

Chapter E 422

APPLIANCES

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A. GENERAL

E 422.01 Scope. This chapter shall apply to electric appliances used in any occupancy.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.02 Branch circuit requirements. Every appliance shall be supplied by a branch circuit of one of the types specified in chapter E 210. Motor-operated appliances shall also conform to the requirements of chapter E 430.

Note: See table E 220.05 for the conductors of a household range branch circuit.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

B. INSTALLATION OF APPLIANCES

E 422.03 Flexible cords. Flexible cords used to connect heating appliances shall comply with the following:

(1) **HEATER CORDS REQUIRED.** All smoothing irons and portable electrically-heated appliances rated at more than 50 watts and which

produce temperatures in excess of 121°C. (250°F.) on surfaces with which the cord is liable to be in contact shall be provided with one of the types of approved heater cords listed in table E 400.11.

(2) OTHER HEATING APPLIANCES. All other portable electrically-heated appliances shall be connected with one of the approved types of cord listed in table E 400.11, selected in accordance with the usage specified in that table.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.04 Insulation of appliances. Portable appliances shall be provided with an adequate dielectric interposed between current-carrying parts and those external surfaces which persons can touch, except for toasters, grills or other heating appliances in which the current-carrying parts at high temperature are necessarily exposed. In locations where the dielectric is exposed to physical damage, it shall be suitably protected.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.05 Portable immersion heaters. Electric heaters of the portable immersion type shall be so constructed and installed that current-carrying parts are effectively insulated from electrical contact with the substance in which immersed. The administrative authority may make exception of special applications of apparatus where suitable precautionary measures are followed.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.06 Protection of combustible material. Each electrically-heated appliance that is obviously intended by size, weight and service to be located in a fixed position shall be so placed as to provide ample protection between the appliance and adjacent combustible material.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.07 Stands for portable appliances. Each smoothing iron and other portable electrically-heated appliance which is intended to be applied to combustible material shall be equipped with an approved stand, which may be a separate piece of equipment or may be a part of the appliance.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.08 Signals for heated appliances. In other than residence occupancies, each electrically-heated appliance, or group of electrically-heated appliances, intended to be applied to combustible material, shall be installed in connection with a signal unless the appliance is provided with an integral temperature-limiting device.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.09 Flatirons. Electrically-heated smoothing irons intended for use in residences shall be equipped with approved temperature-limiting means.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.10 Water heaters. It is recommended that permanently-installed electrically-heated water heaters be equipped with temperature-limiting means.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.11 Infra-red lamp industrial heating appliances. (1) Infra-red heating lamps rated at 300 watts or less may be used with lampholders of the medium-base unswitched porcelain type, or other types approved for the purpose.

(2) Screw-shell lampholders shall not be used with infra-red lamps over 300 watts rating unless the lampholders are especially approved for the purpose.

(3) Lampholders may be connected to any of the branch circuits of chapter E 210 and, in industrial occupancies, may be operated in series on circuits of more than 150 volts to ground provided the voltage rating of the lampholders is not less than the circuit voltage.

Note: Each section, panel or strip carrying a number of infra-red lampholders (including the internal wiring of such section, panel or strip) is considered an appliance. The terminal connection block of each such assembly is deemed an individual outlet.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.12 Grounding. Metal frames of portable and stationary electrically-heated appliances, operating on circuits above 150 volts to ground, shall be grounded in the manner specified in chapter E 250; provided, however, that where this is impracticable, grounding may be omitted by special permission, in which case the frames shall be permanently and effectively insulated from the ground.

Note: It is recommended that the frames be grounded in all cases. For methods of grounding frames of electric ranges and clothes dryers, see sections E 250.057 and E 250.060.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.13 Wall-mounted ovens and counter-mounted cooking units.

(1) Wall-mounted ovens and counter-mounted cooking units complete with provisions for mounting and for making electrical connections shall be considered as fixed appliances.

(2) A separable connector or a plug and receptacle combination in the supply line to an oven or cooking unit used only for ease in servicing or for installation shall:

(a) Not be installed as the disconnecting means required by section E 422.20.

(b) Be approved for the temperature of the space in which it is located.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

C. CONTROL AND PROTECTION OF APPLIANCES

E 422.20 Disconnecting means. Each appliance shall be provided with a means for disconnection from all ungrounded conductors.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.21 Disconnection of portable appliances. (1) For portable appliances a separable connector or an attachment plug and receptacle may serve as the disconnecting means.

(2) The rating of a receptacle or of a separable connector shall not be less than the rating of any appliance connected thereto, except that demand factors authorized elsewhere in this code may be applied.

(3) Attachment plugs and connectors shall conform to the following:

(a) *Live parts.* They shall be so constructed and installed as to guard against inadvertent contact with live parts.

(b) *Interrupting capacity.* They shall be capable of interrupting their rated current without hazard to the operator.

(c) *Interchangeability.* They shall be so designed that they will not fit into receptacles of lesser rating.

Note: For household electric ranges, a plug and receptacle connection at the rear base of a range, if it is accessible from the front by removal of a drawer, is considered as meeting the intent of this rule.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.22 Disconnection of stationary appliances. (1) For stationary appliances rated at not over 300 volt amperes or $\frac{1}{8}$ horsepower, the branch-circuit overcurrent device may serve as the disconnecting means.

(2) For stationary appliances of greater rating the branch-circuit switch or circuit-breaker may, where readily accessible to the user of the appliance, serve as the disconnecting means.

(3) For cord-connected appliances, such as household ranges and clothes dryers, a separable connector or an attachment plug and receptacle may serve as the disconnecting means.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.23 Unit switches as disconnecting means. Switches which are a part of an appliance shall not be considered as taking the place of the single disconnecting means required by part C of this chapter, unless there are other means for disconnection as follows:

(1) **MULTI-FAMILY DWELLINGS.** In multi-family (more than 2) dwellings, the disconnecting means shall be within the apartment, or on the same floor as the apartment in which the appliance is installed, and may control lamps and other appliances.

(2) **TWO-FAMILY DWELLINGS.** In 2-family dwellings, the disconnecting means may be outside of the apartment in which the appliance is installed. This will permit an individual switch for the apartment to be used.

(3) **SINGLE-FAMILY DWELLINGS.** In single-family dwellings, the service disconnecting means may be used.

(4) **OTHER OCCUPANCIES.** In other occupancies, the branch-circuit switch or circuit-breaker, where readily accessible to the user of the appliance, may be used for this purpose.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.24 Switch and circuit-breaker to be indicating. Switches and circuit-breakers used as disconnecting means shall be of the indicating type.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.25 Motor-driven appliances. A switch or circuit-breaker which serves as the disconnecting means for a stationary motor-driven appliance of more than $\frac{1}{8}$ horsepower shall be located within sight of the motor controller or shall be capable of being locked in the open position.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.26 Overcurrent protection. (1) Appliances, other than such motor-operated appliances as are required by chapter E 430 to have additional overcurrent protection, shall be considered as protected against overcurrent when supplied by one of the circuits of chapter E 210 and in accordance with the requirements therein specified.

(2) A household type appliance with surface heating elements and which have a maximum demand of more than 60 amperes as calculated in accordance with table E 220.05 shall have its power supply subdivided into two or more circuits each of which is provided with overcurrent protection rated at not more than 50 amperes.

(3) Infra-red lamp heating appliances shall have overcurrent protection not exceeding 50 amperes.

(4) Open coil or exposed sheathed-coil types of surface heating elements in commercial type heating appliances shall be protected by overcurrent protection devices which are rated at not more than 50 amperes.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

D. MARKING OF APPLIANCES

E 422.30 Nameplate. Each electric appliance shall be provided with a nameplate, giving the maker's name and the normal rating in volts and amperes, or in volts and watts.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.31 Marking of heating elements. Individual heating elements which are a part of an electric appliance containing more than one heating element shall each be legibly marked with normal rating in volts and amperes, or in volts and watts.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E. SPECIAL PROVISIONS FOR FIXED INDOOR ELECTRICAL SPACE HEATING

E 422.40 General. (1) Equipment for use with electrical space heating systems shall be of a type approved for such service.

(2) In addition to complying with the general requirements for appliances, such equipment shall comply with part E of this chapter.

(3) The special provisions of this chapter shall apply to electrically energized units, panels and cables for space heating. They shall also include central heating systems employing electrical heating units.

(4) Electrical space heating systems employing methods of installation other than covered by part E of this chapter may be used only by special permission.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.41 Use. Space heating systems shall not be used:

(1) Where exposed to severe physical damage unless adequately protected.

(2) In wet or damp locations unless specially approved for the purpose.

Note: See also rules on corrosive conditions, section E 310.07.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.42 Temperature limitations. The operating temperature of room surfaces where embedded elements and panels are used shall not exceed 66°C. (150°F.). (Based on room temperature of 30°C., 86°F.).

Note: It is recommended that a temperature limiting control device be incorporated in each baseboard electric heater unit in a residential occupancy.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.43 Appliances to be complete units. (1) Panels and cables shall be installed in their complete sizes or lengths as supplied by the manufacturer.

(2) Units which are shortened or from which the marking labels or nameplates are missing shall not be installed.

(3) Units shall be suitable for use with approved wiring systems.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.44 Heating cable construction. Heating cables shall be furnished complete with factory-assembled non-heating leads at least 7 feet in length, and the leads shall consist of conductors and wiring approved for general use or other wiring approved for the purpose.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.45 Marking of heating cables. (1) Each unit length of heating cable shall have a permanent marking located within 3 inches of the terminal end of the non-heating leads, and shall be legibly marked with the manufacturer's name or identification symbol, catalog number, and rating in volts and watts or amperes.

(2) The lead wires shall have the following color identifications: 230 volts nominal—red, 115 volts nominal—yellow.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.46 Controllers and disconnecting means. (1) Thermostats and thermostatically controlled switching devices which indicate an "off" position and which interrupt line current shall open all ungrounded conductors in the "off" position.

(2) Thermostats and thermostatically controlled switching devices which do not have "on" or "off" positions are not required to open all ungrounded conductors.

Note: See sections E 422.20, E 422.22 and E 422.24 for disconnecting means for stationary appliances.

(3) Switching devices consisting of combined thermostats and manually controlled switches which serve both as controllers and disconnecting means shall:

(a) Open regardless of temperature all ungrounded conductors when manually placed in the "off" position;

(b) Be so designed that the circuit cannot be energized automatically after the device has been manually placed in the "off" position.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.47 Clearances of wiring in ceilings. (1) Wiring located above heated ceilings and within thermal insulation shall be spaced not less than 2 inches above the heated ceiling and shall be considered as operating at an ambient of 50°C. The current carrying capacities of conductors shall be computed on the basis of the correction factors given in tables E 310.12 and E 310.14.

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(2) Wiring located above heated ceilings and over thermal insulation having a minimum thickness of 2 inches requires no correction for temperature.

(3) Wiring located above heated ceilings and within a joist space having no thermal insulation shall be spaced not less than 2 inches above the ceiling and shall be considered as operating at an ambient of 50°C. The current-carrying capacities of conductors shall be computed on the basis of the correction factors given in tables E 310.12 and E 310.14.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.48 Clearances of wiring in walls. (1) Where located in exterior walls, wiring shall be located outside the thermal insulation.

(2) Where located in interior walls or partitions, wiring shall be located away from the heated surfaces, and the wiring shall be considered as operating at an ambient of 40°C. (104°F.); and the current-carrying capacities of conductors shall be computed on the basis of the correction factors given in tables E 310.12 and E 310.14.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.49 Area restrictions. (1) Heating panels shall not extend beyond the room in which they originate.

(2) Cables shall not be installed in closets, over cabinets which extend to the ceiling, under walls or partitions or over walls or partitions which extend to the ceiling.

(a) *Exception:* Single runs of cable may pass over partitions where they are embedded.

(3) This requirement shall not prohibit low-temperature heat sources in closets to control relative humidity.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.50 Clearance from other objects and openings. Panels and cables shall be separated at least 8 inches from lighting fixtures, outlet and junction boxes, and 2 inches from ventilating openings and other such openings in room surfaces, or sufficient area shall be provided to assure that no heating cables or panels will be covered by surface mounted lighting units.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.51 Splices. Embedded cables may be spliced only where necessary and only by approved means, and in no case shall the length of the heating cable be altered.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.52 Installation of heating cables in dry board and plaster.

(1) Cables shall not be installed in walls.

(2) Adjacent runs of cable not exceeding 2¾ watts per foot shall be installed not less than 1½ inches on centers.

(3) Heating cables may be applied only to gypsum board, plaster lath and similar fire-resistant materials. With metal lath or other conducting surfaces, a coat of plaster (brown or scratch coat) shall be applied to completely cover the metal lath or conducting surface before the cable is attached.

(4) The entire ceiling surface shall have a finish of thermally non-insulating sand plaster or other approved non-insulating material having a nominal thickness of ½ inch.

(5) Cables shall be secured at intervals not exceeding 16 inches by means of approved stapling, tape, plaster or other approved means. Staples or metal fasteners which straddle the cable shall not be used with metal lath or other conducting surface.

(6) In dry board installations, the entire ceiling shall be covered with gypsum board not exceeding $\frac{1}{2}$ inch thickness. The void between the upper layer of gypsum board and the surface layer of gypsum board shall be filled with thermally-conducting plaster or other approved material.

(7) Cables shall be kept free from contact with metal or conducting surfaces.

(8) Caution should be used in attaching a surface layer of gypsum so that the nails or other fastenings do not pierce the heating cable.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.53 Installation of non-heating leads. (1) Non-heating leads of cables shall be installed in accordance with approved wiring methods from the junction box to a location on the underside of the ceiling.

(2) Excess leads shall not be cut but shall be secured to the underside of the ceiling and embedded in plaster or other approved material, leaving only a length sufficient to reach the junction box with not less than 6 inches of free lead within the box.

(3) The marking of the leads shall be visible in the junction box.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.54 Installation of cables in concrete or poured masonry floors.

(1) Adjacent runs of cable not exceeding $2\frac{3}{4}$ watts per foot shall be installed not less than 1 inch on centers.

(2) Cables shall be secured in place by non-metallic frames or spreaders or other approved means while the concrete or other finish is applied.

(3) A spacing of at least 1 inch shall be maintained between the heating cable and other metallic bodies embedded in the floor.

(4) Leads shall be protected where they leave the floor by rigid metal conduit, electrical metallic tubing, or by other approved raceways extending to the junction box.

(5) Bushings shall be used where the leads emerge in the floor slab.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.55 Tests during and after installation. (1) Embedded cable installations shall be made with due care to prevent damage to the cable assembly and shall be inspected and approved before cables are covered or concealed.

(2) Cable shall be tested for insulation resistance after plastering or the pouring of floors. See section E 195.19, Insulation Resistance.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.56 Installation of resistance heaters in air ducts. A heater which is to be installed in an air duct or plenum shall be approved for the purpose and shall be installed in the manner approved for the equipment. Each such heater shall be provided with approved controls

which disconnect the power supply to the heaters in the case of failure of a normal air flow across the heaters for any reason, such as blocked filters, motor failure, broken belts, shafts or other driving equipment, etc., and shall be provided with an approved temperature-limiting control.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

F. PROVISIONS FOR ROOM AIR-CONDITIONING UNITS

E 422.60 General. The provisions of sections E 422.61 to E 422.63 inclusive shall apply to electrically energized units and equipment which control temperature and humidity.

Note: See section E 422.56.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.61 Grounding. Exposed non-current-carrying metal parts which are liable to become energized shall be grounded under one or more of the following conditions:

- (1) Where permanently connected to metal-enclosed wiring;
- (2) When in a wet location and not isolated;
- (3) When within reach of a person standing on the ground outside of a building;
- (4) When in a hazardous location, see chapter E 500;
- (5) Where in electrical contact with metal or metal lath;
- (6) Where more than 150 volts to ground.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.62 Branch circuit requirements. (1) The total load of motor operated air-conditioning equipment shall not exceed 80% of the rating of a branch circuit which does not supply lighting units or other appliances.

(2) The total load of air-conditioning equipment shall not exceed 50% of the rating of a branch circuit where lighting units or other appliances are also supplied.

(3) For air-conditioning units employing 2 or more motors, see subsection E 430.053 (3).

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.

E 422.63 Disconnecting means. A separable connector or an attachment plug and receptacle may serve as the disconnecting means.

History: Cr. Register, April, 1964, No. 100, eff. 5-1-64.