ARTICLE 422 – Appliances

Part I. General

422.1 Scope. This article covers electrical appliances used in any occupancy.

422.3 Other Articles. The requirements of Article 430 shall apply to the installation of motor operated appliances, and the requirements of Article 440 shall apply to the installation of appliances containing a hermetic refrigerant motor compressor(s), except as specifically amended in this article.

422.4 Live Parts. Appliances shall have no live parts normally exposed to contact other than those parts functioning as open resistance heating elements, such as the heating element of a toaster, which are necessarily exposed.

422.5 Ground-Fault Circuit-Interrupter (GFCI) Protection for Personnel.

(A) General. Appliances identified in 422.5(A)(1) through (5) rated 250 volts or less and 60 amperes or less, single- or 3-phase, shall be provided with GFCI protection for personnel. Multiple GFCI protective devices shall be permitted but shall not be required.

(1) Automotive vacuum machines provided for public use

(2) Drinking water coolers

(3) High-pressure spray washing machines — cord-and-plug connected

(4) Tire inflation machines provided for public use

(5) Vending machines
(B) **Type.** The GFCI shall be readily accessible, listed, and located in one or more of the following locations:

1. Within the branch circuit overcurrent device
2. A device or outlet within the supply circuit
3. An integral part of the attachment plug
4. Within the supply cord not more than 300 mm (12 in.) from the attachment plug
5. Factory installed within the appliance

**422.6 Listing Required.** All appliances operating at 50 volts or more shall be listed.

**Part II. Installation**

**422.10 Branch-Circuit Rating.** This section specifies the ratings of branch circuits capable of carrying appliance current without overheating under the conditions specified.

(A) **Individual Circuits.** The rating of an individual branch circuit shall not be less than the marked rating of the appliance or the marked rating of an appliance having combined loads as provided in 422.62. The rating of an individual branch circuit for motor operated appliances not having a marked rating shall be in accordance with Part II of Article 430. The branch-circuit rating for an appliance that is a continuous load, other than a motor-operated appliance, shall not be less than 125 percent of the marked rating, or not less than 100 percent of the marked rating if the branch-circuit device and its assembly are listed for continuous loading at 100 percent of its rating. Branch circuits and branch-circuit conductors for household ranges and cooking appliances shall be permitted to be in accordance with Table 220.55 and shall be sized in accordance with 210.19(A)(3).
(B) **Circuits Supplying Two or More Loads.** For branch circuits supplying appliance and other loads, the rating shall be determined in accordance with 210.23.

**422.11 Overcurrent Protection.** Appliances shall be protected against overcurrent in accordance with 422.11(A) through (G) and 422.10.

(A) **Branch-Circuit Overcurrent Protection.** Branch circuits shall be protected in accordance with 240.4. If a protective device rating is marked on an appliance, the branch-circuit overcurrent device rating shall not exceed the protective device rating marked on the appliance.

(B) **Household-Type Appliances with Surface Heating Elements.** Household-type appliances with surface heating elements having a maximum demand of more than 60 amperes calculated in accordance with Table 220.55 shall have their power supply subdivided into two or more circuits, each of which shall be provided with overcurrent protection rated at not over 50 amperes.

(C) **Infrared Lamp Commercial and Industrial Heating Appliances.** Infrared lamp commercial and industrial heating appliances shall have overcurrent protection not exceeding 50 amperes.

(D) **Open-Coil or Exposed Sheathed-Coil Types of Surface Heating Elements in Commercial-Type Heating Appliances.** Open-coil or exposed sheathed-coil types of surface heating elements in commercial-type heating appliances shall be protected by overcurrent protective devices rated at not over 50 amperes.

(E) **Single Non–Motor-Operated Appliance.** If the branch circuit supplies a single non–motor-operated appliance, the rating of overcurrent protection shall comply with the following:

1. Not exceed that marked on the appliance.
(2) Not exceed 20 amperes if the overcurrent protection rating is not marked and the appliance is rated 13.3 amperes or less; or

(3) Not exceed 150 percent of the appliance rated current if the overcurrent protection rating is not marked and the appliance is rated over 13.3 amperes. Where 150 percent of the appliance rating does not correspond to a standard overcurrent device ampere rating, the next higher standard rating shall be permitted.

(F) Electric Heating Appliances Employing Resistance-Type Heating Elements Rated More Than 48 Amperes.

(1) Electric Heating Appliances. Electric heating appliances employing resistance-type heating elements rated more than 48 amperes, other than household appliances with surface heating elements covered by 422.11(B), and commercial-type heating appliances covered by 422.11(D), shall have the heating elements subdivided. Each subdivided load shall not exceed 48 amperes and shall be protected at not more than 60 amperes. These supplementary overcurrent protective devices shall be

(1) factory-installed within or on the heater enclosure or provided as a separate assembly by the heater manufacturer;

(2) accessible; and

(3) suitable for branch-circuit protection. The main conductors supplying these overcurrent protective devices shall be considered branch-circuit conductors.

(2) Commercial Kitchen and Cooking Appliances. Commercial kitchen and cooking appliances using sheathed-type heating elements not covered in 422.11(D) shall be
permitted to be subdivided into circuits not exceeding 120 amperes and protected at not more than 150 amperes where one of the following is met:

(1) Elements are integral with and enclosed within a cooking surface.

(2) Elements are completely contained within an enclosure identified as suitable for this use.

(3) Elements are contained within an ASME-rated and stamped vessel.

(3) Water Heaters and Steam Boilers. Resistance-type immersion electric heating elements shall be permitted to be subdivided into circuits not exceeding 120 amperes and protected at not more than 150 amperes as follows:

(1) Where contained in ASME-rated and stamped vessels

(2) Where included in listed instantaneous water heaters

(3) Where installed in low-pressure water heater tanks or open-outlet water heater vessels

Informational Note: Low-pressure and open-outlet heaters are atmospheric pressure water heaters as defined in IEC 60335-2-21, Household and similar electrical appliances — Safety — Particular requirements for storage water heaters.

(G) Motor-Operated Appliances. Motors of motor-operated appliances shall be provided with overload protection in accordance with Part III of Article 430. Hermetic refrigerant motor compressors in air-conditioning or refrigerating equipment shall be provided with overload protection in accordance with Part VI of Article 440. Where appliance overcurrent protective
devices that are separate from the appliance are required, data for selection of these devices shall be marked on the appliance. The minimum marking shall be that specified in 430.7 and 440.4.

422.12 Central Heating Equipment. Central heating equipment other than fixed electric space-heating equipment shall be supplied by an individual branch circuit.

Exception No. 1: Auxiliary equipment, such as a pump, valve, humidifier, or electrostatic air cleaner directly associated with the heating equipment, shall be permitted to be connected to the same branch circuit.

Exception No. 2: Permanently connected air-conditioning equipment shall be permitted to be connected to the same branch circuit.

422.13 Storage-Type Water Heaters. A fixed storage-type water heater that has a capacity of 450 L (120 gal) or less shall be considered a continuous load for the purposes of sizing branch circuits.

Informational Note: For branch-circuit rating, see 422.10.

422.15 Central Vacuum Outlet Assemblies.

(A) Listed central vacuum outlet assemblies shall be permitted to be connected to a branch circuit in accordance with 210.23(A).
(B) The ampacity of the connecting conductors shall not be less than the ampacity of the branch circuit conductors to which they are connected.

(C) Accessible non–current-carrying metal parts of the central vacuum outlet assembly likely to become energized shall be connected to an equipment grounding conductor in accordance with 250.110. Incidental metal parts such as screws or rivets installed into or on insulating material shall not be considered likely to become energized.

422.16 Flexible Cords.

(A) General. Flexible cord shall be permitted (1) for the connection of appliances to facilitate their frequent interchange or to prevent the transmission of noise or vibration or (2) to facilitate the removal or disconnection of appliances that are fastened in place, where the fastening means and mechanical connections are specifically designed to permit ready removal for maintenance or repair and the appliance is intended or identified for flexible cord connection.

(B) Specific Appliances.

(1) Electrically Operated In-Sink Waste Disposers. Electrically operated in-sink waste disposers shall be permitted to be cord and- plug-connected with a flexible cord identified as suitable in the installation instructions of the appliance manufacturer where all of the following conditions are met:

(1) The flexible cord shall be terminated with a grounding type attachment plug.
Exception: A listed in-sink waste disposer distinctly marked to identify it as protected by a system of double insulation shall not be required to be terminated with a grounding-type attachment plug.

(2) The length of the cord shall not be less than 450 mm (18 in.) and not over 900 mm (36 in.).

(3) Receptacles shall be located to protect against physical damage to the flexible cord.

(4) The receptacle shall be accessible.

(2) Built-in Dishwashers and Trash Compactors. Built-in dishwashers and trash compactors shall be permitted to be cord and plug-connected with a flexible cord identified as suitable for the purpose in the installation instructions of the appliance manufacturer where all of the following conditions are met:

(1) The flexible cord shall be terminated with a grounding type attachment plug.

Exception: A listed dishwasher or trash compactor distinctly marked to identify it as protected by a system of double insulation shall not be required to be terminated with a grounding-type attachment plug.

(2) For a trash compactor, the length of the cord shall be 0.9 m to 1.2 m (3 ft to 4 ft) measured from the face of the attachment plug to the plane of the rear of the appliance.
(3) **For a built-in dishwasher,** the length of the cord shall be 0.9 m to 2.0 m (3 ft to 6.5 ft) measured from the face of the attachment plug to the plane of the rear of the appliance.

(4) Receptacles shall be located to protect against physical damage to the flexible cord.

(5) The receptacle for a **trash compactor** shall be located in the space occupied by the appliance or adjacent thereto.

(6) **The receptacle for a built-in dishwasher shall be located in the space adjacent to the space occupied by the dishwasher.**

(7) The receptacle shall be accessible.

(3) **Wall-Mounted Ovens and Counter-Mounted Cooking Units.** Wall-mounted ovens and counter-mounted cooking units complete with provisions for mounting and for making electrical connections shall be permitted to be permanently connected or, only for ease in servicing or for installation, cord-and plug-connected. A separable connector or a plug and receptacle combination in the supply line to an oven or cooking unit shall be approved for the temperature of the space in which it is located.

(4) **Range Hoods.** Range hoods shall be permitted to be cord and-plug-connected with a flexible cord identified as suitable for use on range hoods in the installation instructions of the appliance manufacturer, where all of the following conditions are met:

   (1) The flexible cord is terminated with a grounding-type attachment plug.
Exception: A listed range hood distinctly marked to identify it as protected by a system of double insulation shall not be required to be terminated with a grounding-type attachment plug.

(2) The length of the cord is not less than 450 mm (18 in.) and not over 1.2 m (4 ft).

(3) Receptacles are located to protect against physical damage to the flexible cord.

(4) The receptacle is accessible.

(5) The receptacle is supplied by an individual branch circuit.

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

422.18 Support of Ceiling-Suspended (Paddle) Fans. Ceiling suspended (paddle) fans shall be supported independently of an outlet box or by one of the following:

(1) A listed outlet box or listed outlet box system identified for the use and installed in accordance with 314.27(C)

(2) A listed outlet box system, a listed locking support and mounting receptacle, and a compatible factory installed attachment fitting designed for support, identified for the use and installed in accordance with 314.27(E)

422.19 Space for Conductors. Canopies of ceiling-suspended (paddle) fans and outlet boxes taken together shall provide sufficient space so that conductors and their connecting devices are capable of being installed in accordance with 314.16.
422.20 Outlet Boxes to Be Covered. In a completed installation, each outlet box shall be provided with a cover unless covered by means of a ceiling-suspended (paddle) fan canopy.

422.21 Covering of Combustible Material at Outlet Boxes. Any combustible ceiling finish that is exposed between the edge of a ceiling-suspended (paddle) fan canopy or pan and an outlet box and that has a surface area of 1160 mm² (180 in.²) or more shall be covered with noncombustible material.

422.22 Other Installation Methods. Appliances employing methods of installation other than covered by this article shall be permitted to be used only by special permission.

Part III. Disconnecting Means

422.30 General. A means shall be provided to simultaneously disconnect each appliance from all ungrounded conductors in accordance with the following sections of Part III. If an appliance is supplied by more than one branch circuit or feeder, these disconnecting means shall be grouped and identified as being the multiple disconnecting means for the appliance. Each disconnecting means shall simultaneously disconnect all ungrounded conductors that it controls.

422.31 Disconnection of Permanently Connected Appliances.

(A) Rated at Not over 300 Volt-Amperes or 1/8 Horsepower. For permanently connected appliances rated at not over 300 volt-amperes or 1/8 hp, the branch-circuit overcurrent device shall be permitted to serve as the disconnecting means where the switch or circuit breaker is within sight from the appliance or is lockable in accordance with 110.25.

(B) Appliances Rated over 300 Volt-Amperes. For permanently connected appliances rated over 300 volt-amperes, the branch-circuit switch or circuit breaker shall be permitted to serve
as the disconnecting means where the switch or circuit breaker is within sight from the appliance or is lockable in accordance with 110.25.

Informational Note: For appliances employing unit switches, see 422.34.

(C) Motor-Operated Appliances Rated over 1/8 Horsepower. The disconnecting means shall comply with 430.109 and 430.110. For permanently connected motor-operated appliances with motors rated over 1/8 hp, the disconnecting means shall be within sight from the appliance or be capable of being locked in the open position in compliance with 110.25.

Exception: If an appliance of more than 1/8 hp is provided with a unit switch that complies with 422.34(A), (B), (C), or (D), the switch or circuit breaker serving as the other disconnecting means shall be permitted to be out of sight from the appliance.

422.33 Disconnection of Cord-and-Plug-Connected or Attachment Fitting–Connected Appliances.

(A) Separable Connector or an Attachment Plug (or Attachment Fitting) and Receptacle. For cord-and-plug- (or attachment fitting–) connected appliances, an accessible separable connector or an accessible plug (or attachment fitting) and receptacle combination shall be permitted to serve as the disconnecting means. The attachment fitting shall be a factory installed part of the appliance and suitable for disconnection of the appliance. Where the separable connector or plug (or attachment fitting) and receptacle combination are not
accessible, cord-and-plug-connected or attachment fitting-and-plug connected appliances shall be provided with disconnecting means in accordance with 422.31.

**(B) Connection at the Rear Base of a Range.** For cord-and-plug-connected household electric ranges, an attachment plug and receptacle connection at the rear base of a range, accessible from the front by removal of a drawer, shall meet the intent of 422.33(A).

**(C) Rating.** The rating of a receptacle or of a separable connector shall not be less than the rating of any appliance connected thereto.

*Exception: Demand factors authorized elsewhere in this Code shall be permitted to be applied to the rating of a receptacle or of a separable connector.*

### 422.34 Unit Switch(es) as Disconnecting Means

A unit switch(es) with a marked-off position that is a part of an appliance and disconnects all ungrounded conductors shall be permitted as the disconnecting means required by this article where other means for disconnection are provided in occupancies specified in 422.34(A) through (D).

**(A) Multifamily Dwellings.** In multifamily dwellings, the other disconnecting means shall be within the dwelling unit, or on the same floor as the dwelling unit in which the appliance is installed, and shall be permitted to control lamps and other appliances.

**(B) Two-Family Dwellings.** In two-family dwellings, the other disconnecting means shall be permitted either inside or outside of the dwelling unit in which the appliance is installed. In this case, an individual switch or circuit breaker for the dwelling unit shall be permitted and shall also be permitted to control lamps and other appliances.
(C) One-Family Dwellings. In one-family dwellings, the service disconnecting means shall be permitted to be the other disconnecting means.

(D) Other Occupancies. In other occupancies, the branch circuit switch or circuit breaker, where readily accessible for servicing of the appliance, shall be permitted as the other disconnecting means.

422.35 Switch and Circuit Breaker to Be Indicating. Switches and circuit breakers used as disconnecting means shall be of the indicating type.

Part IV. Construction

422.40 Polarity in Cord-and Plug-Connected Appliances. If the appliance is provided with a manually operated, line connected, single-pole switch for appliance on–off operation, an Edison-base lamp holder, or a 15- or 20-ampere receptacle, the attachment plug shall be of the polarized or grounding type. A 2-wire, nonpolarized attachment plug shall be permitted to be used on a listed double-insulated shaver.

Informational Note: For polarity of Edison-base lampholders, see 410.82(A).

422.41 Cord-and Plug-Connected Appliances Subject to Immersion. Cord-and plug-connected portable, freestanding hydromassage units and hand-held hair dryers shall be constructed to provide protection for personnel against electrocution when immersed while in the “on” or “off” position.
422.42 Signals for Heated Appliances. In other than dwelling type occupancies, each electrically heated appliance or group of appliances intended to be applied to combustible material shall be provided with a signal or an integral temperature limiting device.

422.43 Flexible Cords.

(A) Heater Cords. All cord-and plug-connected smoothing irons and electrically heated appliances that are rated at more than 50 watts and produce temperatures in excess of 121°C (250°F) on surfaces with which the cord is likely to be in contact shall be provided with one of the types of approved heater cords listed in Table 400.4.

(B) Other Heating Appliances. All other cord-and plug connected electrically heated appliances shall be connected with one of the approved types of cord listed in Table 400.4, selected in accordance with the usage specified in that table.

422.44 Cord-and Plug-Connected Immersion Heaters. Electric heaters of the cord-and plug-connected immersion type shall be constructed and installed so that current-carrying parts are effectively insulated from electrical contact with the substance in which they are immersed.

422.45 Stands for Cord-and Plug-Connected Appliances. Each smoothing iron and other cord-and plug-connected electrically heated appliance intended to be applied to combustible material shall be equipped with an approved stand, which shall be permitted to be a separate piece of equipment or a part of the appliance.

422.46 Flatirons. Electrically heated smoothing irons shall be equipped with an identified temperature-limiting means.
**422.47 Water Heater Controls.** All storage or instantaneous type water heaters shall be equipped with a temperature limiting means in addition to its control thermostat to disconnect all ungrounded conductors. Such means shall comply with both of the following:

1. Installed to sense maximum water temperature.
2. Be either a trip-free, manually reset type or a type having a replacement element.

Such water heaters shall be marked to require the installation of a temperature and pressure relief valve.

*Exception No. 1:* Storage water heaters that are identified as being suitable for use with a supply water temperature of 82°C (180°F) or above and a capacity of 60 kW or above.

*Exception No. 2:* Instantaneous-type water heaters that are identified as being suitable for such use, with a capacity of 4 L (1 gal) or less.


**422.48 Infrared Lamp Industrial Heating Appliances.**

(A) **300 Watts or Less.** Infrared heating lamps rated at 300 watts or less shall be permitted with lampholders of the medium-base, unswitched porcelain type or other types identified as suitable for use with infrared heating lamps rated 300 watts or less.

(B) **Over 300 Watts.** Screw shell lampholders shall not be used with infrared lamps rated over 300 watts, unless the lampholders are identified as being suitable for use with infrared heating lamps rated over 300 watts.
422.50 Cord-and-Plug-Connected Pipe Heating Assemblies. Cord-and-plug-connected pipe heating assemblies intended to prevent freezing of piping shall be listed.

**Part V. Marking**

422.60 Nameplate.

**(A) Nameplate Marking.** Each electrical appliance shall be provided with a nameplate giving the identifying name and the rating in volts and amperes, or in volts and watts. If the appliance is to be used on a specific frequency or frequencies, it shall be so marked. Where motor overload protection external to the appliance is required, the appliance shall be so marked.

**Informational Note:** See 422.11 for overcurrent protection requirements.

**(B) To Be Visible.** Marking shall be located so as to be visible or easily accessible after installation.

422.61 Marking of Heating Elements. All heating elements that are rated over one ampere, replaceable in the field, and a part of an appliance shall be legibly marked with the ratings in volts and amperes, or in volts and watts, or with the manufacturer’s part number.

422.62 Appliances Consisting of Motors and Other Loads.

**(A) Nameplate Horsepower Markings.** Where a motor operated appliance nameplate includes a horsepower rating, that rating shall not be less than the horsepower rating on the motor nameplate. Where an appliance consists of multiple motors, or one or more motors and other loads, the nameplate value shall not be less than the equivalent horsepower of the combined loads, calculated in accordance with 430.110(C)(1).
(B) Additional Nameplate Markings. Appliances, other than those factory-equipped with cords and attachment plugs and with nameplates in compliance with 422.60, shall be marked in accordance with 422.62(B)(1) or (B)(2).

(1) Marking. In addition to the marking required in 422.60, the marking on an appliance consisting of a motor with other load(s) or motors with or without other load(s) shall specify the minimum supply circuit conductor ampacity and the maximum rating of the circuit overcurrent protective device. This requirement shall not apply to an appliance with a nameplate in compliance with 422.60 where both the minimum supply circuit conductor ampacity and maximum rating of the circuit overcurrent protective device are not more than 15 amperes.

(2) Alternate Marking Method. An alternative marking method shall be permitted to specify the rating of the largest motor in volts and amperes, and the additional load(s) in volts and amperes, or volts and watts in addition to the marking required in 422.60. The ampere rating of a motor 1/8 horsepower or less or a nonmotor load 1 ampere or less shall be permitted to be omitted unless such loads constitute the principal load.

ARTICLE 424
Fixed Electric Space-Heating Equipment

Part I. General

424.1 Scope. This article covers fixed electric equipment used for space heating. For the purpose of this article, heating equipment shall include heating cable, unit heaters, boilers,
central systems, or other approved fixed electric space-heating equipment. This article shall not apply to process heating and room air conditioning.

**424.2 Other Articles.** Fixed electric space-heating equipment incorporating a hermetic refrigerant motor-compressor shall also comply with Article 440.

**424.3 Branch Circuits.**

*(A) Branch-Circuit Requirements.* Individual branch circuits shall be permitted to supply any volt-ampere or wattage rating of fixed electric space-heating equipment for which they are rated. Branch circuits supplying two or more outlets for fixed electric space-heating equipment shall be rated not over 30 amperes. In other than a dwelling unit, fixed infrared heating equipment shall be permitted to be supplied from branch circuits rated not over 50 amperes.

*(B) Branch-Circuit Sizing.* Fixed electric space-heating equipment and motors shall be considered continuous load.

**424.6 Listed Equipment.** Electric baseboard heaters, heating cables, duct heaters, and radiant heating systems shall be listed and labeled.

**Part II. Installation**

**424.9 General.** Permanently installed electric baseboard heaters equipped with factory-installed receptacle outlets, or outlets provided as a separate listed assembly, shall be permitted in lieu of a receptacle outlet(s) that is required by 210.50(B). Such receptacle outlets shall not be connected to the heater circuits.

**Informational Note:** Listed baseboard heaters include instructions that may not permit their installation below receptacle outlets.
424.10 Special Permission. Fixed electric space-heating equipment and systems installed by methods other than covered by this article shall be permitted only by special permission.

424.11 Supply Conductors. Fixed electric space-heating equipment requiring supply conductors with over 60°C insulation shall be clearly and permanently marked. This marking shall be plainly visible after installation and shall be permitted to be adjacent to the field connection box.

424.12 Locations.

(A) Exposed to Physical Damage. Where subject to physical damage, fixed electric space-heating equipment shall be protected in an approved manner.

(B) Damp or Wet Locations. Heaters and related equipment installed in damp or wet locations shall be listed for such locations and shall be constructed and installed so that water or other liquids cannot enter or accumulate in or on wired sections, electrical components, or ductwork.

Informational Note No. 1: See 110.11 for equipment exposed to deteriorating agents.

Informational Note No. 2: See 680.27(C) for pool deck areas.

424.13 Spacing from Combustible Materials. Fixed electric space-heating equipment shall be installed to provide the required spacing between the equipment and adjacent combustible material, unless it is listed to be installed in direct contact with combustible material.