

parts of the power switches to be operated may be used.

§ 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.

§ 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.

§ 77.516 Electric wiring and equipment; installation and maintenance.

In addition to the requirements of §§ 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

§ 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.

§ 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.

§ 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.

§ 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.

§ 77.604 Protection of trailing cables.

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

§ 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.

§ 77.606 Energized trailing cables; handling.

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

§ 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 §§ 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

§ 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.

§ 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.

§ 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.

§ 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;
- (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.

§ 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.

§ 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: