

Changes to the 2017 National Electrical Code®

Part 3 – Chapter 3

Wiring Methods and Materials

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Table 300.5 Minimum Cover Requirements

- Low voltage lighting is at voltage levels at 50 volts or below which is less a safety hazard.
- Conflicts is resolved between manufacture instructions that in many cases allows for a reduced wiring depth on the secondary of a transformer than what is required in Table 300.5.
- Added new footnotes to Table 300.5 allowing reduced depths for **listed low-voltage lighting system** and for pool and spa lighting when included as part of a listed low-voltage lighting system.

Table 300.5 Minimum Cover Requirements, 0 to 1000 Volts, Nominal, Burial in Millimeters (Inches)

Location of Wiring Method or Circuit	Type of Wiring Method or Circuit									
	Column 1 Direct Burial Cables or Conductors		Column 2 Rigid Metal Conduit or Intermediate Metal Conduit		Column 3 Nonmetallic Raceways Listed for Direct Burial Without Concrete Encasement or Other Approved Raceways		Column 4 Residential Branch Circuits Rated 120 Volts or Less with GFCI Protection and Maximum Overcurrent Protection of 20 Amperes		Column 5 Circuits for Control of Irrigation and Landscape Lighting Limited to Not More than 30 volts and Installed with Type UF or in Other Identified Cable or Raceway	
	mm	in	mm	in	mm	in	mm	in	mm	in
All locations not specified below	600	24	150	6	450	18	300	12	150 ^{a, b}	6 ^{a, b}
In trench below 50 mm (2 in.) thick concrete or equivalent	150	18	150	6	300	12	150	6	150	6
Under a building	0	0	0	0	0	0	0	0	0	0
Under minimum of 102 mm (4 in) thick concrete exterior slab with no vehicular traffic and the slab extending not less than 152 mm (6 in) beyond the underground installation.	450	18	100	4	100	4	150	6	150	6
							100	4	100	4
Under streets, highways, roads, alleys, driveways, and parking lots	600	24	600	24	600	24	600	24	600	24
One- and two-family dwelling driveways and outdoor parking areas, and used only for dwelling related purposes	450	18	450	18	450	18	300	12	450	18
In or under airport runways, including adjacent areas where trespassing prohibited	450	18	450	18	450	18	300	12	450	18

^aA lesser depth shall be permitted where specified in the installation instructions of a listed low-voltage lighting system.

^bA depth of 150 mm (6 in.) shall be permitted for pool, spa, and fountain lighting, installed in a nonmetallic raceway, limited to not more than 30 volts where part of a listed low-voltage lighting system.





300.7(B) Expansion, Expansion-Deflection and Deflection Fittings

(B) Expansion, Expansion-Deflection, and Deflection Fittings. Raceways shall be provided with expansion, expansion-deflection, or deflection fittings where necessary to compensate for thermal expansion, deflection, and contraction.



300.22(B) Ducts Specifically Fabricated for Environmental Air - Exception

Exception: Wiring methods and cabling systems, **listed for use in other spaces used for environmental air (plenums)**, shall be permitted to be installed in ducts specifically fabricated for environmental air-handling purposes under the following conditions:

(1) The wiring methods or cabling systems shall be permitted only **if necessary to connect to equipment or devices associated with the direct action upon or sensing of the contained air, and**

(2) **The total length of such wiring methods or cabling systems shall not exceed 1.2 m (4 ft).**

2014 - 310.15(B)(3)(4)

(4) Adjustment factors shall not apply to Type AC cable or to Type MC cable under the following conditions:

- a. The cables do not have an overall outer jacket.
- b. Each cable has not more than three current-carrying conductors.
- c. The conductors are 12 AWG copper.
- d. Not more than 20 current-carrying conductors are installed without maintaining spacing, are stacked, or are supported on bridle rings.

2017 - 310.15(B)(3)(4)

(4) Adjustment factors shall not apply to Type AC cable or to Type MC cable under the following conditions:

- a. The cables do not have an overall outer jacket.
- b. Each cable has not more than three current-carrying conductors.
- c. The conductors are 12 AWG copper.
- d. Not more than 20 current-carrying conductors are installed without maintaining spacing, are stacked, or are supported on “bridle rings.”

Exception to (4): If cables meeting the requirements in 310.15(B)(3)(4)a through c with more than 20 current-carrying conductors are installed longer than 600 mm (24 in.) without maintaining spacing, are stacked, or are supported on bridle rings, a 60 percent adjustment factor shall be applied.

310.15(B)(3)(c) Raceways and Cables on Rooftops

- Code requirements regarding deration of conductors on rooftops that was placed in code in 2008 has been eliminated.
- Study found that existing temperature correction factors along with wind and other factors already ensure a safe installation.
- Table 310.15(B)(3)(c) was deleted .
- Raceways and cables are to be raised off of roof by minimum 7/8" inch. If not a rooftop temperature adder shall be included and the conductors derated accordingly.
- A temperature adder of 33°C (60°F) shall be included when raceway or cable is installed directly on or less than 23 mm (7/8 in.) above a rooftop

310.15(B)(3)(c)

(c) Raceways and Cables Exposed to Sunlight on Rooftops. Where raceways or cables are exposed to direct sunlight on or above rooftops, raceways or cables shall be installed a minimum distance above the roof to the bottom of the raceway or cable of 23 mm (7/8 in.). Where the distance above the roof to the bottom of the raceway is less than 23 mm (7/8 in.), a temperature adder of 33°C (60°F) shall be added to the outdoor temperature to determine the applicable ambient temperature for application of the correction factors in Table 310.15(B)(2)(a) or Table 310.15(B)(2)(b).

Exception: Type XHHW-2 insulated conductors shall not be subject to this ampacity adjustment. (See Picture of XHHW-2)

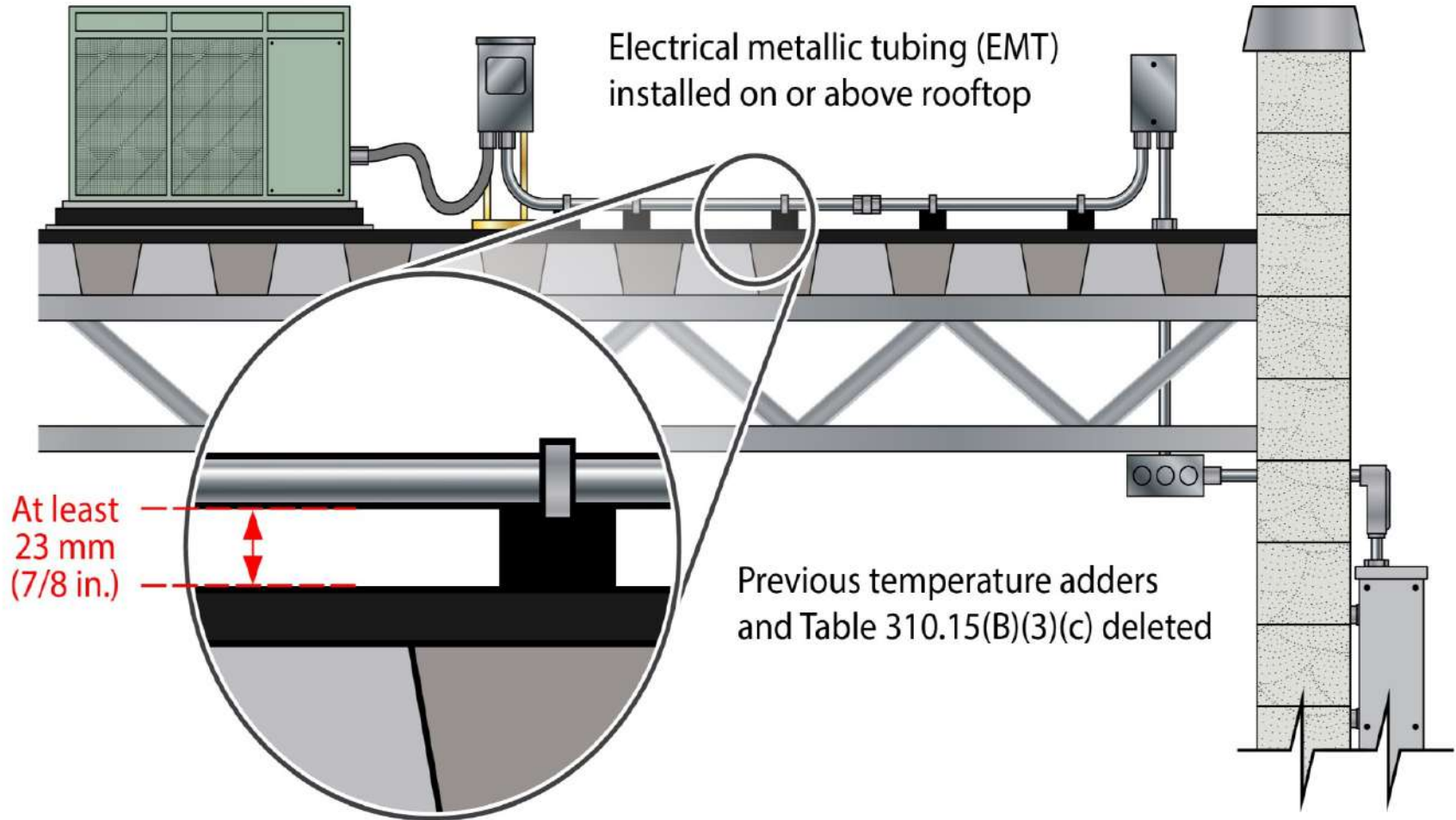


EMTEC SCHEDULE 40 RIBBON PIPE



310.15(B)(3)(c) Raceways and Cables on Rooftops

Where raceways or cables are exposed to direct sunlight on or above rooftops, they shall be installed **23 mm (7/8 in.) above the roof** or be subject to a rooftop temperature adder of **33°C (60°F)** (see exception for *Type XHHW-2* conductors)







310.15(B)(7) Dwelling Unit Services and Feeders

- After many cycles of debate, the provisions for sizing dwelling unit service (and main power feeder) was expanded to allow for 208Y/120-volt single-phase systems.
- Keep in mind this is only for the single-phase component of a three phase 208/120 volt system.
- Many users liked the simplified residential dwelling ampacity table and this was added back to the Annex D7. (Previous Table 310.15(B)(7) in 2014).
- Explanatory language added to address the permitted application of correction or adjustment factors required by 310.15(B)(2)(a) (Temperature Correction Factors) or 310.15(B)(3)(a) (More Than Three Current-Carrying Conductors) applied to the ampacity associated with the temperature rating of the conductors
- New informational note added with direction to 240.6(A) for service ratings based on standard ampacity ratings for application of 310.15(B)(7)

310.15(B)(7)

(7) ~~120/240-Volt~~, Single-Phase Dwelling Services and Feeders.

For one-family dwellings and the individual dwelling units of two-family and multifamily dwellings, service and feeder conductors supplied by a single-phase, 120/240-volt system shall be permitted to be sized in accordance with 310.15(B)(7)(1) through (4).

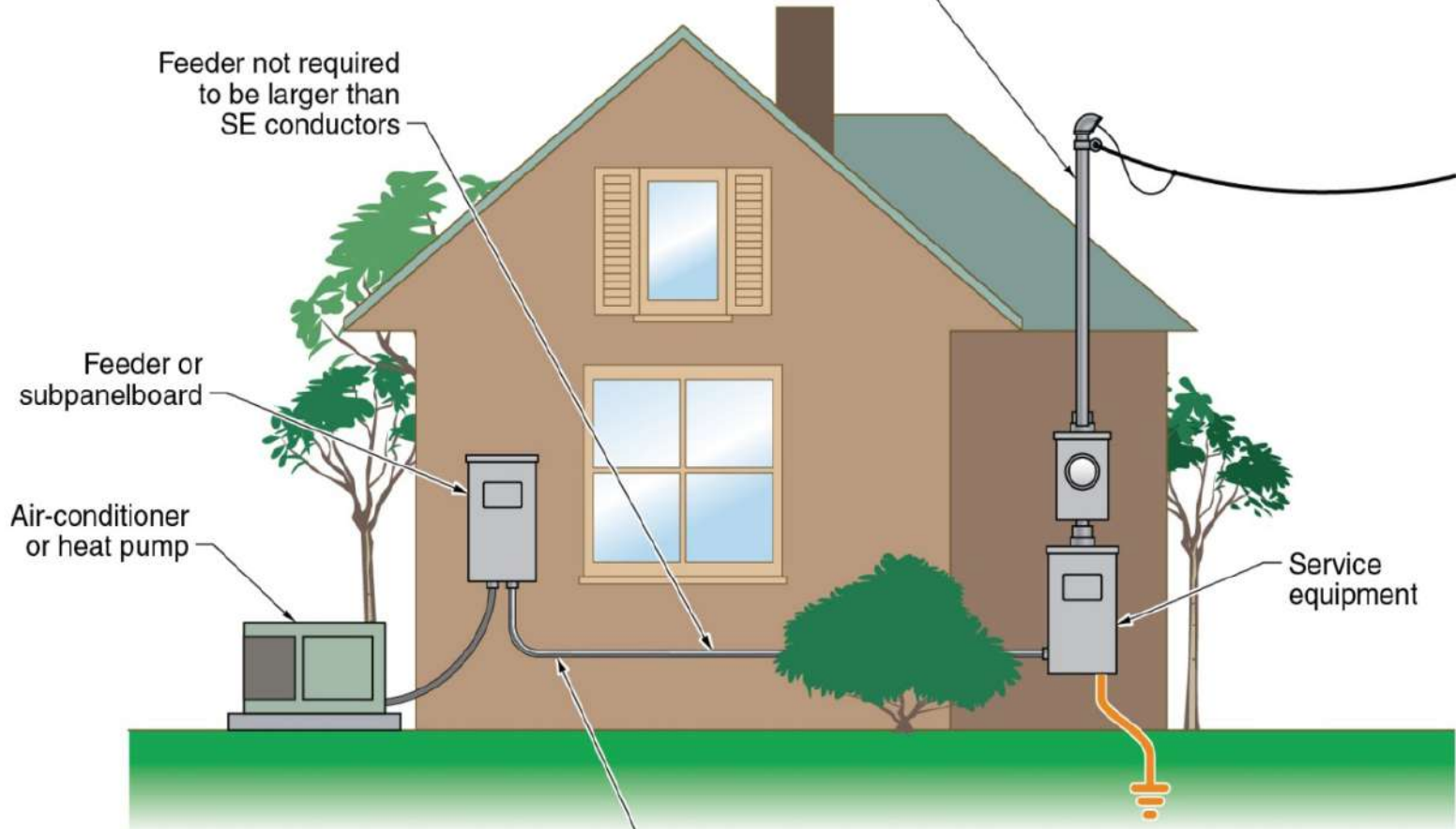
Single-phase feeders from a 208Y/120 volt system shall be permitted to use 310.15(B)(7)(1) through (4).

For a service rated 100 through 400 **A amperes**, the service conductors supplying the entire load associated with a one-family dwelling, or the service conductors supplying the entire load associated with an individual dwelling unit in a two-family or multifamily dwelling, shall be permitted to have an ampacity not less than 83 percent of the service rating...

Continued on next slide

310.15(B)(7) Dwelling Unit Services and Feeders

83 percent reduction from 310.15(B)(7) can be applied to standard service ampacity rating from 240.6(D) using ampacity from Table 310.15(B)(16)



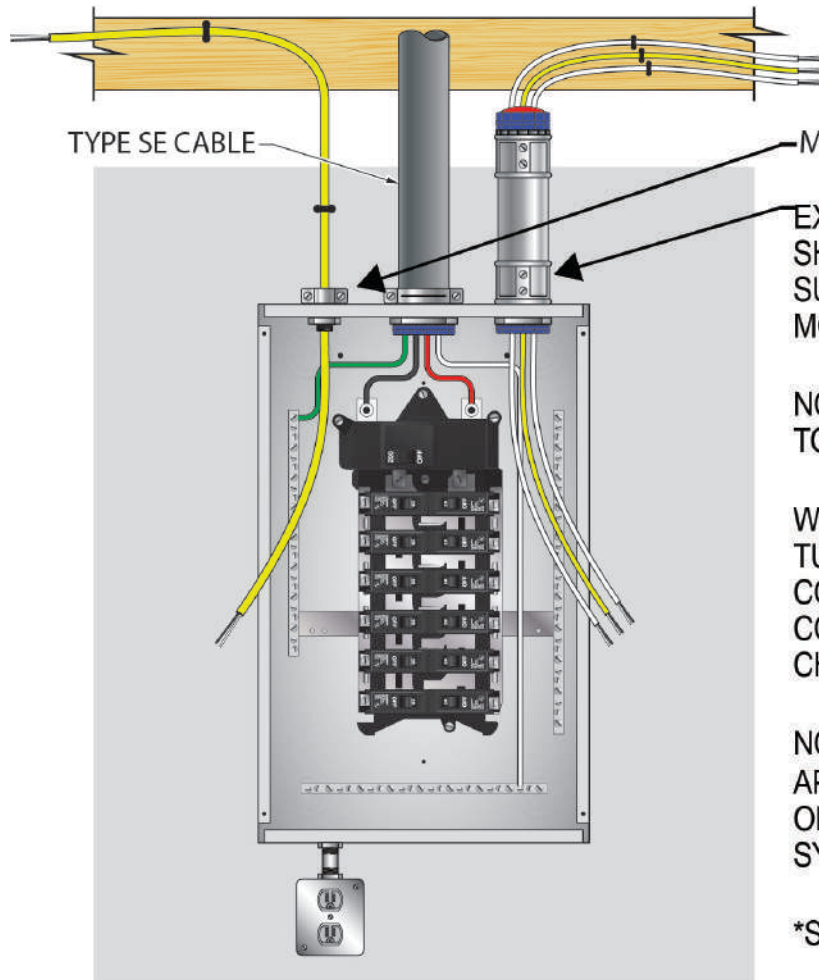
2017 *NEC* - 310.15(B)(7) - Will apply to 120/240-volt and 208Y/120-volt, single-phase dwelling services and main feeder

312.5(C), Exception for Cables entering an enclosure through a raceway

- Note 2 to the tables in Chapter 9 allows the 40 and 53% conduit fill requirement to be enforced only for complete conduit systems. These percentages do not apply to raceway sleeves into a panel.
- New Language for the exception in 312.5(C) voids Note 2 for non-metallic sheath cables in a conduit sleeve. The 40 and 53% percent conduit fill would apply for these situations.
- Cables with non-metallic sheaths cables are permitted to enter the top of a surface-mounted enclosure through a non-flexible raceway of the raceway length is not less than 450 mm (18 in.) and not more than 3.0 m (10 ft) in length.

312.5(C), Ex., Item (g) Cable Raceway

Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action



MAIN RULE: CABLES MUST BE SECURED TO CABINET

EXCEPTION: CABLES WITH ENTIRELY NONMETALLIC SHEATHS PERMITTED TO ENTER THE TOP OF A SURFACE-MOUNTED ENCLOSURE THROUGH ONE OR MORE NONFLEXIBLE RACEWAYS.

NONFLEXIBLE RACEWAYS MUST BE FROM 450 mm (18") TO 3.0 m (10') IN LENGTH.

WHERE CABLES ARE INSTALLED IN CONDUIT OR TUBING, THE CABLE FILL CANNOT EXCEED THE CONDUCTOR FILL PERMITTED FOR COMPLETE CONDUIT OR TUBING SYSTEMS BY TABLE 1 OF CHAPTER 9.

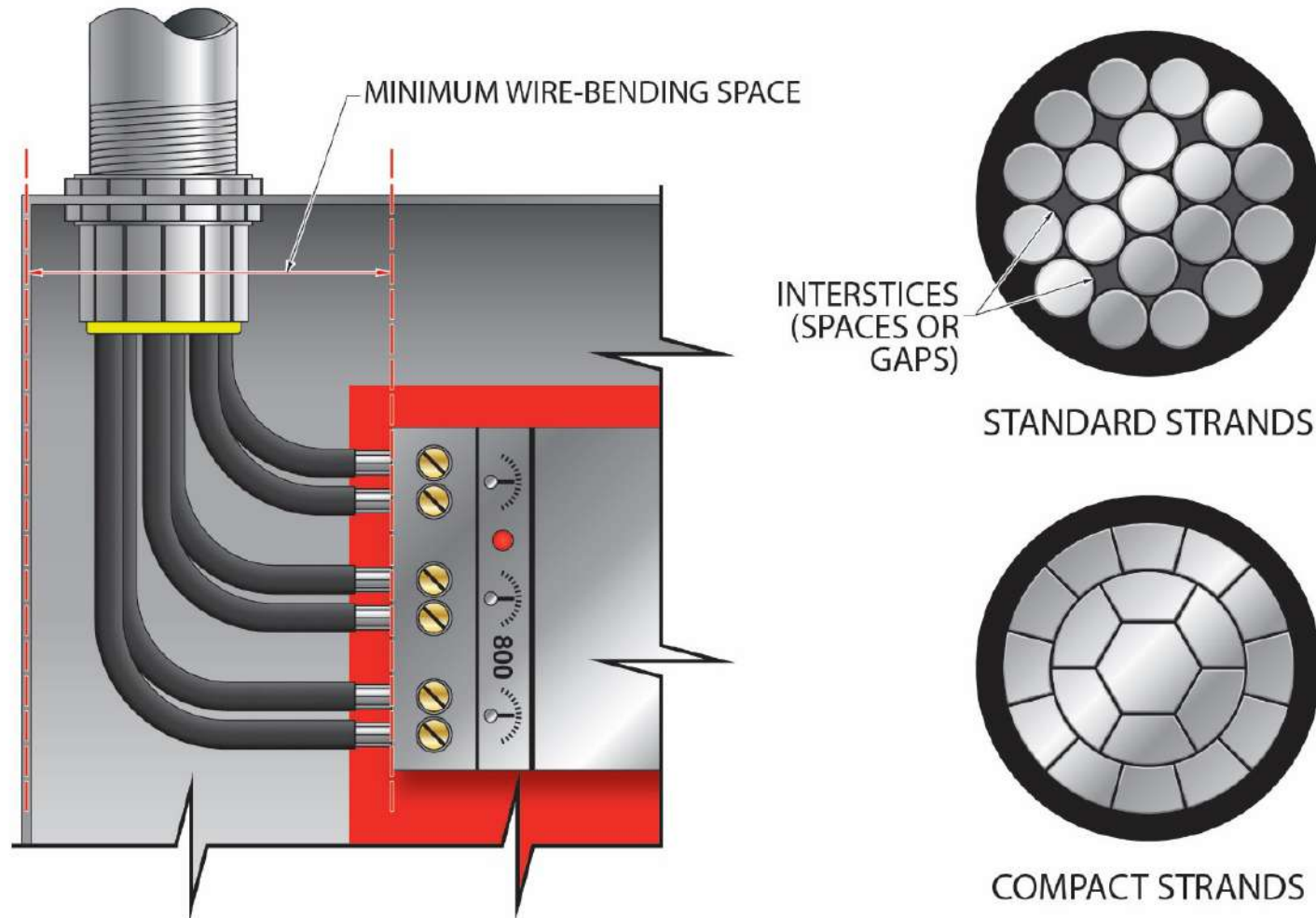
NOTE 2 TO THE TABLES IN CHAPTER 9 DOES NOT APPLY TO THIS CONDITION (TABLE 1 OF CHAPTER 9 ONLY APPLIES TO "COMPLETE CONDUIT OR TUBING SYSTEMS")

*SEE NEC FOR COMPLETE CONDITIONS OF EXCEPTION

Table 312.6(A) Minimum Wire-Bending Space at Terminals and Minimum Width of Wiring Gutters

- Table 312.6(A) added a new column which covers minimum wire-bending space for Compact Stranded AA-8000 Aluminum Alloy Conductors.
- While the Aluminum Alloy Conductors was included in Table 312.6(B) adding this to 312.6(A) provided consistency between the tables.
312.6(B)
- Aluminum Alloy Conductors is a fancy name for simple aluminum compact conductors and allow a smaller bending space as compared to the same size copper conductor.

Table 312.6(A) Minimum Wire-Bending Space at Terminals and Minimum Width of Wiring Gutters



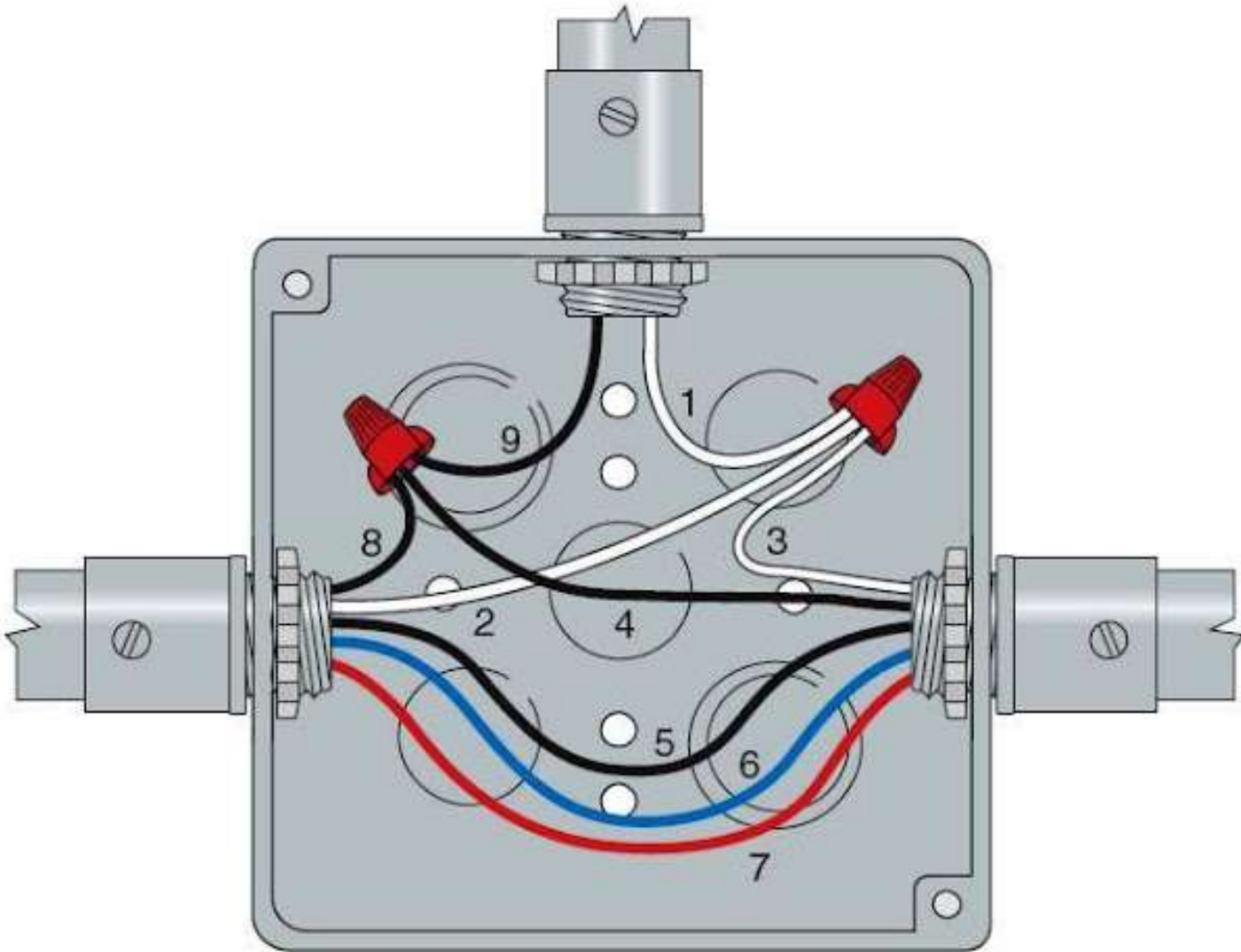
A new column for **compact stranded AA-8000 aluminum conductors** has been added to Table 310.6(A) for minimum wire-bending space at terminals

Table 312.6(A) Minimum Wire-Bending Space at Terminals and Minimum Width of Wiring Gutters

Wire Size (AWG or kcmil)		Wires per Terminal									
		1		2		3		4		5	
All Other Conductors	Compact Stranded AA-8000 Aluminum Alloy Conductors (see Note 2)	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
	14-10	12-8	Not specified		—	—	—	—	—	—	—
8-6	6-4	38.1	1½	—	—	—	—	—	—	—	—
4-3	2-1	50.8	2	—	—	—	—	—	—	—	—
2	1/0	63.5	2½	—	—	—	—	—	—	—	—
1	2/0	76.2	3	—	—	—	—	—	—	—	—
1/0-2/0	3/0-4/0	88.9	3½	127	5	178	7	—	—	—	—
3/0-4/0	250-300	102	4	152	6	203	8	—	—	—	—
250	350	114	4½	152	6	203	8	254	10	—	—
300-350	400-500	127	5	203	8	254	10	305	12	—	—
400-500	600-750	152	6	203	8	254	10	305	12	356	14
600-700	800-1000	203	8	254	10	305	12	356	14	406	16
750-900	—	203	8	305	12	356	14	406	16	457	18
1000-1250	—	254	10	—	—	—	—	—	—	—	—
1500-2000	—	305	12	—	—	—	—	—	—	—	—

314.16(A) and (B) Box Fill Calculations

- If an internal barrier or divider is added to a junction box or enclosure, either the divider needs to be marked indicated the reduction in fill volume or a set deduction shall be included.
- Nonmetallic box barriers (similar to picture shown) typically have volume marking stamped on barrier. Metal barriers are not currently marked.
- Each space in a box needs to be calculated separately
- Non-marked barriers take up, by default, the following cubic inches:
 - 8.2 cm³ (½ in.³) if metal
 - 16.4 cm³ (1 in.³) if nonmetallic



Standard 4 in. x 1½ in. square box (21.0 in.³)

IEC
INDUSTRIAL ELECTRIC COMPANY

BDW

2.50

2

WIRE
IN
CIRCA

ONLY TO BE USED WITH IEC'S
SUPERBLUE ELECTRICAL BOXES
P/N BM235A, BM353A, BM404R
AND BM234R

WHEN CALCULATING WIRE FILL,
DEDUCT .50 CUBIC INCHES PER
SIDE OF DIVIDER AFFECTED.

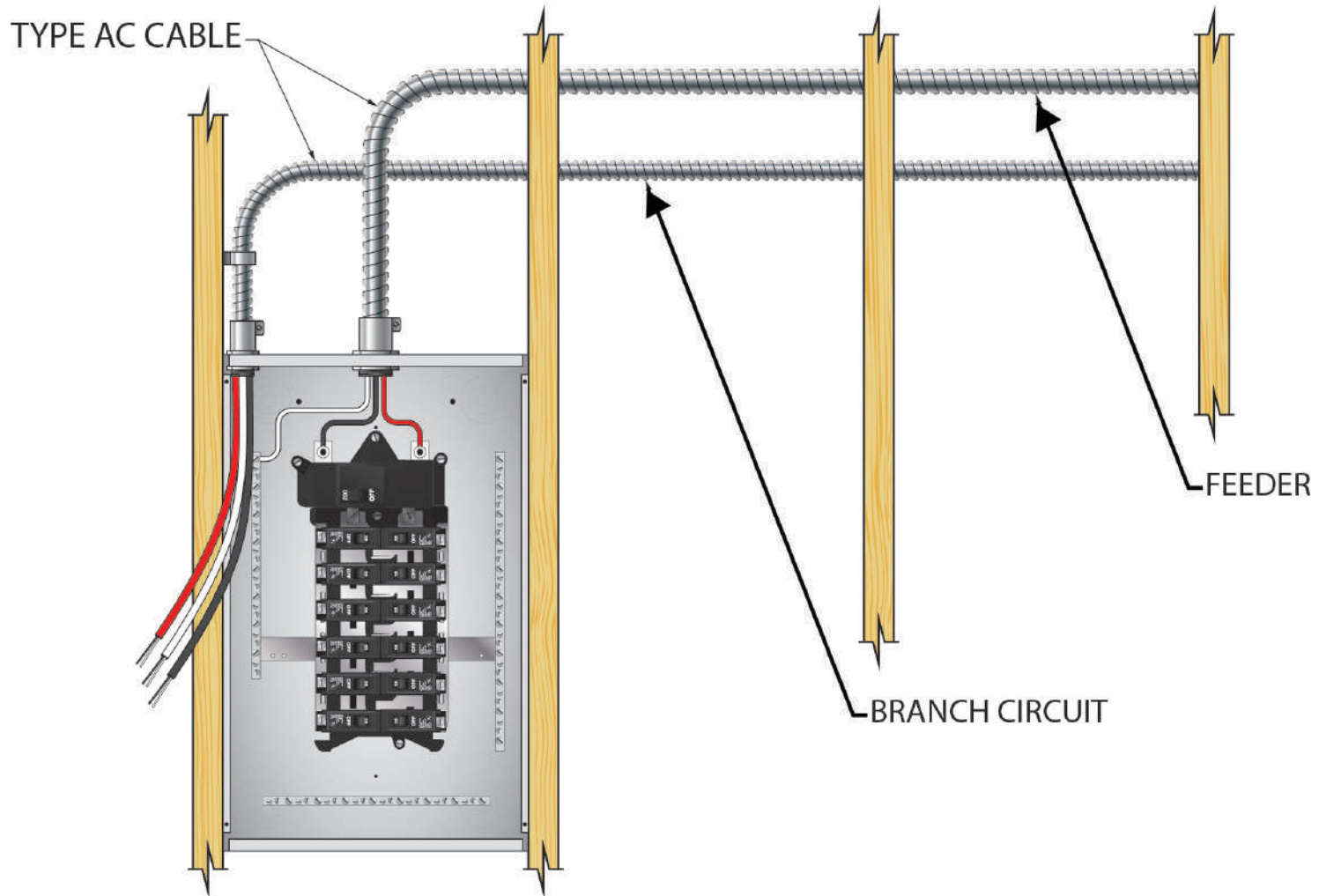
320.6 Listing Requirements

- Text was added to require cable wiring methods to be listed as well as the cable fittings.
- While most cable wiring methods are listed, this additional language will help ensure that the cable is installed in accordance with an appropriate product standard.

320.6 Listing Requirements

Type AC cable and associated fittings required to be listed

Several cable-type wiring methods and their associated fittings now require this same listing requirement



3xx.6 Listing Requirements

320.6 Type AC cable

322.6 Type FC cable

328.6 Type MV cable

330.6 Type MC cable

332.6 Type MI cable

334.6 Type NM cable

336.6 Type TC cable

338.6 Type SE cable

340.6 Type UF cable



324.12 Uses Not Permitted

324.12 Uses Not Permitted. FCC systems shall not be used in the following locations:

- (1) Outdoors or in wet locations
- (2) Where subject to corrosive vapors
- (3) In any hazardous (classified) location
- (4) In residential buildings
- (5) In school and hospital buildings, other than administrative office areas



Model No. 553536
1012 AWG

THIS SIDE UP
Model No. 553536
1012 AWG

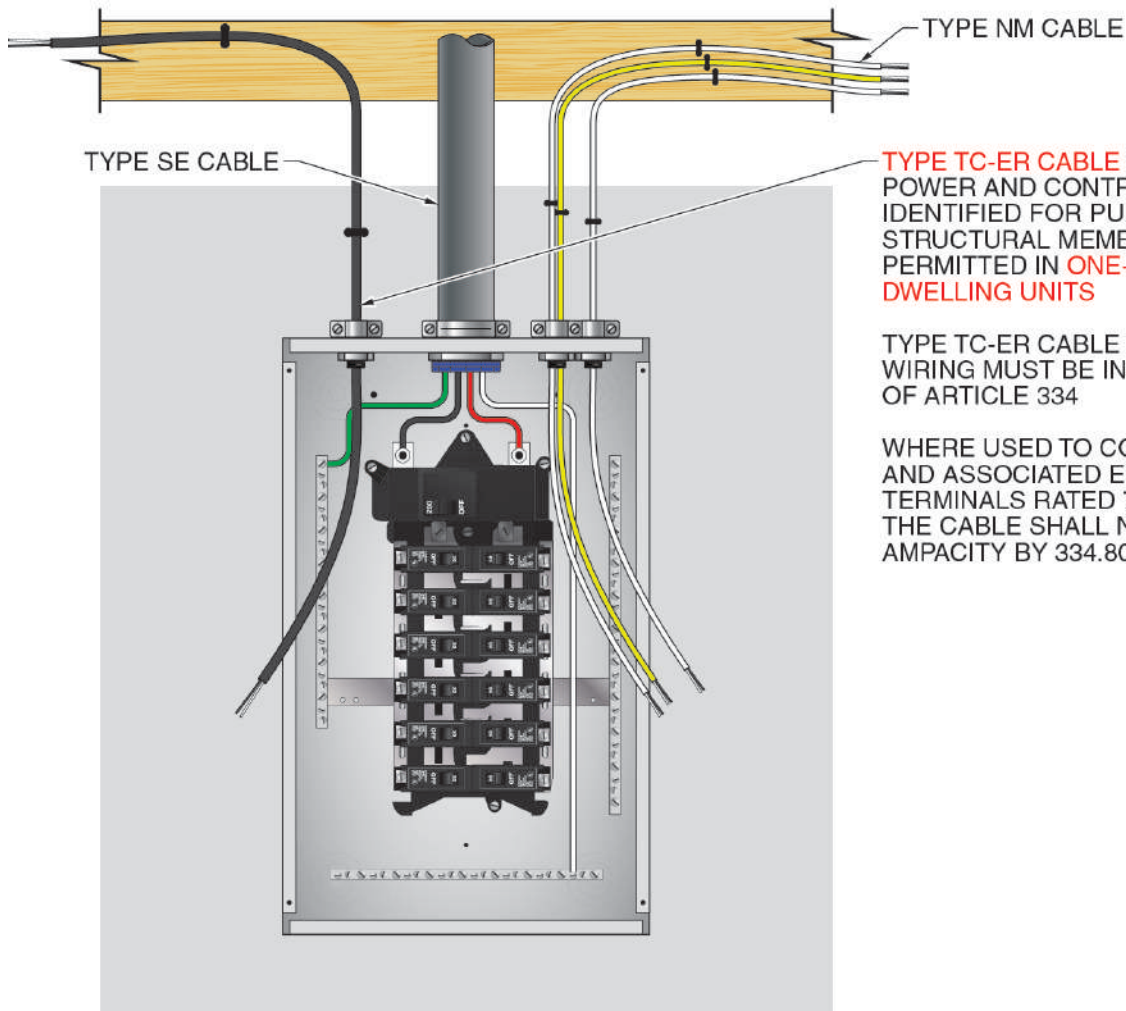
WARNING: THIS CIRCUIT MUST BE DEENERGIZED BEFORE REMOVAL OF THIS METAL COVER. THE SYSTEM MUST BE SERVICED BY AN AUTHORIZED ELECTRICIAN.
AVERTISSEMENT: LE CIRCUIT DOIT ÊTRE DÉENERGIZÉ AVANT D'ENLEVER LE COUVERCISSEMENT MÉTALLIQUE. LE SYSTÈME DOIT ÊTRE ENTRETIENU PAR UN MAÎTRE ÉLECTRICIEN AUTORISÉ.

336.10(9) Power and Control Tray Cable: Type TC

- Type TC-ER cable is now permitted to be installed in one and two family dwellings.
- This type cable contains both power and control conductors in one cable.
- It needs to be identified for pulling through structural members such as wood when installed in those dwellings. (Type JP)
- Type TC-ER cable can be installed exposed in dwellings. (“ER” stands for Exposed Run.)
- “-JP” stands for “Joist Pull”.

336.10(9) Uses Permitted for Type TC Cable

Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action



TYPE TC-ER CABLE CONTAINING BOTH POWER AND CONTROL CONDUCTORS IDENTIFIED FOR PULLING THROUGH STRUCTURAL MEMBERS (JP) NOW PERMITTED IN **ONE- AND TWO-FAMILY DWELLING UNITS**

TYPE TC-ER CABLE USED AS INTERIOR WIRING MUST BE INSTALLED PER PART II OF ARTICLE 334

WHERE USED TO CONNECT A GENERATOR AND ASSOCIATED EQUIPMENT HAVING TERMINALS RATED 75°C (167°F) OR HIGHER, THE CABLE SHALL NOT BE LIMITED IN AMPACITY BY 334.80 OR 340.80 [60°C (140°C)]



344.14 Dissimilar Metals

344.14 Dissimilar Metals. Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action. Aluminum fittings and enclosures shall be permitted to be used with galvanized steel RMC, and galvanized steel fittings and enclosures shall be permitted to be used with aluminum RMC where not subject to severe corrosive influences. Stainless steel RMC shall only be used with stainless steel fittings and approved accessories, outlet boxes, and enclosures.

344.14 Dissimilar Metals: Type RMC

- Text was added in this section to notify the user that stainless steel (RMC) rigid metallic conduit can only be used with stainless steel fittings, approved accessories, stainless steel outlet boxes, and stainless steel enclosures.
- Mating stainless steel with a dissimilar metal can cause galvanic action or corrosion.
- A galvanic action or corrosion is an electrochemical process in which one metal corrodes preferentially to another when both metals are in electrical contact (in the presence of an electrolyte)
- The word “galvanized” has been added in two areas to indicate that aluminum fittings and enclosures are acceptable to be connected to galvanized steel RMC.

344.14 Dissimilar Metals: Type RMC

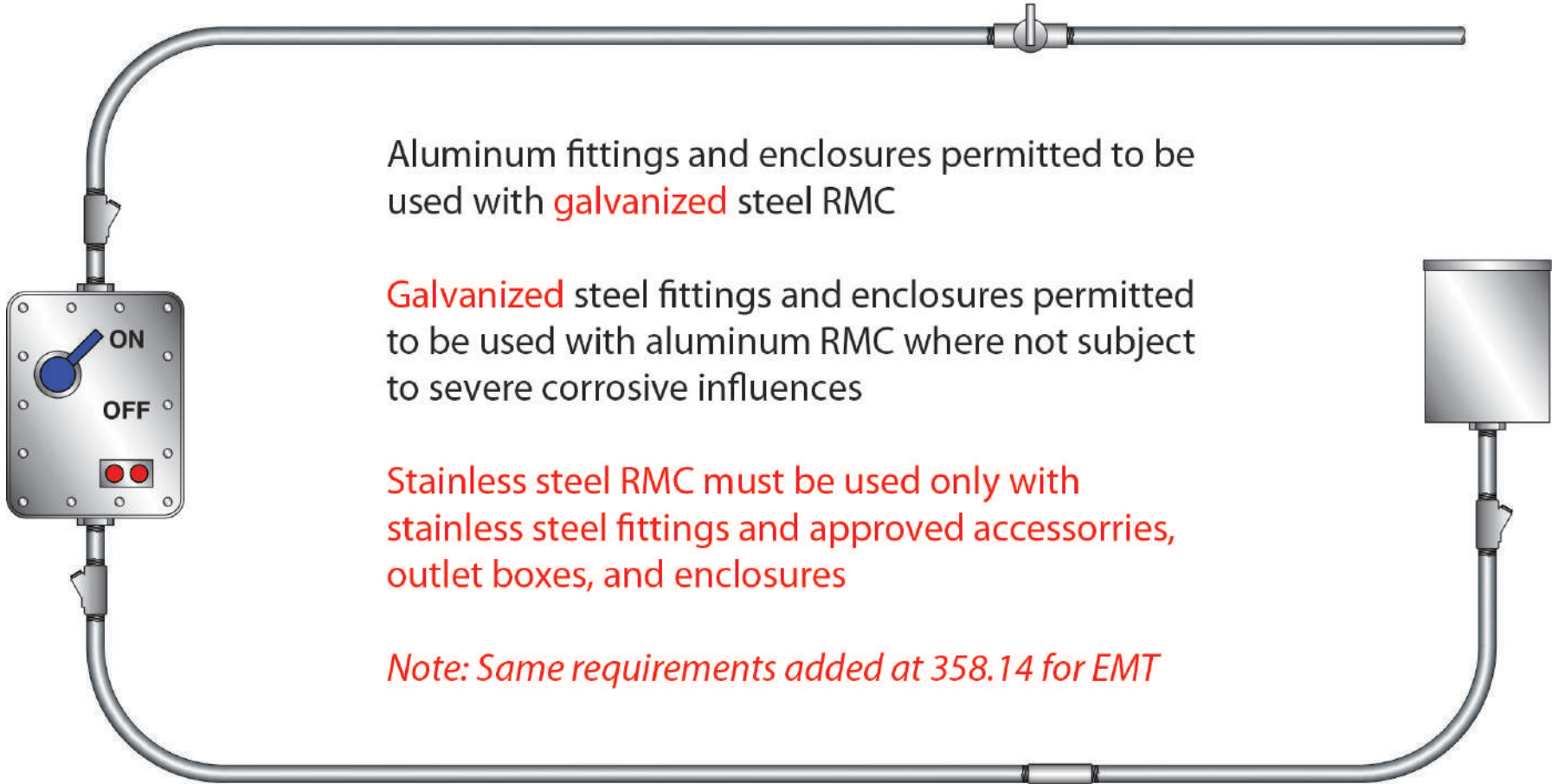
Where practicable, dissimilar metals in contact anywhere in the system shall be avoided to eliminate the possibility of galvanic action

Aluminum fittings and enclosures permitted to be used with **galvanized** steel RMC

Galvanized steel fittings and enclosures permitted to be used with aluminum RMC where not subject to severe corrosive influences

Stainless steel RMC must be used only with stainless steel fittings and approved accessories, outlet boxes, and enclosures

Note: Same requirements added at 358.14 for EMT





3/31/21

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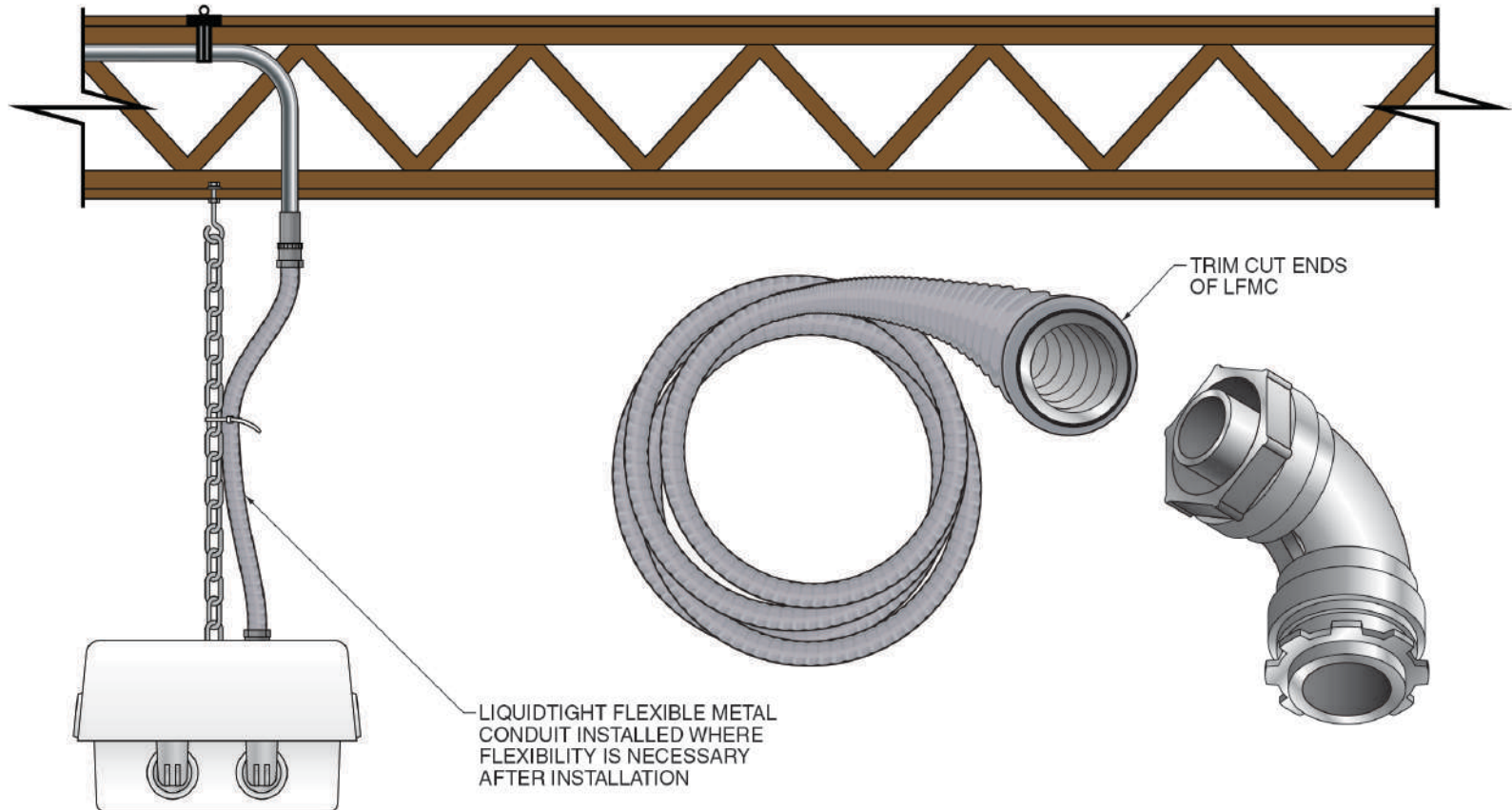
350.28 Trimming of LFMC

N 350.28 Trimming. All cut ends of conduit shall be trimmed inside and outside to remove rough edges.

- Added text requires trimming cut ends of liquidtight flexible metal conduit (Type LFMC) to remove rough edges.
- This is similar to requirement to trim ends of flexible metallic conduit in Article 350.
- Trimming of Type LFMC is necessary to install connector and to complete overall proper ground path.

350.28 Trimming of LFMC

All cut ends of liquidtight flexible metal conduit (LFMC) shall be trimmed inside and outside to remove rough edges

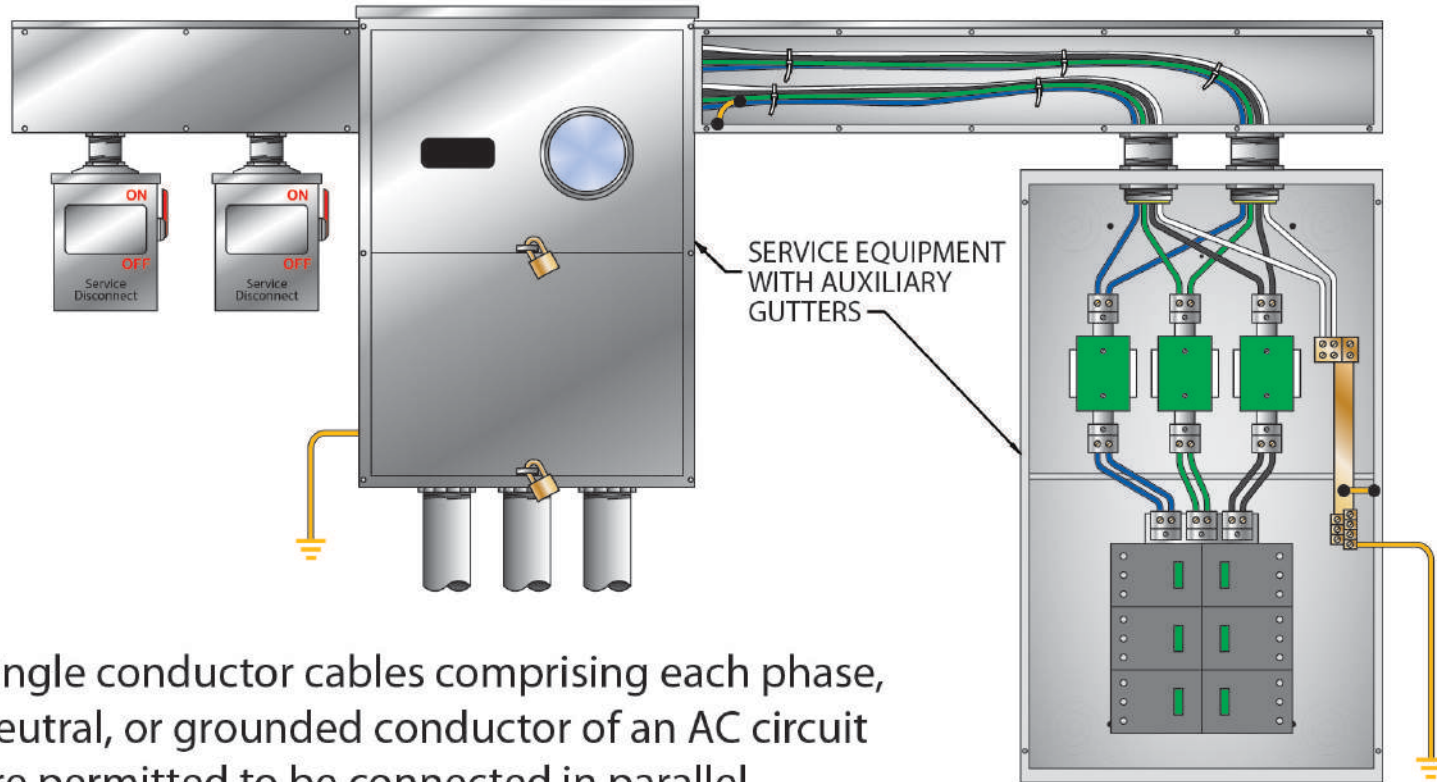




366.20 Parallel Conductors In Auxiliary Gutters

- New text has been added to this section to require parallel conductors installed in an auxiliary gutter to be grouped by each set.
- Not more than one conductor per phase, neutral or grounded conductor shall be grouped in one set.
- Grouping reduces overall impedance of conductors and prevents unnecessary heating that may lead to a conductor failure.
- A gutter per the definition found in the NEC is used to “supplement wiring spaces at meter centers, distribution centers, switchgear, switchboards, and similar points of wiring systems...The enclosure is designed for conductors to be laid or set in place after the enclosures have been installed as a complete system.”

366.20 Parallel Conductors in Auxiliary Gutters



Single conductor cables comprising each phase, neutral, or grounded conductor of an AC circuit are permitted to be connected in parallel

Conductors to be installed in groups consisting of not more than one conductor per phase, neutral, or grounded conductor to prevent current imbalance in the paralleled conductors due to inductive reactance



368.17(C) Busways Feeders and Branch Circuits

(C) Feeder or Branch Circuits.

Where a busway is used as a feeder, devices or plug-in connections for tapping off feeder or branch circuits from the busway shall contain the overcurrent devices required for the protection of the feeder or branch circuits. The plug-in device shall consist of an externally operable circuit breaker or an externally operable fusible switch. Where such devices are mounted out of reach and contain disconnecting means, suitable means such as ropes, chains, or sticks shall be provided for operating the disconnecting means from the floor.

NEW EXCEPTION ADDED:

Exception No. 4: Where the branch-circuit overcurrent plug-in device is directly supplying a readily accessible disconnect, a method of floor operation shall not be required.

ON



I-LINE[®]
ROSWAY SWITCH

141.90	338
74.300	1.1
100	1.1
100	1.1
100	1.1

EDWARDS COMPANY

OFF

