 FR 16546, Aug. 16, 1972]

Sec. 75.1103-3 Automatic fire sensor and warning device systems; minimum requirements; general.

Automatic fire sensor and warning device systems installed in belt haulageways of underground coal mines shall be assembled from components which meet the minimum requirements set forth in Sec. Sec. 75.1103-4 through 75.1103-7 unless otherwise approved by the Secretary.

[37 FR 16545, Aug. 16, 1972]

Sec. 75.1103-4 Automatic fire sensor and warning device systems; installation; minimum requirements.

(a) Automatic fire sensor and warning device systems shall provide identification of fire within each belt flight (each belt unit operated by a belt drive).
(1) Where used, sensors responding to temperature rise at a point (point-type

[[Page 551]]

sensors) shall be located at or above the elevation of the top belt, and installed at the beginning and end of each belt flight, at the belt drive, and in increments along each belt flight so that the maximum distance between sensors does not exceed 125 feet, except as provided in paragraph (a) (3) of this section.
(2) Where used, sensors responding to radiation, smoke, gases, or other indications of fire, shall be spaced at regular intervals to provide protection equivalent to point-type sensors, and installed within the time specified in paragraph (a) (3) of this section.
(3) When the distance from the tailpiece at loading points to the first outby sensor reaches 125 feet when point-type sensors.

CFR PART 77

Sec. 77.500 Electric power circuits and electric equipment; deenergization.

Power circuits and electric equipment shall be deenergized before work is done on such circuits and equipment, except when necessary for troubleshooting or testing.

Sec. 77.501 Electric distribution circuits and equipment; repair.

No electrical work shall be performed on electric distribution

circuits or equipment, except by a qualified person or by a person trained to perform electrical work and to maintain electrical equipment under the direct supervision of a qualified person. Disconnecting devices shall be locked out and suitably tagged by the persons who perform such work, except that in cases where locking out is not possible, such devices shall be opened and suitably tagged by such persons. Locks or tags shall be removed only by the persons who installed them or, if such persons are unavailable, by persons authorized by the operator or his agent.

Sec. 77.501-1 Qualified person.

A qualified person within the meaning of Sec. 77.501 is an individual who meets the requirements of Sec. 77.103.

[[Page 632]]

Sec. 77.502 Electric equipment; examination, testing, and maintenance.

Electric equipment shall be frequently examined, tested, and properly maintained by a qualified person to assure safe operating conditions. When a potentially dangerous condition is found on electric equipment, such equipment shall be removed from service until such condition is corrected. A record of such examinations shall be kept.

Sec. 77.502-1 Qualified person.

A qualified person within the meaning of Sec. 77.502 is an individual who meets the requirements of Sec. 77.103.

Sec. 77.502-2 Electric equipment; frequency of examination and testing.

The examinations and tests required under the provision of this Sec. 77.502 shall be conducted at least monthly.

Sec. 77.503 Electric conductors; capacity and insulation.

Electric conductors shall be sufficient in size and have adequate current carrying capacity and be of such construction that a rise in temperature resulting from normal operation will not damage the insulating materials.

Sec. 77.503-1 Electric conductors.

Electric conductors shall be sufficient in size to meet the minimum current carrying capacity provided for in the National Electric Code, 1968. All trailing cables shall meet the minimum requirements for

ampacity provided in the standards of the Insulated Power Cable Engineers Association--National Electric Manufacturers Association in effect when such cables are purchased.

Sec. 77.504 Electrical connections or splices; suitability.

Electrical connections or splices in electric conductors shall be mechanically and electrically efficient, and suitable connectors shall be used. All electrical connections or splices in insulated wire shall be reinsulated at least to the same degree of protection as the remainder of the wire.

Sec. 77.505 Cable fittings; suitability.

Cables shall enter metal frames of motors, splice boxes, and electric compartments only through proper fittings. When insulated wires, other than cables, pass through metal frames, the holes shall be substantially bushed with insulated bushings.

Sec. 77.506 Electric equipment and circuits; overload and short-circuit protection.

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.

Sec. 77.506-1 Electric equipment and circuits; overload and short circuit protection; minimum requirements.

Devices providing either short circuit protection or protection against overload shall conform to the minimum requirements for protection of electric circuits and equipment of the National Electric Code, 1968.

Sec. 77.507 Electric equipment; switches.

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

Sec. 77.508 Lightning arresters, ungrounded and exposed power conductors and telephone wires.

All ungrounded, exposed power conductors and telephone wires shall be equipped with suitable lightning arresters which are adequately installed and connected to a low resistance grounding medium.

Sec. 77.508-1 Lightning arresters; wires entering buildings.

Lightning arresters protecting exposed telephone wires entering buildings shall be provided at the point where each such telephone wire enters the building.

Sec. 77.509 Transformers; installation and guarding.

(a) Transformers shall be of the totally enclosed type, or shall be placed at least 8 feet above the ground, or installed in a transformer house, or surrounded by a substantial fence at least

[[Page 633]]

6 feet high and at least 3 feet from any energized parts, casings, or wiring.

(b) Transformer stations shall be enclosed to prevent persons from unintentionally or inadvertently contacting energized parts.

(c) Transformer enclosures shall be kept locked against unauthorized entry.

Sec. 77.510 Resistors; location and guarding.

Resistors, heaters, and rheostats shall be located so as to minimize fire hazards and, where necessary, provided with guards to prevent personal contact.

Sec. 77.511 Danger signs at electrical installations.

Suitable danger signs shall be posted at all major electrical installations.

Sec. 77.512 Inspection and cover plates.

Inspection and cover plates on electrical equipment shall be kept in place at all times except during testing or repairs.

Sec. 77.513 Insulating mats at power switches.

Dry wooden platforms, insulating mats, or other electrically nonconductive material shall be kept in place at all switchboards and power-control switches where shock hazards exist. However, metal plates on which a person normally would stand and which are kept at the same potential as the grounded, metal, non-current-carrying parts of the power switches to be operated may be used.

Sec. 77.514 Switchboards; passageways and clearance.

Switchboards shall be installed to provide passageways or lanes of travel which permit access to the back of the switchboard from both ends

for inspection, adjustment or repair. Openings permitting access to the rear of any switchboard shall be guarded, except where they are located in buildings which are kept locked.

Sec. 77.515 Bare signal or control wires; voltage.

The voltage on bare signal or control wires accessible to personal contact shall not exceed 40 volts.

Sec. 77.516 Electric wiring and equipment; installation and maintenance.

In addition to the requirements of Sec. Sec. 77.503 and 77.506, all wiring and electrical equipment installed after June 30, 1971, shall meet the requirements of the National Electric Code in effect at the time of installation.

Subpart G_Trailing Cables

Sec. 77.600 Trailing cables; short-circuit protection; disconnecting devices.

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

Sec. 77.601 Trailing cables or portable cables; temporary splices.

Temporary splices in trailing cables or portable cables shall be made in a workmanlike manner and shall be mechanically strong and well insulated. Trailing cables or portable cables with exposed wires or splices that heat or spark under load shall not be used.

Sec. 77.602 Permanent splicing of trailing cables.

When permanent splices in trailing cables are made, they shall be:
(a) Mechanically strong with adequate electrical conductivity;
(b) Effectively insulated and sealed so as to exclude moisture; and,
(c) Vulcanized or otherwise made with suitable materials to provide good bonding to the outer jacket.

[[Page 634]]

Sec. 77.603 Clamping of trailing cables to equipment.

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

Sec. 77.604 Protection of trailing cables.

Trailing cables shall be adequately protected to prevent damage by mobile equipment.

Sec. 77.605 Breaking trailing cable and power cable connections.

Trailing cable and power cable connections between cables and to power sources shall not be made or broken under load.

Sec. 77.606 Energized trailing cables; handling.

Energized medium- and high-voltage trailing cables shall be handled only by persons wearing protective rubber gloves (see Sec. 77.606-1) and, with such other protective devices as may be necessary and appropriate under the circumstances.

Sec. 77.606-1 Rubber gloves; minimum requirements.

(a) Rubber gloves (lineman's gloves) worn while handling high-voltage trailing cables shall be rated at least 20,000 volts and shall be used and tested in accordance with the provisions of Sec. Sec. 77.704-6 through 77.704-8.
(b) Rubber gloves (wireman's gloves) worn while handling trailing cables energized by 660 to 1,000 volts shall be rated at least 1,000 volts and shall not be worn inside out or without protective leather gloves.
(c) Rubber gloves shall be inspected for defects before use on each shift and at least once thereafter during the shift when such rubber gloves are used for extended periods. All protective rubber gloves which contain defects shall be discarded and replaced prior to handling energized cables.

Subpart H_Grounding

Sec. 77.700 Grounding metallic sheaths, armors, and conduits enclosing power conductors.

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.

Sec. 77.700-1 Approved methods of grounding.

Metallic sheaths, armors, and conduits in resistance grounded systems, where the enclosed conductors are a part of the system, will be approved if a solid connection is made to the neutral conductor; in all other systems, the following methods of grounding will be approved:

(a) A solid connection to metal waterlines having low resistance to earth;

(b) A solid connection to a grounding conductor, other than the neutral conductor of a resistance grounded system, extending to a low-resistance ground field;

(c) Any other method of grounding, approved by an authorized representative of the Secretary, which ensures that there is no difference in potential between such metallic enclosures and the earth.

Sec. 77.701 Grounding metallic frames, casings, and other enclosures of electric equipment.

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.

Sec. 77.701-1 Approved methods of grounding of equipment receiving power from ungrounded alternating current power systems.

For purposes of grounding metallic frames, casings and other enclosures of equipment receiving power from ungrounded alternating current power systems, the following methods of grounding will be approved:

(a) A solid connection between the metallic frame; casing, or other metal enclosure and the grounded metallic sheath, armor, or conduit enclosing the power conductor feeding the electric equipment enclosed;

(b) A solid connection to metal waterlines having low resistance to earth;

[[Page 635]]

(c) A solid connection to a grounding conductor extending to a low-resistance ground field; and,

(d) Any other method of grounding, approved by an authorized representative of the Secretary, which insures that there is no difference in potential between such metal enclosures and the earth.

Sec. 77.701-2 Approved methods of grounding metallic frames, casings, and other enclosures of electric equipment receiving power from a direct-current power system.

(a) The following methods of grounding metallic frames, casings, and

other enclosures of electric equipment receiving power from a direct-current power system with one polarity grounded will be approved:

(1) A solid connection to the grounded power conductor of the system; and,

(2) Any other method, approved by an authorized representative of the Secretary, which insures that there is no difference in potential between such metal enclosures and the earth.

(b) A method of grounding of metallic frames, casings, and other enclosures of electric equipment receiving power from a direct-current power system other than a system with one polarity grounded, will be approved by an authorized representative of the Secretary if the method insures that there is no difference in potential between such frames, casings, and other enclosures, and the earth.

Sec. 77.701-3 Grounding wires; capacity.

Where grounding wires are used to ground metallic sheaths, armors, conduits, frames, casings, and other metallic enclosures, such grounding wires will be approved if:

(a) Where the power conductor used is No. 6 A.W.G., or larger, the cross-sectional area of the grounding wire is at least one-half the cross-sectional area of the power conductor.

(b) Where the power conductor used is less than No. 6 A.W.G., the cross-sectional area of the grounding wire is equal to the cross-sectional area of the power conductor.

Sec. 77.701-4 Use of grounding connectors.

If ground wires are attached to grounded power conductors, separate clamps, suitable for such purpose, shall be used and installed to provide a solid connection.

Sec. 77.702 Protection other than grounding.

Methods other than grounding which provide no less effective protection may be permitted by the Secretary or his authorized representative. Such methods may not be used unless so approved.

Sec. 77.703 Grounding frames of stationary high-voltage equipment receiving power from ungrounded 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.

Sec. 77.703-1 Approved methods of grounding.

The methods of grounding stated in Sec. 77.701-1 will be approved

with respect to the grounding of frames of high-voltage equipment referred to in Sec. 77.703.

Sec. 77.704 Work on high-voltage lines; deenergizing and grounding.

High-voltage lines shall be deenergized and grounded before work is performed on them, except that repairs may be permitted on energized high-voltage lines if (a) such repairs are made by a qualified person in accordance with procedures and safeguards set forth in Sec. Sec. 77.704-1 through 77.704-11 of this Subpart H as applicable, and (b) the operator has tested and properly maintained the protective devices necessary in making such repairs.

Sec. 77.704-1 Work on high-voltage lines.

(a) No high-voltage line shall be regarded as deenergized for the purpose of performing work on it, until it has been determined by a qualified person (as provided in Sec. 77.103) that such high-voltage line has been deenergized and grounded. Such qualified person shall

[[Page 636]]

by visual observation (1) determine that the disconnecting devices on the high-voltage circuit are in open position, and (2) insure that each ungrounded conductor of the high-voltage circuit upon which work is to be done is properly connected to the system grounding medium. In the case of resistance grounded or solid wye-connected systems, the neutral wire is the system grounding medium. In the case of an ungrounded power system, either the steel armor or conduit enclosing the system or a surface grounding field is a system grounding medium;
(b) No work shall be performed on any high-voltage line which is supported by any pole or structure which also supports other high-voltage lines until: (1) All lines supported on the pole or structure are deenergized and grounded in accordance with all of the provisions of this Sec. 77.704-1 which apply to the repair of deenergized surface high-voltage lines; or (2) the provisions of Sec. Sec. 77.704-2 through 77.704-10 have been complied with, with respect to all energized lines, which are supported on the pole or structure.
(c) Work may be performed on energized surface high-voltage lines only in accordance with the provisions of Sec. Sec. 77.704-2 through 77.704-10, inclusive.

Sec. 77.704-2 Repairs to energized high-voltage lines.

An energized high-voltage line may be repaired only when:
(a) The operator has determined that,
(1) Such repairs cannot be scheduled during a period when the power circuit could be properly deenergized and grounded;

(2) Such repairs will be performed on power circuits with a phase-to-phase nominal voltage no greater than 15,000 volts;

(3) Such repairs on circuits with a phase-to-phase nominal voltage of 5,000 volts or more will be performed only with the use of live line tools; and,

(4) Weather conditions will not interfere with such repairs or expose those persons assigned to such work to an imminent danger; and,

(b) The operator has designated a person qualified under the provisions of Sec. 77.104 as the person responsible for carrying out such repairs and such person, in order to ensure protection for himself and other qualified persons assigned to perform such repairs from the hazards of such repair, has prepared and filed with the operator:

(1) A general description of the nature and location of the damage or defect to be repaired;

(2) The general plan to be followed in making such repairs;

(3) A statement that a briefing of all qualified persons assigned to make such repairs was conducted informing them of the general plan, their individual assignments, and the dangers inherent in such assignments;

(4) A list of the proper protective equipment and clothing that will be provided; and

(5) Such other information as the person designated by the operator feels necessary to describe properly the means or methods to be employed in such repairs.

Sec. 77.704-3 Work on energized high-voltage surface lines; reporting.

Any operator designating and assigning qualified persons to perform repairs on energized high-voltage surface lines under the provisions of Sec. 77.704-2 shall maintain a record of such repairs. Such record shall contain a notation of the time, date, location, and general nature of the repairs made together with a copy of the information filed with the operator by the qualified person designated as responsible for performing such repairs.

Sec. 77.704-4 Simultaneous repairs.

When two or more persons are working on an energized high-voltage surface line simultaneously, and any one of them is within reach of another, such persons shall not be allowed to work on different phases or on equipment with different potentials.

Sec. 77.704-5 Installation of protective equipment.

Before repair work on energized high-voltage surface lines is begun, protective equipment shall be used to cover all bare conductors, ground wires, guys, telephone lines, and other attachments in proximity to the area of

planned repairs. Such protective equipment shall be installed from a safe position below the conductors or other apparatus being covered. Each rubber protective device employed in the making of repairs shall have a dielectric strength of 20,000 volts, or more.

Sec. 77.704-6 Protective clothing; use and inspection.

All persons performing work on energized high-voltage surface lines shall wear protective rubber lineman's gloves, sleeves, and climber guards if climbers are worn. Protective rubber gloves shall not be worn wrong side out or without protective leather gloves. Protective devices worn by a person assigned to perform repairs on high-voltage surface lines shall be worn continuously from the time he leaves the ground until he returns to the ground and, if such devices are employed for extended periods, such person shall visually inspect the equipment assigned him for defects before each use and, in no case, less than twice each day.

Sec. 77.704-7 Protective equipment; inspection.

Each person shall visually inspect protective equipment and clothing provided him in connection with work on high-voltage surface lines before using such equipment and clothing, and any equipment or clothing containing any defect or damage shall be discarded and replaced with proper protective equipment or clothing prior to the performance of any electrical work on such lines.

Sec. 77.704-8 Protective equipment; testing and storage.

(a) All rubber protective equipment used on work on energized high-voltage surface lines shall be electrically tested by the operator in accordance with ASTM standards, Part 28, published February 1968, and such testing shall be conducted in accordance with the following schedule:

(1) Rubber gloves, once each month;
(2) Rubber sleeves, once every 3 months;
(3) Rubber blankets, once every 6 months;
(4) Insulator hoods and line hose, once a year; and
(5) Other electric protective equipment, once a year.

(b) Rubber gloves shall not be stored wrong side out. Blankets shall be rolled when not in use, and line hose, and insulator hoods shall be stored in their natural position and shape.

Sec. 77.704-9 Operating disconnecting or cutout switches.

Disconnecting or cutout switches on energized high-voltage surface lines shall be operated only with insulated sticks, fuse tongs, or pullers which are adequately insulated and maintained to protect the operator from the voltage to which he is exposed. When such switches are operated from the ground, the person using such devices shall wear protective rubber lineman's gloves, except where such switches are bonded to a metal mat as provided in Sec. 77.513.

Sec. 77.704-10 Tying into energized high-voltage surface circuits.

If the work of forming an additional circuit by tying into an energized high-voltage surface line is performed from the ground, any person performing such work must wear and employ all of the protective equipment and clothing required under the provisions of Sec. Sec. 77.704-5 and 77.704-6. In addition, the insulated stick used by such person must have been designed for such purpose and must be adequately insulated and be maintained to protect such person from the voltage to which he is exposed.

Sec. 77.704-11 Use of grounded messenger wires; ungrounded systems.

Solely for purposes of grounding ungrounded high-voltage power systems, grounded messenger wires used to suspend the cables of such systems may be used as a grounding medium.

Sec. 77.705 Guy wires; grounding.

Guy wires from poles supporting high-voltage transmission lines shall be securely connected to the system ground or be provided with insulators installed near the pole end.

[[Page 638]]

Subpart I_Surface High-Voltage Distribution

Sec. 77.800 High-voltage circuits; circuit breakers.

High-voltage circuits supplying power to portable or mobile equipment shall be protected by suitable circuit breakers of adequate interrupting capacity which are properly tested and maintained and equipped with devices to provide protection against under voltage, grounded phase, short circuit and overcurrent. High-voltage circuits supplying power to stationary equipment shall be protected against overloads by either a circuit breaker or fuses of the correct type and capacity.

Sec. 77.800-1 Testing, examination, and maintenance of circuit breakers; procedures.

(a) Circuit breakers and their auxiliary devices protecting high-voltage circuits to portable or mobile equipment shall be tested and examined at least once each month by a person qualified as provided in Sec. 77.103.

(b) Tests shall include:

(1) Breaking continuity of the ground check conductor where ground check monitoring is used; and,

(2) Actuating any of the auxiliary protective relays.

(c) Examination shall include visual observation of all components of the circuit breaker and its auxiliary devices, and such repairs or adjustments as are indicated by such tests and examinations shall be carried out immediately.

Sec. 77.800-2 Testing, examination, and maintenance of circuit breakers; record.

The operator shall maintain a written record of each test, examination, repair, or adjustment of all circuit breakers protecting high-voltage circuits. Such record shall be kept in a book approved by the Secretary.

Sec. 77.801 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.

Sec. 77.801-1 Grounding resistors; continuous current rating.

The ground fault current rating of grounding resistors shall meet the ``extended time rating'' set forth in American Institute of Electrical Engineers, Standard No. 32.

Sec. 77.802 Protection of high-voltage circuits; neutral grounding resistors; disconnecting devices.

High-voltage circuits supplying portable or mobile 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 other high-voltage circuits to feed stationary

electrical equipment, if he finds that such exception will not pose a hazard to the miners. 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.

Sec. 77.803 Fail safe ground check circuits on high-voltage resistance grounded systems.

On and after September 30, 1971, all high-voltage, resistance grounded systems shall include a fail safe ground check circuit or other no less effective device approved by the Secretary to monitor continuously the grounding circuit to assure continuity. The fail safe ground check circuit shall cause the circuit breaker to open when either the ground or ground check wire is broken.

Sec. 77.803-1 Fail safe ground check circuits; maximum voltage.

The maximum voltage used for ground check circuits under Sec. 77.803 shall not exceed 96 volts.

[[Page 639]]

Sec. 77.803-2 Ground check systems not employing pilot check wires; approval by the Secretary.

Ground check systems not employing pilot check wires shall be approved by the Secretary only if it is determined that the system includes a fail safe design which will cause the circuit interrupter to open when ground continuity is broken.

Sec. 77.804 High-voltage trailing cables; minimum design requirements.

(a) High-voltage trailing 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 conductor for the ground continuity check circuit. External ground check conductors may be used if they are not smaller than No. 8 (AWG) and have an insulation rated at least 600 volts.

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

Sec. 77.805 Cable couplers and connection boxes; minimum design requirements.

(a)(1) Couplers that are used in medium- or high-voltage power circuits shall be of the three-phase type and enclosed in a full

metallic shell, except that the Secretary may permit, under such guidelines as he may prescribe, no less effective couplers constructed of materials other than metal.

(2) Cable couplers shall be adequate for the intended current and voltage.

(3) Cable couplers with any metal exposed shall be grounded to the ground conductor in the cable.

(4) Couplers shall be constructed to cause the ground check continuity conductor to break first and the ground conductor last when being uncoupled when pilot check circuits are used.

(b) Cable connection boxes shall be of substantial construction and designed to guard all energized parts from personal contact.

Sec. 77.806 Connection of single-phase loads.

Single-phase loads, such as transformer primaries, shall be connected phase to phase in resistance grounded systems.

Sec. 77.807 Installation of high-voltage transmission cables.

High-voltage transmission cables shall be installed or placed so as to afford protection against damage. They shall be placed to prevent contact with low-voltage or communication circuits.

Sec. 77.807-1 High-voltage powerlines; clearances above ground.

High-voltage powerlines located above driveways, haulageways, and railroad tracks shall be installed to provide the minimum vertical clearance specified in National Electrical Safety Code: Provided, however, That in no event shall any high-voltage powerline be installed less than 15 feet above ground.

Sec. 77.807-2 Booms and masts; minimum distance from high-voltage lines.

The booms and masts of equipment operated on the surface of any coal mine shall not be operated within 10 feet of an energized overhead powerline. Where the voltage of overhead powerlines is 69,000 volts, or more, the minimum distance from the boom or mast shall be as follows:

Nominal power line voltage (in 1,000 volts)	Minimum distance (feet)
69 to 114	12
115 to 229	15
230 to 344	20

345 to 499	25
500 or more	35

Sec. 77.807-3 Movement of equipment; minimum distance from high-voltage lines.

When any part of any equipment operated on the surface of any coal mine is required to pass under or by any energized high-voltage powerline and the clearance between such equipment and powerline is less than that specified in Sec. 77.807-2 for booms and masts, such powerlines shall be deenergized or other precautions shall be taken.

[[Page 640]]

Sec. 77.808 Disconnecting devices.

Disconnecting devices shall be installed at the beginning of each branch line in high-voltage circuits and they shall be equipped or designed in such a manner that it can be determined by visual observation that the circuit is deenergized when such devices are open.

Sec. 77.809 Identification of circuit breakers and disconnecting switches.

Circuit breakers and disconnecting switches shall be labeled to show which units they control, unless identification can be made readily by location.

Sec. 77.810 High-voltage equipment; grounding.

Frames, supporting structures, and enclosures of stationary, portable, or mobile high-voltage equipment shall be effectively grounded.

Sec. 77.811 Movement of portable substations and transformers.

Portable substations and transformers shall be deenergized before they are moved from one location to another.

Subpart J_Low- and Medium-Voltage Alternating Current Circuits

Sec. 77.900 Low- and medium-voltage circuits serving portable or mobile three-phase alternating current equipment; circuit breakers.

Low- and medium-voltage circuits supplying power to portable or mobile three-phase alternating current equipment shall be protected by

suitable circuit breakers of adequate interrupting capacity which are properly tested and maintained and equipped with devices to provide protection against undervoltage, grounded phase, short circuit, and over-current.

Sec. 77.900-1 Testing, examination, and maintenance of circuit breakers; procedures.

Circuit breakers protecting low- and medium-voltage circuits serving portable or mobile three-phase alternating current equipment and their auxiliary devices shall be tested and examined at least once each month by a person qualified as provided in Sec. 77.103. In performing such tests, the circuit breaker auxiliaries or control circuits shall be actuated in any manner which causes the circuit breaker to open. All components of the circuit breaker and its auxiliary devices shall be visually examined and such repairs or adjustments as are indicated by such tests and examinations shall be carried out immediately.

Sec. 77.900-2 Testing, examination, and maintenance of circuit breakers; record.

The operator shall maintain a written record of each test, examination, repair or adjustment of all circuit breakers protecting low- and medium-voltage circuits serving three-phase alternating current equipment and such record shall be kept in a book approved by the Secretary.

Sec. 77.901 Protection of low- and medium-voltage three-phase circuits.

(a) Low- and medium-voltage circuits supplying power to portable or mobile three-phase alternating equipment shall contain:

(1) Either a direct or derived neutral grounded through a suitable resistor at the power source;

(2) A grounding circuit originating at the grounded side of the grounding resistor which extends along with the power conductors and serves as a grounding conductor for the frames of all the electric equipment supplied power from the circuit.

(b) Grounding resistors, where required, shall be of an ohmic value which limits the ground fault current to no more than 25 amperes. Such grounding resistors shall be rated for maximum fault current continuously and provide insulation from ground for a voltage equal to the phase-to-phase voltage of the system.

(c) Low- and medium-voltage circuits supplying power to three-phase alternating current stationary electric equipment shall comply with the National Electric Code.

Sec. 77.901-1 Grounding resistor; continuous current rating.

The ground fault current rating of grounding resistors shall meet the

[[Page 641]]

``extended time rating" set forth in American Institute of Electrical Engineers Standard No. 32.

Sec. 77.902 Low- and medium-voltage ground check monitor circuits.

On and after September 30, 1971, three-phase low- and medium-voltage resistance grounded systems to portable and mobile equipment shall include a fail safe ground check circuit or other no less effective device approved by the Secretary to monitor continuously the grounding circuit to assure continuity. The fail safe ground check circuit shall cause the circuit breaker to open when either the ground or pilot check wire is broken. Cable couplers shall be constructed to cause the ground check continuity conductor to break first and the ground conductor last when being uncoupled when pilot check circuits are used.

Sec. 77.902-1 Fail safe ground check circuits; maximum voltage.

The maximum voltage used for ground check circuits under Sec. 77.902 shall not exceed 40 volts.

Sec. 77.902-2 Approved ground check systems not employing pilot check wires.

Ground check systems not employing pilot check wires shall be approved by the Secretary only after it has been determined that the system includes a fail safe design causing the circuit breaker to open when ground continuity is broken.

Sec. 77.902-3 Attachment of ground conductors and ground check wires to equipment frames; use of separate connections.

In grounding the frames of stationary, portable, or mobile equipment receiving power from resistance grounded systems, separate connections shall be used.

Sec. 77.903 Disconnecting devices.

Disconnecting devices shall be installed in circuits supplying power to portable or mobile equipment and shall provide visual evidence that the power is disconnected.

Sec. 77.904 Identification of circuit breakers.

Circuit breakers shall be labeled to show which circuits they control unless identification can be made readily by location.

Sec. 77.905 Connection of single-phase loads.

Single-phase loads shall be connected phase-to-phase in resistance grounded systems.

Sec. 77.906 Trailing cables supplying power to low-voltage mobile equipment; ground wires and ground check wires.

On and after September 30, 1971, all trailing cables supplying power to portable or mobile equipment from low-voltage three-phase resistance grounded power systems shall contain one or more ground conductors having a cross-sectional area of not less than one-half the power conductor. Such trailing cables shall include an insulated conductor for the ground continuity check circuit except where a no less effective device has been approved by the Secretary to assure continuity. Splices made in low-voltage trailing cables shall provide continuity of all components.