

Chapter E 117

FUSES, CIRCUIT-BREAKERS, SWITCHES
AND CONTROLLERS

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E 117.01 Accessible and indicating. (1) **ARRANGEMENT.** All switches, fuses, automatic circuit-breakers, starting rheostats and other control devices shall be readily and safely accessible to authorized persons, unless remotely controlled. They shall be so arranged or marked as to identify the equipment controlled by them, and (except fuses) shall indicate whether they are open or closed.

(2) **ACCIDENTAL CLOSING.** Switches shall be so installed as to minimize the danger of accidental operation, and where practicable so that gravity cannot close them; such switches as may tend to close by gravity shall be provided with a proper latch or stop block to prevent accidental closing. Where practicable, the blades of knife switches should be dead when the switches are open.

History: Cr. Register, November, 1961, No. 71, eff. 12-1-61.

E 117.02 Oil Switches. (1) Oil circuit-breakers and oil switches shall, wherever practicable, be isolated from other types of switches, and other electrical apparatus to conform to subsection E 111.05(1).

(2) Remote control of switches and circuit-breakers shall be used on circuits of more than 7,500 volts, or when they may be subject to large short-circuit values.

Note: Remote control may be mechanical, electrical, or other type. It is not intended to prohibit the use of switches and circuit-breakers operated manually by means of levers or poles from a remote position (see note in section E 111.05 for conditions usually applying to electrical systems).

History: Cr. Register, November, 1961, No. 71, eff. 12-1-61.

E 117.03 Where switches are required. Suitable disconnectors, switches or circuit-breakers which may be manually operated shall be inserted in all leads to all supply equipment and all outgoing supply circuits, except as listed below:

Exceptions: (1) Where 2 or more pieces of electrical supply equipment or supply lines are operated as a single unit no switch is necessarily required between them.

(2) Switches are not required in transformer vaults except as may be deemed necessary by the engineer in charge to meet operating requirements.

(3) Switches are not required in leads to instrument transformers.

(4) Switches are not required in grounded conductors.

Note: In most cases the switch called for should be capable of opening the circuit under loads. In some cases, as between generators and transformer banks used with them, disconnectors only would be required.

History: Cr. Register, November, 1961, No. 71, eff. 12-1-61.

E 117.04 Switches or other grounding devices. It is recommended that switches or other suitable means be provided, where practicable, to facilitate short-circuiting and grounding equipment or lines for which the operating rules (see sections E 142.04 and E 142.05 of this code), require grounding to protect workmen. (See subsection E 112.04(3)).

History: Cr. Register, November, 1961, No. 71, eff. 12-1-61.

E 117.05 Capacity of switches and disconnectors. (1) **SUITABILITY.** Switches used otherwise than as disconnectors shall be of suitable voltage and ampere rating for the circuit on which they are installed and should preferably be marked with the current which they can safely interrupt. Disconnectors shall be of suitable voltage and ampere rating for the circuit on which they are installed.

(a) It is recommended that disconnectors be marked with a warning against opening when carrying load. Where a group of disconnectors is contained in one room or compartment, a single conspicuous sign may be sufficient.

(2) **LOCKING.** Remotely controlled switches, oil switches, and disconnectors shall be so arranged that they can be secured in the open position or plainly tagged to prevent careless closing while work is being done on equipment controlled by them. It is important that the control circuit be tagged or provided with a positive disconnecting means near the apparatus to prevent accidental operation of the mechanism. For switches and disconnectors the accidental opening of which may cause hazard, similar arrangements are desirable for retaining them in closed position. Locking is recommended rather than blocking wherever parts of equipment are remote from the point of control.

(3) **AIR BREAKS.** Unless a switch operating on a circuit between 750 and 7,500 volts makes an air break, it is recommended that there shall be installed between it and the source of energy supply a suitable air or oil break disconnector or equivalent device having an air or oil gap suitable for the operating voltage of the circuit. An air-break switch or air-break disconnector shall be inserted in each conductor between electrical supply equipment or lines and sources of energy of more than 7,500 volts, if the equipment or lines may have to be worked on without protective grounding while the sources may be alive (for lightning arresters see section E 119.02).

(4) **ALINEMENT.** Knife switches shall maintain such alinement under service conditions that they can be closed with a single unhesitating motion.

History: Cr. Register, November, 1961, No. 71, eff. 12-1-61.

E 117.06 Where fuses or automatic circuit-breakers are required. (1) All circuit leads to motors, constant-potential generators, transformer primaries, and station auxiliaries, and all outgoing circuits shall be protected from excessive current by suitable fuses or automatic circuit-breakers, except as indicated below.

(2) Fuses and automatic circuit-breakers may be omitted from the following:

(a) A motor-driven generator or rotary converter when the supply leads to such apparatus are already protected by fuses or automatic circuit-breakers.

(b) Ground conductors.

(c) Circuits for field excitation.

(d) Leads of alternating-current generators.

(e) Leads connecting 2 or more pieces of electrical supply equipment operated as a single unit.

(f) Circuits supplying interconnected 3-wire systems of direct-current distribution.

(g) Leads of series transformers.

(h) Leads of potential transformers or other circuits, the opening of which may cause greater hazard to life or property through interruption of service.

History: Cr. Register, November, 1961, No. 71, eff. 12-1-61.

E 117.07 Disconnection of fuses before handling. (1) Fuses in circuits of more than 150 volts or more than 60 amperes shall be arranged in one of the following ways:

(a) So that the fuses are necessarily disconnected from all sources of electrical energy before they can be touched.

(b) So that the fuses can be disconnected from all sources of electrical energy by a suitable switch.

(c) So that the fuses can be conveniently handled by means of insulating handles or portable appliances provided for the purpose.

Exception: Circuits of less than 150 volts and less than 60 amperes capacity are exempted from the provisions of this rule.

(d) The use of insulating gloves and mats is permissible on circuits not exceeding 750 volts.

History: Cr. Register, November, 1961, No. 71, eff. 12-1-61.

E 117.08 Arcing or suddenly moving parts. (1) PROTECTION FROM BURNS. Fuses and circuit-breakers shall, as far as possible, be so located and shielded that persons will not be burned by their operation.

(2) PROTECTION AGAINST MOVING PARTS. Handles or levers of circuit-breakers, and similar parts which may move suddenly in such a way that persons in the vicinity are liable to be injured by them, shall be guarded or isolated.

History: Cr. Register, November, 1961, No. 71, eff. 12-1-61.

E 117.09 Grounding noncurrent-carrying metal parts. Exposed non-current-carrying parts of switch and fuse cases, levers, and other similar parts to which leakage is liable to occur from live parts, and thereby create a hazard, shall be effectively grounded in accordance with section E 112.04. ✓

(1) Exception: Minor parts, such as ferrules of knife switches, which are not liable to become alive, are excepted.

History: Cr. Register, November, 1961, No. 71, eff. 12-1-61.

E 117.10 Guarding live parts of switches, fuses and automatic circuit-breakers. Switches, fuses, and automatic circuit-breakers shall be isolated or guarded in accordance with sections E 112.05 ✓ and E 112.06. ✓

History: Cr. Register, November, 1961, No. 71, eff. 12-1-61.