

AMENDMENTS TO THE NATIONAL ELECTRICAL CODE

City of Tempe
Development Services Dept.
Building Safety Division
P.O. Box 5002
Tempe, AZ 85280
(480) 350-8341



THE TEMPE ELECTRICAL CODE

The Tempe Electrical Code consists of the National Electrical Code (NEC) 1996 ⁽¹⁾ Edition, Chapters 1-8; the City of Tempe Amendments to the 1996 NEC, printed herein, and the administrative requirements contained in Chapter 8 Tempe City Code.

All installations, alterations, repairs and use of electric wiring, connections and fixtures shall be in conformity with the provisions of the National Fire Protection Association Standard No. 70-1996 National Electrical Code, except as otherwise provided for in this Code.

The requirements contained herein shall take precedence over any conflicting requirements in the National Electrical Code. Identification is by corresponding National Electrical Code, Chapter, Article, Section and/or paragraph number. Numbers in () following the amendment indicate the ordinances and effective date of revisions which are listed on the last page. Amendments have been underlined for easy identification.

Section 110-7. Insulation Integrity.

[Section 110-7 is hereby amended as follows:]

110-7. Insulation Integrity. All wiring and electric equipment shall be so installed that, when completed, the system will be free from short circuits and from grounds other than as required or permitted in Article 250.

All equipment rated at 1,000 amperes or more shall be tested in conformance with UL Standard 869 or 891 for insulation breakdown prior to its being energized. This test shall be performed by an independent testing facility or agency approved by the Authority Having Jurisdiction.

Section 110-16. Working Space About Electric Equipment (600 Volts, Nominal, or Less).

[Subsection 110-16(c) is hereby amended as follows:]

(c) Access and Entrance to Working Space. At least one entrance of sufficient area shall be provided to give access to the working space about electric equipment.

For equipment rated 1200 amperes or more and over 6 ft (1.83 m) wide, containing overcurrent devices, switching devices, or control devices, there shall be one entrance not less than 24 in. (610 mm) wide and 6 1/2 ft (1.98 m) high at each end.

Exception No. 1: Where the location permits a continuous and unobstructed way of exit travel, one means of exit shall be permitted.

Exception No. 2: Where the work space required by Section 110-16(a) is doubled, only one entrance to the working space is required, and it shall be located so that the edge of the entrance nearest the equipment is the minimum clear distance given in Table 110-16(a) away from such equipment.

All room(s) or space(s) as described in Section 110-16(a), dedicated to electric equipment, shall have all door(s) open outward. Such door(s) shall be a minimum of 24 in. (610 mm) wide and 6 1/2 ft (1.98 m) high.

For electric equipment having hinged door(s) or panel(s), a clear means of egress shall be provided when door(s) or panel(s) are open in any position. Such means of egress shall not be less than 24 in. (610 mm) in width.

Section 110-33. Entrance and Access to Work Space.

[Subsection 110-33(a) is hereby amended as follows:]

(a) Entrance. At least one entrance not less than 24 in. (610 mm) wide and 6 1/2 ft (1.98 m) high shall be provided to give access to the working space about electric equipment.

On switchboard and control panels exceeding 6 ft (1.83 m) in width, there shall be one entrance at each end of such board.

Exception No. 1: Where the switchboards and control panels location permits a continuous and unobstructed way of exit travel.

Exception No. 2: Where the work space required in Section 110-34(a) is doubled.

Working space with one entrance provided shall be so located that the edge of the entrance nearest the switchboards and control panels is the minimum clear distance given in Table 110-34(a) away from such equipment.

All room(s) or space(s) as described in Section 110-34(a), dedicated to electric equipment, shall have all door(s) open outward. Such door(s) shall be a minimum of 24 in. (610 mm) wide and 6 1/2 ft (1.98 m) high.

For electric equipment having hinged door(s) or panel(s), a clear means of egress shall be provided when door(s) or panel(s) are open in any position. Such clear means of egress shall not be less than 24 in. (610 mm) in width.

Where bare energized parts at any voltage or insulated energized parts above 600 volts, nominal, to ground are located adjacent to such entrance, they shall be suitably guarded.

Section 210-5. Color Code for Branch Circuits.

[Subsection 210-5(c) is hereby added as follows:]

(c) Color Code. Where 15, 20, or 30 ampere branch circuits requiring a neutral, are installed in raceways, the conductors of branch circuits connected to the same system shall conform to the following color code:

VOLTS	PHASE	SYSTEM	PHASE A	PHASE B	PHASE C	NEUTRAL
<u>120/208</u>	<u>3</u>	<u>WYE</u>	<u>BLACK</u>	<u>RED</u>	<u>BLUE</u>	<u>WHITE</u>
<u>277/480</u>	<u>3</u>	<u>WYE</u>	<u>BROWN</u>	<u>ORANGE</u>	<u>YELLOW</u>	<u>GRAY</u>
<u>120/240</u>	<u>3</u>	<u>DELTA</u>	<u>BLACK</u>	<u>ORANGE</u>	<u>BLUE OR RED</u>	<u>WHITE</u>

Exception No. 1: The above color coding is not required in residential occupancies.

Exception No. 2: Industrial occupancies holding their own maintenance license may use their own color coding system.

Exception No. 3: Conductors of listed cable assemblies shall be permitted to be permanently re-identified at the time of installation by distinctive markings at each outlet or termination where the conductor is visible and accessible; such as, 6 in. (152 mm) taping or other effective means.

Exception No. 4: Additions to an existing electrical system, where an acceptable color coding system exists, the existing color coding system shall be continued.

Section 210-8. Ground-Fault Circuit-Interrupter Protection for Personnel.

[Subsection 210-8(a) is hereby amended as follows:]

(a) All Occupancies. All 125-volt, single-phase, 15- and 20-ampere receptacles installed in the locations specified below shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms.

(2) Garages and grade-level portions of unfinished accessory buildings used for storage or work areas.

Exception No. 1: Receptacles that are not readily accessible.

Exception No. 2: A single receptacle or a duplex receptacles for two appliances located within dedicated space for each appliance that in normal use is not easily moved from one place to another, and that is cord- and plug-connected in accordance with Section 400-7(a)(6), (a)(7), or (a)(8).

Receptacles installed under exceptions to Section 210-8(a)(2) shall not be considered as meeting the requirements of Section 210-52(g).

(3) Outdoors.

Exception: Receptacles that are not readily accessible and are supplied from a dedicated branch circuit for electric snow-melting or deicing equipment as covered in Article 426 shall be permitted to be installed without ground-fault circuit-interrupter protection for personnel.

(4) Crawl spaces. Where the crawl space is at or below grade level.

(5) Unfinished basements. For purposes of this section, unfinished basements are defined as portions or areas of the basement not intended as habitable rooms and limited to storage areas, work areas, and the like.

Exception No. 1: Receptacles that are not readily accessible.

Exception No. 2: A single receptacle or a duplex receptacle for two appliances located within dedicated space for each appliance that in normal use is not easily moved from one place to another, and that is cord- and plug-connected in accordance with Section 400-7(a)(6), (a)(7), or (a)(8).

Receptacles installed under exceptions to Section 210-8(a)(5) shall not be considered as meeting the requirements of Section 210-52(g).

(6) Kitchens. Where the receptacles are installed to serve the countertop surfaces.

(7) Wet bar sinks. Where the receptacles are installed to serve the countertop surfaces and are located within 6 ft (1.83 m) of the outside edge of the wet bar sink.

(8) Within 6 ft (1.83 m) of any sink, wash basin, tub, or shower.

Section 220-3. Computation of Branch Circuits.

[Subsection 220-3(c) is hereby amended by adding subsection 8 after Exception 5. as follows:]

(8) For purposes of calculations and installation requirements, the following loads and branch circuit requirements may be used where the actual nameplate rating is not available.

	LOAD	CONDUCTOR AMPACITY	SINGLE PHASE NOMINAL VOLTAGE
ELECTRIC CLOTHES DRYER	5000 VA	30 AMPERE	(120/240V)
WATER HEATER	4500 VA	30 AMPERE	(240V)
DISHWASHER	1500 VA	20 AMPERE	(120V)
GARBAGE DISPOSAL	720 VA	20 AMPERE	(120V)
EVAPORATIVE COOLER	1200 VA	20 AMPERE	(120V)
COMPACTOR	1500 VA	20 AMPERE	(120V)
WALL MOUNTED OVEN OR COUNTER MOUNTED COOKING UNITS	6000 VA	30 AMPERE	(120/240V)
RANGE	12000 VA	50 AMPERE	(120/240V)
GAS FIRED CLOTHES DRYER	1500 VA	20 AMPERE	(120V)
CLOTHES WASHER	1500 VA	20 AMPERE	(120V)
MICROWAVE OVENS (FIXED)	1200 VA	20 AMPERE	(120V)

NOTE: The above calculations are without appropriate NEC demands, which may be taken where permitted in the NEC.

If appliances are installed having higher nameplate ratings than the minimum loads specified above, the conductors shall be increased to the proper size. Where limited storage capacity water heaters are specified, the nameplate rating of the unit(s) shall be used.

Section 225-8. Disconnection.

[Subsection 225-8(b) is hereby amended by adding an Exception 4 as follows:]

Exception No. 4: For free-standing canopies, carports, towers, and similar structures; a branch circuit disconnecting means shall be permitted to be located elsewhere on the premises.

A bonding conductor sized per Sections 250-51 and 250-95 shall be run with the circuit conductors.

Section 230-28. Service Masts as Supports.

[Section 230-28 is hereby amended as follows:]

230-28. Service Masts as Supports. A service mast(s) used for the support of service-drop conductors shall be of adequate strength. The service mast shall be rigid steel conduit or intermediate metal conduit, not less than 1-1/2 in. trade size, and shall not contain any coupling(s) which would be subject to strain by the service-drop. Where the service-drop point of attachment exceeds 18 in. (457 mm) above the roof or 30 in. (762 mm) above the final raceway support, the service mast shall be supported by braces to safely withstand the strain imposed by the service-drop. Only power service-drop conductors shall be permitted to be attached to a service mast.

(FPN): Lag Screws are not acceptable. See local electrical utility specifications.

Section 230-43. Wiring Methods for 600 Volts, Nominal, or Less.

[Section 230-43 is hereby amended as follows:]

230-43. Wiring Methods for 600 Volts, Nominal, or Less. Service-entrance conductors shall be installed in accordance with the applicable requirements of this Code covering the type of wiring method used and limited to the following methods: (1) rigid metal conduit; (2) intermediate metal conduit; (3) wireways; (4) busways; (5) auxiliary gutters; (6) rigid nonmetallic conduit may be used underground; (7) Schedule 80 rigid non-metallic conduit may extend aboveground to the service equipment.

(FPN): Refer to the electric utility requirements for additional information on installing service-entrance conductors on or within buildings and underground serving the premises.

Section 230-70. General.

[Section 230-70(a) is hereby amended as follows:]

(a) Location. The service disconnecting means shall be installed at a readily accessible location either outside of a building or structure, or inside nearest the point of entrance of the service conductors. The service disconnecting means shall be installed adjacent to and accessible from the same working area as the utility meter.

All service disconnecting means located inside a building shall be enclosed within a room or space separated from the rest of the building by not less than a one-hour fire-resistive occupancy separation.

Exception: The ceiling of this Service Entrance Room may be constructed as required for a one-hour wall assembly with protected openings.

Section 250-80. Bonding of Piping Systems and Exposed Structural Steel.

[Section 250-80(b) is hereby amended as follows:]

(b) Other Metal Piping. Metal piping that is on or within a building that may become energized shall be bonded to the service equipment enclosure, the grounded conductor at the service, the grounding electrode conductor where of sufficient size, or to the one or more grounding electrodes used. The bonding jumper shall be sized in accordance with Table 250-95 using the rating of the circuit that may energize the piping.

The equipment grounding conductor for the circuit that may energize the piping shall be permitted to serve as the bonding means.

(FPN): Bonding all piping and metal air ducts on or within the premises will provide additional safety.

Section 250-91. Material.

[Subsection 250-91(b) is hereby amended as follows:]

(b) Types of Equipment Grounding Conductors. The equipment grounding conductor run with or enclosing the circuit conductors shall be one or more or a combination of the following: (1) a copper or other corrosion-resistant conductor. This conductor shall be solid or stranded; insulated, covered, or bare; and in the form of a wire or a busbar of any shape; (2) rigid metal conduit; (3) intermediate metal conduit; (4) electrical metallic tubing with an individual equipment grounding conductor, (5) flexible metal conduit with an individual equipment grounding conductor; (6) Type AC cable with an individual equipment grounding conductor; (7) the copper sheath of mineral-insulated, metal-sheathed cable; (8) Type MC cable with an individual equipment grounding conductor; (9) cable trays as permitted in Sections 318-3(c) and 318-7; (10) cablebus framework as permitted in Section 365-2(a); (11) other electrically continuous metal raceways listed for grounding.

Section 305-3. Time Constraints.

[Section 305-3 is hereby amended as follows:]

(a) During the Period of Construction. Temporary electrical power and lighting installations shall be permitted during the period of construction, remodeling, maintenance, repair, or demolition of buildings, structures, equipment, or similar activities.

For Group R, Division 3 occupancies, temporary electrical power shall be independent of the permanent premises wiring system.

For occupancies other than Group R, Division 3, temporary electrical power may be permitted to be used to energize the permanent premises wiring system only with special permission.

(FPN): Temporary Metered Power Outlets are allowed under this Section and Section 301.2(15).

Tables 310-16 to 310-19

[Note 3 is hereby amended as follows:]

3. 120/240-Volt, 3-Wire, Single-Phase Dwelling Services and Feeders. For dwelling units, conductors, as listed below, shall be permitted to be utilized as 120/240-volt, 3-wire, single-phase service-entrance conductors, service lateral conductors, and feeder conductors that serve as the main power feeder to a dwelling unit and are installed in raceway or cable with or without an equipment grounding conductor. For applications of this note, the feeder conductors to a dwelling unit shall not be required to be larger than its service-entrance conductors. The grounded conductor shall be permitted to be smaller than the ungrounded conductors, provided the requirements of Sections 215-2, 220-22, and 230-42 are met.

Conductor Types and Sizes
RH-RHH-RHW-THHW-THW-THWN-THHN-XHHW-USE

Copper	Aluminum or Copper-Clad Aluminum	Service or Feeder Rating in Amps <u>≤ 30°C (86°F)</u>	<u>Service or Feeder Rating in Amps > 30°C (86°F)</u>
AWG	AWG		
4	2	100	=
3	1	110	=
2	1/0	125	<u>100</u>
1	2/0	150	<u>125</u>
1/0	3/0	175	<u>150</u>
2/0	4/0	200	<u>175</u>
3/0	250 kcmil	225	<u>200</u>
4/0	300 kcmil	250	<u>225</u>
250 kcmil	350 kcmil	300	<u>250</u>
350 kcmil	500 kcmil	350	<u>300</u>
400 kcmil	600 kcmil	400	<u>350</u>
<u>500 kcmil</u>	<u>750 kcmil</u>	=	<u>400</u>

Section 336-4. Uses Permitted.

[Section 336-4 is hereby amended as follows:]

336-4. Uses Permitted. Type NM, Type NMC, and Type NMS cables shall be permitted to be used only in branch circuits in one- and two-family dwellings, multi-family dwellings, and other one and two-family residential accessory structures not exceeding 3 floors above grade, except as prohibited in Section 336-5. Where installed in cable trays, cables shall be identified for this use.

(Remainder of Section 336-4 to remain unchanged.)

Section 338-2. Uses Permitted as Service Entrance Conductors.

[Section 338-2 is hereby repealed.]

Section 350-14. Grounding.

[Section 350-14 is hereby amended as follows:]

350-14. Grounding. Flexible metal conduit shall provide an adequate path for equipment grounding as required by Sections 250-51 and 250-91.

Section 351-9. Grounding.

[Section 351-9 is hereby amended as follows:]

351-9. Grounding. Liquidtight flexible metal conduit shall provide an adequate path for equipment grounding as required by Sections 250-51 and 250-91

Section 501-16. Grounding, Class I, Division 1 and 2.

[Subsection 501-16(b) is hereby amended as follows:]

(b) Types of Equipment Grounding Conductors. Where flexible metal conduit or liquidtight flexible metal conduit is used as permitted in Section 501-4(b) and is to be relied upon to complete a sole equipment grounding path, it shall be installed with internal or external bonding jumpers in parallel with each conduit and complying with Section 250-79.

(Remainder of Subsection 501-16(b) is repealed.)

Section 502-16. Grounding, Class II, Division 1 and 2.

[Subsection 502-16(b) is hereby amended as follows:]

(b) Types of Equipment Grounding Conductors. Where flexible conduit is used as permitted in Section 502-4, it shall be installed with internal or external bonding jumpers in parallel with each conduit and complying with Section 250-79.

(Remainder of Subsection 502-16(b) is repealed.)

Section 503-16. Grounding, Class III, Division 1 and 2.

[Section 503-16(b) is hereby amended as follows:]

(b) Types of Equipment Grounding Conductors. Where flexible conduit is used as permitted in Section 503-3, it shall be installed with internal or external bonding jumpers in parallel with each conduit and complying with Section 250-79.

(Remainder of Subsection 503-16(b) is repealed.)

Section 680-13. Mechanical and Electrical Equipment Location.

[Section 680 is hereby amended by adding Section 680-13 as follows:]

680-13. Mechanical and Electrical Equipment Location. Mechanical and electrical equipment not addressed in other sections in Article 680, shall not be permitted within the area extending 5 ft (1.52 mm) horizontally from the inside wall of the pool.

Exception: Listed swimming pool covers where the electrical equipment is part of the total assembly.

(FPN): In determining the above dimension the distance to be measured is the shortest path to the equipment without piercing a floor, wall, ceiling, doorway with hinged or sliding door, window opening, or other similar effective permanent barrier.

Section 680-22. Bonding.

[Section 680-22(b) is hereby amended by adding a subsection 4 as follows:]

(4) Rigid or intermediate conduit of brass or other identified corrosion resistant metal conduit.

Section 725-9. Bell and Signal Transformers.

[Section 725 is hereby amended by adding Section 725-9 as follows:]

725-9. Bell and Signal Transformers. In residential occupancies, bell or signal transformers shall not be installed in attics, closets, or in any inaccessible concealed place.

REFERENCES

- (1) Ordinance 99.08 - Effective 08-22-99