

## Chapter E 460

## CAPACITORS

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**E 460.01 Application.** This chapter applies to installation of capacitors on electric circuits in or on buildings.

(1) **EXCEPTION NO. 1.** Capacitors that are components of other apparatus shall conform to the requirements for such apparatus.

(2) **EXCEPTION NO. 2.** Capacitors in hazardous locations shall comply with additional requirements in chapters E 500–E 517.

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

**E 460.02 Location.** An installation of capacitors in which any single unit contains more than 3 gallons of combustible liquid shall be in a vault conforming to part C of chapter E 450.

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

**E 460.03 Mechanical protection.** Capacitors shall be protected from physical damage by location or by suitable fences, barriers or other enclosures.

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

**E 460.04 Cases and supports.** Capacitors shall be provided with non-combustible cases and supports.

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

**E 460.05 Transformers used with capacitors.** Transformers that are components of capacitor installations and are used for the purpose of connecting the capacitor to a power circuit shall be installed in accordance with chapter E 450. The kva rating shall not be less than 135% of the capacitor rating in kvar.

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

**E 460.06 Drainage of stored charge.** Capacitors shall be provided with a means of draining the stored charge.

(1) **TIME OF DISCHARGE.** The residual voltage of a capacitor shall be reduced to 50 volts or less within one minute after the capacitor is disconnected from the source of supply in the case of capacitors rated 600 volts or less and in 5 minutes in the case of capacitors rated more than 600 volts.

(2) **MEANS OF DISCHARGE.** The discharge circuit shall be either permanently connected to the terminals of the capacitor or capacitor

bank, or provided with automatic means of connecting it to the terminals of the capacitor bank on removal of voltage from the line. Manual means of switching or connecting the discharge circuit shall not be used. The windings of motors, of transformers, or of other equipment directly connected to capacitors without a switch or overcurrent device interposed, constitutes a suitable discharge means.

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

**E 460.07 Power factor correction; motor circuit.** The total kvar rating of capacitors which are connected on the load side of a motor controller shall not exceed the value required to raise the no-load power factor of the motor to unity.

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

**E 460.08 Conductor rating.** (1) **CURRENT-CARRYING CAPACITY OF CAPACITOR CIRCUIT CONDUCTORS.** The current-carrying capacity of capacitor circuit conductors shall be not less than 135% of the rated current of the capacitor. The current-carrying capacity of conductors which connect a capacitor to the terminals of a motor or to motor circuit conductors, shall be not less than one-third the carrying capacity of the motor circuit conductors but not less than 135% of the rated current of the capacitor.

(2) **OVERCURRENT PROTECTION.** (a) An overcurrent device shall be provided in each ungrounded conductor.

Exception: A separate overcurrent device is not required on the load-side of a motor running overcurrent device.

(b) The rating or setting of the overcurrent device shall be as low as practicable.

(3) **DISCONNECTING MEANS.** (a) A disconnecting means shall be provided in each ungrounded conductor.

Exception: A separate disconnecting means is not required for a capacitor connected on the load side of a motor overcurrent device.

(b) The disconnecting device need not open all ungrounded conductors simultaneously.

(c) The disconnecting device may be used for disconnecting the capacitor from the line as a regular operating procedure.

(d) The continuous current carrying capacity of the disconnecting device shall be not less than 135% of the rated current of the capacitor.

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

**E 460.09 Rating or setting of the motor-running overcurrent device.** Where a motor installation includes a capacitor connected on the load side of the motor-running overcurrent device, and the overcurrent device used can be adjusted, the rating or setting of the motor overcurrent device shall be determined as provided in section E 430.032, except that instead of using the full-load rated current of the motor as provided in that rule a lower value corresponding with the improved power-factor of the motor circuit shall be used. Section E 430.022 applies with respect to the rating of the motor circuit conductors.

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

**E 460.10 Grounding.** Capacitor cases shall be grounded in accordance with chapter E 250.

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

**E 460.11 Guarding.** All live parts of capacitors which are connected to circuits of more than 600 volts between conductors and are accessible to unqualified persons, shall be enclosed or isolated. For isolation by elevation, see section E 710.36.

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

**E 460.12 Marking.** Each capacitor shall be provided with a nameplate giving the maker's name, rated voltage, frequency, kvar, or amperes, number of phases, and if filled with a combustible liquid, the amount of liquid in gallons. When filled with a non-flammable liquid, the nameplate shall so state. The nameplate shall also indicate if a capacitor has a discharge device inside the case.

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