

Chapter E 384

SWITCHBOARDS AND PANELBOARDS

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E 384.01 Scope. (1) The requirements of this chapter shall apply to all switchboards, panelboards, and distribution boards installed for the control of light and power circuits.

(a) *Exception No. 1.* Switchboards in utility company operated central stations or substations, which directly control energy derived from generators or transforming devices.

(b) *Exception No. 2.* Switchboards or portions thereof used exclusively to control signal circuits operated by batteries.

(2) The requirements of this chapter shall apply to battery-charging panels where current is taken from light or power circuits.

History: Cr. Register, January, 1968, No. 145. eff. 2-1-68.

E 384.02 Application of other chapters. Switches, circuit-breakers and overcurrent devices used on switchboards, panelboards and distribution boards, the boards and their enclosures, shall conform to the requirements of Wis. Adm. Code chapters E 240, E 250, E 370, E 380 and other chapters which apply. Switchboards and panelboards in hazardous locations shall conform to the requirements of chapters E 500 to E 517 inclusive.

History: Cr. Register, January, 1968, No. 145. eff. 2-1-68.

E 384.03 Support and arrangement of bus-bars and conductors. (1) Conductors and bus-bars on a switchboard, panelboard or control board shall be so located as to be free from physical damage and shall be held firmly in place.

(2) The arrangement of bus-bars and conductors shall be such as to avoid overheating due to inductive effects.

(3) Each switchboard, switchboard section or panelboard, if used as service equipment, shall be provided with an equipment grounding

means placed within the service disconnect section for connecting the neutral on its supply side to the switchboard or panelboard frame. The equipment grounding means for switchboards or panelboards rated more than 225 amperes shall have a cross sectional area of at least 25% of the cross sectional area of the service entrance conductors, but need not exceed the cross sectional area of the grounding conductors specified in table E 250.094 (1).

Note: It is recommended that the switchboard, if consisting of more than one section, be provided with a copper ground bus, and equipment ground strap be connected to the switchboard ground bus.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

A. SWITCHBOARDS

E 384.04 Location of switchboards. Switchboards which have any exposed live parts shall be located in permanently dry locations and then only where under competent supervision and accessible only to qualified persons.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.05 Wet locations. Where a switchboard is in a wet location or outside of a building, it shall be enclosed in a weather-proof enclosure or cabinet installed to conform to section E 373.02.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.06 Location relative to easily ignitable material. Switchboards shall be so placed as to reduce to a minimum the probability of communicating fire to adjacent easily ignitable material.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.07 Clearance from ceiling. Switchboards shall not be built up to a non-fireproof ceiling, a space of 3 feet being left between the ceiling and the board, unless an adequate fireproof shield is provided between the board and the ceiling.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.08 Clearance back of switchboard. Clearances around switchboards shall conform to the provisions for working space about electrical equipment as specified in Wis. Adm. Code section E 195.16.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.09 Conductor covering. Insulated conductors where closely grouped, as on the rear of switchboards, shall each have a flame-retardant outer covering. The conductor covering shall be stripped back a sufficient distance from the terminals so as not to make contact with them. Insulated conductors used for instrument and control wiring on the back of switchboards shall be flame-retardant, either inherently or by means of an outer covering, such as one of the following types: R, RH, RW, RHH, RHW, V, ALS, AVA, AVB, SIS, T, TA, TBS, TW, THW, MI, or other types specifically approved for the purpose.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.11 Grounding switchboard frames. Switchboard frames and structures supporting switching equipment shall be grounded, except

that frames of direct-current single-polarity switchboards need not be grounded if effectively insulated.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.12 Grounding of instruments, relays, meters and instrument transformers on switchboards. Instruments, relays, meters and instrument transformers located on switchboards shall be grounded as specified in sections E 250.121 to E 250.125.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

B. PANELBOARDS

E 384.13 General. All panelboards shall have a rating not less than the minimum feeder capacity required for the load as computed from chapter E 220. Panelboards shall be durably marked by the manufacturer with the voltage and the current rating and the number of phases for which they are designed and with the manufacturer's name, or trademark in such a manner as to be visible after installation, without disturbing the interior parts or wiring.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.14 Lighting and appliance branch circuit panelboard. (1) For the purposes of this rule, a lighting and appliance branch circuit panelboard is one having more than 10% of its overcurrent devices rated 30 amperes or less, for which neutral connections are provided.

(2) A lighting and appliance branch circuit panelboard shall not contain the "wild" or high phase of 3-phase, 4-wire delta-connected system having the midpoint of one phase grounded.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.15 Number of overcurrent devices on one panelboard. (1) Not more than 42 overcurrent devices, (other than those provided for in the mains) of a lighting and appliance branch circuit panelboard shall be installed in any one cabinet or cutout box.

(2) A lighting and appliance branch circuit panelboard shall be provided with physical means to prevent the installation of more overcurrent devices than the number for which the panelboard was designed, rated and approved.

(3) For the purposes of this chapter a two-pole circuit breaker shall be considered 2 overcurrent devices; a three-pole breaker shall be considered 3 overcurrent devices.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.16 Overcurrent protection. (1) Each lighting and appliance branch circuit panelboard shall be individually protected on the supply side by not more than 2 main circuit breakers or 2 sets of fuses having a combined rating not greater than that of the panelboard.

(a) *Exception No. 1.* Individual protection for a lighting and appliance panelboard is not required when the panelboard feeder has overcurrent protection not greater than that of the panelboard.

(2) Panelboards equipped with snap switches rated at 30 amperes or less, shall have overcurrent protection not in excess of 200 amperes.

(3) The total load on any overcurrent device located in a panelboard shall not exceed 80% of its rating where in normal operation the load will continue for 3 hours or more.

(a) *Exception.* Except where the assembly including the overcurrent device is approved for continuous duty at 100% of its rating.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.17 Panelboards in damp or wet locations. Panelboards in damp or wet locations shall be installed in conformity to section E 373.02.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.18 Enclosure. Panelboards shall be mounted in cabinets or cutout boxes.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.19 Relative arrangement of switches and fuses. Panelboards having switches on the load side of any type of fuses shall not be installed except for use as service equipment as provided in section E 230.094.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

C. CONSTRUCTION SPECIFICATIONS

E 384.20 Panels. The panels of switchboards shall be made of moisture-resistant, noncombustible material.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.21 Bus-bars. Bus-bars may be of bare metal provided they are rigidly mounted.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.22 Protection of instrument circuits. Instruments, pilot lights, potential transformers, and other switchboard devices with potential coils, except where the operation of the overcurrent device might introduce a hazard in the operation of devices, shall be supplied by a circuit that is protected by standard overcurrent devices of a rating not greater than 15 amperes, except that for ratings of 2 amperes or less special types of enclosed fuses may be used.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.23 Component parts. Switches, fuses, and fuseholders used on panelboards shall conform to the requirements of Wis. Adm. Code chapters E 240 and E 380 so far as they apply.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.24 Knife switches. Knife switches shall be so arranged that the blades, when exposed during operation, will be dead when the switches are open.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.25 Color-coding. On switchboards or panelboards that are provided with color markings to indicate the main bus-bars to which branch circuit bus-bars are connected, the colors shall conform to the color coding of section E 210.05.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.

E 384.26 Spacings. (1) Except at switches and circuit-breakers, the distance between bare metal parts, bus-bars, etc., shall be not less than specified in the following table:

TABLE E 384.26
SPACINGS BETWEEN BARE METAL PARTS

	Opposite Polarity When Mounted on the Same Surface	Opposite Polarity When Held Free in Air	*Live Parts to Ground
Not over 125 volts.....	$\frac{3}{4}$ inch	$\frac{1}{2}$ inch	$\frac{1}{2}$ inch
Not over 250 volts.....	$1\frac{1}{4}$ inch	$\frac{3}{4}$ inch	$\frac{1}{2}$ inch
Not over 600 volts.....	2 inches	1 inch	1 inch

*For spacing between live parts and doors of cabinets, see section E 373.11(1).

Note: It should be noted that the above distances are the minimum allowable, and it is recommended that greater distances be provided wherever the conditions will permit.

(2) At switches, enclosed fuses, etc., parts of the same polarity may be placed as close together as convenience in handling will allow, unless close proximity causes excessive heating.

History: Cr. Register, January, 1968, No. 145, eff. 2-1-68.