

## 2005 National Electrical Code Changes Relevant to Carlon Products

The National Electrical Code (NEC) is revised every three years to reflect the latest installation practices in the electrical industry. There were 3,577 proposals and 4,031 public comments submitted to revise the 2002 NEC.

Carlon is proud to participate in the development of the NEC. Carlon is represented on several Code Making Panels, the NEC Usability Task Group and other NEC Task Groups. We are current members of the Electrical Section of the National Fire Protection Association (NFPA). Carlon continues to participate in the education of the International Association of Electrical Inspectors (IAEI), International Brotherhood of Electrical Workers (IBEW), National Electrical Contractors Association (NECA) and the Independent Electrical Contractors (IEC).

The purpose of this document is to familiarize parties, associated with Carlon and Carlon products, with the major changes that have occurred in the 2005 NEC relevant to Carlon. It is to also educate those on the general changes pertaining to the NEC.

### General

The following are changes that are general in nature and occurred throughout the 2005 NEC:

- **Article 80 Administration and Enforcement:** Article 80 was first introduced to the NEC in 2002 and contained recommended guidelines and administrative procedures that can be used to adapt and administer electrical safety Code rules. Since Article 80 is for information purposes only, the NEC Technical Correlating Committee relocated it to Annex G. Annexes are not a part of the requirements of the NEC, but are included for informational purposes only.
- **90.8 Wiring Planning:** 90.8(A) was revised to include communication circuits to be considered in future expansion and convenience. This would include communication raceways.
- **Manholes and Handholes:** There were a series of proposals and comments accepting the addition of Manholes and Handholes into the NEC.
- **FPN:** The “Uses Permitted” is not an all-inclusive list. The cable articles, found in Chapter 3, added this fine print note at the end of the Uses Permitted sections of each cable article to indicate that the permitted list does not include all possible permitted applications for the appropriate cables.

- **Article 590 Temporary Installations:** Article 527 for Temporary Installations of the 2002 NEC was renumbered to Article 590 for the 2005 NEC.

## Carlson Product Related Changes

### Article 210 Branch Circuits

**210.52(C)(1) Exception Wall Counter Spaces:** (Outlet Boxes). Receptacle outlets shall not be required on a wall directly behind a range or sink in the installation described in Figure 210.52.

*What does this mean?:* Outlet boxes will not be required to be installed behind a sink or range to fulfill the requirement for an outlet box every 24 inches. The width of the sink or range is not to be included in the spacing of the outlet boxes unless the distance from the sink or range to the wall is greater than 12" for straight counter tops and 18" for sinks and ranges installed in corner counters.

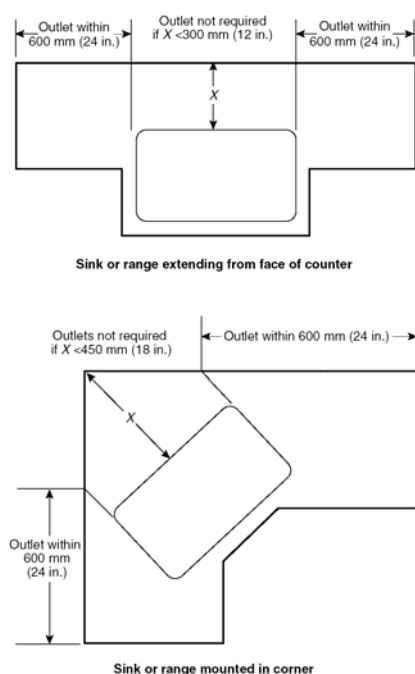


Figure 210.52 Determination of Area Behind Sink or Range.

**210.52(D) Exception Bathrooms:** (Outlet Boxes). The receptacle shall not be required to be mounted in the wall or partition where it is installed on the side or face of the basin cabinet not more than 300 mm (12 in.) below the countertop.

*What does this mean?:* This new exception permits outlet boxes to be installed in the basin cabinet instead of the wall or partition where it is not practical for the outlet installation. Old work boxes or Adjust-A-Boxes are commonly used with cabinets.

**210.52(E) Outdoor Outlets:** (Outlet Boxes and In-Use Weatherproof Covers). For each dwelling unit of a multifamily dwelling where the dwelling unit is located at the grade level and provided with individual exterior entrance/egress, at least one receptacle outlet accessible from grade level and not more than 2.0 m (6 ½ ft) above the grade shall be installed.

**What does this mean?:** Receptacles are now required to be installed at each entrance to a dwelling of a multifamily (townhouse, condominium or apartment) dwelling where the entrance is located at the ground level. If these receptacles are installed where exposed to the elements an In-Use Weatherproof cover is required to be used. See 406.8(B)(1)

## **Article 230 Services**

**230.50 Protection of Open Conductors and Cables Against Damage – Above Ground:** (Schedule 80 Rigid Nonmetallic Conduit). Service-entrance conductors installed above ground shall be protected against physical damage as specified in 230.50(A) or (B).

**230.50(A) Service Cables.** Service cables, where subject to physical damage, shall be protected by any of the following:

- ...
- (3) Schedule 80 Rigid Nonmetallic Conduit
- ...

**What does this mean?:** This is not a new rule or revision to the 2005 NEC. This section was revised for the 2002 NEC and is worth reexamining:

Section 230-50(a) of the 1999 NEC states that service cables, where exposed to physical damage, is required to be protected by any of the following:

- (1) Rigid Metal Conduit
- (2) Intermediate Metal Conduit
- (3) Rigid Nonmetallic Conduit Suitable for the Location
- (4) Electrical Metallic Tubing
- (5) Other approved means

Schedule 80 Rigid Nonmetallic Conduit is the only Rigid Nonmetallic Conduit suitable for the location (Area of Physical Damage). In the 2002 NEC, they replaced "(3) Rigid Nonmetallic Conduit Suitable for the Location" with "(3) Schedule 80 Rigid Nonmetallic Conduit".

The only time Schedule 80 PVC conduit would be required is when the service cable is exposed to physical damage. The AHJ needs to determine if the cables are exposed to physical damage since there is not a definition of physical damage in the code. Some AHJ state if the cable is coming out of the ground next to a house into a meter then it has to be installed in Schedule 80 conduit. Other AHJ are not as strict. Schedule 40 conduit can be used underground and transition to the schedule 80 (usually at the elbow).

When it comes right down to it the rule in the code has not been changed at all, just the description.

**230.54(A) Raintight Service Head.** (Service Weatherheads) Service raceways shall be equipped with a raintight service head at the point of connection to service-drop conductors.

**What does this mean?:** This is not a new rule or revision to the 2005 NEC. Since Carlon has introduced a NEW Raintight Service Entrance Head it was worth locating the requirement in the NEC.

## **Article 240 Overcurrent Protection**

**240.21(B)(2) Taps Not Over 7.5 m (25 ft) Long.** (Schedule 80 Rigid Nonmetallic Conduit)

(3) The tap conductors are protected from physical damage by being enclosed in an approved raceway or by other approved means.

See also: 240.21(B)(3)(4), 240.21(B)(4)(5), 240.21(B)(5)(1), 240.21(C)(3)(3), 240.21(C)(4)(1) and 240.92(B)(3).

*What does this mean?: Article 240 under Section 240.21 added this requirement to several sections including 240.21(2). These are new rules that state the primary and secondary Feeder Taps and Transformer Secondary Conductors that require conductors and cables to be protected from physical damage. These Sections could be misinterpreted as saying that this is an area of physical damage and requiring Schedule 80 Rigid Nonmetallic Conduit to be used as the approved raceway.*

## **Article 300 Wiring Methods**

**300.4(B)(2) Exception.** (ENT) A listed and marked steel plate less than 1.6mm (1/16 in) thick that provides equal or better protection against nail or screw penetration shall be permitted.

*What does this mean?: This is a new exception that allows steel plates thinner than a 1/16" thick to be used to protect ENT that could be penetrated by nails and screws. These thinner plates are required to be listed and marked.*

**300.5(B) Listed.** (Schedule 40, Schedule 80 Rigid Nonmetallic Conduit, HDPE Conduit and Bore-Gard) Cables and insulated conductors installed in enclosures or raceways in underground installations shall be listed for use in a wet location.

*What does this mean?: This section was numbered 300.5(D)(5) in the 2002 NEC and moved to 300.5(B) for the 2005 NEC. Panel 3 believed that it was better located under the general rules of underground installations than it was under protection from damage.*

**300.6(C) Nonmetallic Equipment.** (All Carlon Products) Nonmetallic raceways, cable trays, cablebus, auxiliary gutters, boxes, cables with a nonmetallic outer jacket and internal metal armor or jacket, cable sheathing, cabinets, elbows, couplings, nipples, fittings, supports and support hardware shall be made of material approved for the condition and shall comply with (C)(1) and (C)(2) as applicable to the specific installation.

(1) **Exposed to Sunlight.** Where exposed to sunlight, the materials shall be listed as sunlight resistant or shall be identified as sunlight resistant.

(2) **Chemical Exposure.** Where subject to exposure to chemical solvents, vapors, splashing, or immersion, materials or coatings shall either be inherently resistant to chemicals based on its listing or be identified for the specific chemical reagent.

*What does this mean?: 300.6 was completely rewritten for usability and to address the concerns of nonmetallic material in corrosive or deteriorative exposures. The raceway articles address each of these areas in their specific articles. Enclosure would refer to Table 430.91 for NEMA Type Designations. Fittings listed for "Wet Locations" are also approved for outdoor applications where exposed to sunlight.*

**300.18(A) Exception:** (Schedule 80 Rigid Nonmetallic Conduit) Short sections of raceways used to contain conductors or cable assemblies for protection from physical damage shall not be required to be installed complete between outlet, junction, or splice points.

*What does this mean?: 300.18(A) requires a raceway system to be installed as a complete system between outlet or junction boxes. The exception takes in consideration that raceway can be used as "sleeves" for cables or conductors needing additional protection from physical damage is required. Schedule 80 Rigid Nonmetallic Conduit is listed as a raceway acceptable for use in areas of physical damage.*

**Table 300.50 Minimum Cover Requirements:** (All Nonmetallic Raceways and Fittings) Revised Table.

*What does this mean?: Table 300.50 for minimum cover of conduit used in high voltage (over 600 volt) application was rewritten for usability. The requirements remain the same. The format of the table removed the note and six exceptions into an easily used table.*

**Article 314**  
**Outlet, Device, Pull, and Junction Boxes;**  
**Conduit Bodies; Fittings; and Handhole Enclosures**

**314.16(B)(1) Conductor Fill.** (Outlet Boxes and Junction Boxes). ...A looped, unbroken conductor not less than twice the minimum length required for free conductors per 300.14 shall be counted twice...

*What does this mean?: 314.16(B)(1) was revised to add the aforementioned requirement to address looped conductors. The loop conductor has to be at least 12 inches in length per 300.14 inside a standard outlet box to be required to be counted as twice. Present rules permit unbroken conductors to be run through the box and only be counted once. Some installations used larger lengths of conductors for the purpose of pulling to be left in the outlet box and using up capacity in the box. If this practice is utilized larger boxes will be required to be used.*

**314.20 In Wall or Ceiling.** (Box Extenders). ...In walls and ceilings constructed of wood or other combustible surface material, boxes, plaster rings, extension rings, or listed extenders shall be flush with the finished surface or projected therefrom.

*What does this mean?: Listed Box Extenders were added as an approved means for use with outlet boxes that are recessed in a combustible surface material where an outlet box is not permitted to be recessed 1/4".*

**314.27(D) Boxes at Ceiling-Suspended (Paddle) Fan Outlets.** (Fan Rated Ceiling Boxes) Outlet boxes or outlet box systems used for the sole support of a ceiling-suspended (paddle) fan shall be listed, shall be marked by the manufacturer as suitable for the purpose, and shall not support ceiling-suspended (paddle) fans that weigh more than 32 kg (70 lb). For outlet boxes or outlet box systems designed to support ceiling-suspended (paddle) fans that weigh more than 16 kg (35 lb), the required marking shall include the maximum weight to be supported.

*What does this mean?: The supporting requirements for fan rated ceiling boxes was removed from 422.18 to 314.27(D). This relocation of the requirements for a ceiling outlet box is more appropriate in the outlet box article than the appliance article.*

**Article 334**  
**Nonmetallic-Sheathed Cable: Types NM, NMC, and NMS**

**334.15(B) Protection from Physical Damage.** (Schedule 80 Rigid Nonmetallic Conduit). Cable shall be protected from physical damage where necessary by rigid metal conduit, intermediate metal conduit, electrical metallic tubing, Schedule 80 PVC rigid nonmetallic conduit, or other approved means. Where passing through a floor, the cable shall be enclosed in rigid metal conduit, intermediate metal conduit, electrical metallic tubing, Schedule 80 PVC rigid nonmetallic conduit, or other approved means extending at least 150 mm (6 in.) above the floor.

*What does this mean?: 315(B) was revised to remove "pipe, guard strips, listed surface metal or nonmetallic raceway" as an approved method for the protection of NM Cable in areas of physical damage.*

**334.15(C) In Unfinished Basements.** (Rigid Nonmetallic Conduit, FS Boxes, Fittings). ...NM cable used on a wall of an unfinished basement shall be permitted to be installed in a listed conduit or tubing. Conduit or tubing shall utilize a nonmetallic bushing or adapter at the point the cable enters the raceway. Metal conduit and tubings and metal outlet boxes shall be grounded.

*What does this mean?: 334.15(C) was revised to require a raceway to be used with NM Cable when the NM Cable comes down the wall to a switch or receptacle in an unfinished basement. This section also indicates that nonmetallic systems are acceptable to be used in this application.*

**Article 352**  
**Rigid Nonmetallic Conduit: Type RNC**

**352.2 Definition.**

**Rigid Nonmetallic Conduit (RNC).** A nonmetallic raceway of circular cross section, with integral or associated couplings, connector, and fittings for the installation of electrical conductors and cables.

*What does this mean?: The definition for Rigid Nonmetallic Conduit was revised to “and cables” to make it clear that cables are permitted to be installed in the raceway.*

**352.10(G) Underground Installations.** For underground installations, see 300.5 and 300.50.

**FPN:** Refer to Article 353 for High Density Polyethylene Conduit: Type HDPE.

*What does this mean?: The Fine Print Note was added to section 352.10(G) to refer the reader to the new Article 353 for HDPE Conduit.*

**352.10(H) Support of Conduit Bodies.** Rigid nonmetallic conduit shall be permitted to support nonmetallic conduit bodies not larger than the largest trade size of an entering raceway. These conduit bodies shall not support luminaries (fixtures) or other equipment and shall not contain devices other than splicing devices as permitted by 110.14(B) and 314.16(C)(2).

*What does this mean?: 352.10(H) was revised to allow splicing devices to be installed into a conduit body and supported by the conduit. Prior to the revision splicing devices were considered a device and the conduit had to be supported within 3 feet of each entry into the conduit body. 110.14(B) defines the requirements of splicing conductors which include splicing devices. 314.16(C)(2) indicates that those conduit bodies that have the volume marked inside of them, are permitted to contain splices.*

**352.12(E) Insulation Temperature Limitations.** For conductors or cables operating at a temperature higher than the RNC listed operating temperature rating.

**Exception:** Conductors or cables rated at a temperature higher than the RNC listed temperature rating shall be permitted to be installed in RNC, provided they are not operating at a temperature higher than the RNC listed temperature rating.

*What does this mean?: The exception was added to permit conductors and cables rated at a higher temperature than the RNC listed temperature to be used as long as the cables or conductors are not operated at the higher temperature. Recognizing that most wire and cable manufacturers no longer mark Type MV conductors or cables for 90°C since the conductors insulation met the 105°C requirements and are marked for the higher temperature rating, the Code Making Panel decided to add the exception. Carlon’s RNC is listed for 90°C. The temperature rating of the conduit will not be exceeded since the users do not operate MV conductors or cables above 90°C. The rated temperature is based upon the rating of the insulation and jacketing material used in the construction of the cable, not the operational temperature.*

**352.22 Number of Conductors.** ...Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

*What does this mean?: 352.22 was revised to make it clear that cables can be used in RNC unless the appropriate cable article prohibits the use. The 2002 NEC stated that the respective cable articles had to permit the use of the cables in the raceway. Not all cable articles permitted nor prohibited the use of cable in the raceway. The previous language prohibited some cables from being used in a raceway even though a safety issue was not present.*

**352.24 Bends-How Made.** Bends shall be so made that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Field bends shall be made only with bending

equipment identified for the purpose. The radius of the curve to the centerline of such bends shall not be less than shown in Table 2, Chapter 9.

*What does this mean?: Table 2 Radius of Conduit and Tubing Bends was relocated from Article 344 (Table 344.24) Rigid Metal Conduit. This prevents users from being sent back to a competitive metal raceway article when determining minimum bending radius for conduit or tubing.*

### **Article 353 High Density Polyethylene Conduit: Type HDPE Conduit**

**353.1 Scope.** (UL Listed HDPE Conduit and Fittings) This article covers the use, installation, and construction specifications for high density polyethylene (HDPE) conduit and fittings.

*What does this mean?: This new article was added to the 2005 NEC. HDPE Conduit was always listed in accordance with Article 352 Rigid Nonmetallic Conduit. The new article will help users understand the use, installation and construction requirements for Listed HDPE Conduit and fittings better than what was described in Article 352. This new article will also make users aware that Listed HDPE Conduit and fittings are an acceptable alternative for underground conduit applications.*

### **Article 356 Liquidtight Flexible Nonmetallic Conduit: Type LFNC**

**356.22 Number of Conductors.** ...Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

*What does this mean?: 356.22 was revised to make it clear that cables can be used in LFNC unless the appropriate cable article prohibits the use. The 2002 NEC stated that the respective cable articles had to permit the use of the cables in the raceway. Not all cable articles permitted nor prohibited the use of cable in the raceway. The previous language prohibited some cables from being used in a raceway even though a safety issue was not present.*

**356.24 Bends-How Made.** Bends shall be so made that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Field bends shall be made only with bending equipment identified for the purpose. The radius of the curve to the centerline of such bends shall not be less than shown in Table 2, Chapter 9.

*What does this mean?: Table 2 Radius of Conduit and Tubing Bends was relocated from Article 344 (Table 344.24) Rigid Metal Conduit. This prevents users from being sent back to a competitive metal raceway article when determining minimum bending radius for conduit or tubing.*

**356.30 Securing and Supporting.** (LFNC-B) Type LFNC-B shall be securely fastened and supported in accordance with one of the following:

- (1) Where installed in lengths longer exceeding 1.8 m (6 ft), the conduit shall be securely fastened at intervals not exceeding 900 mm (3 ft) and within 300 mm (12 in) on each side of every outlet box, junction box, cabinet or fitting.
- (2)...
- (3)...
- (4) Securing or supporting of LFNC-B shall not be required where installed in lengths not exceeding 1.8 m (6 ft) from the last point where the raceway is securely fastened for connections within an accessible ceiling to luminaire(s) [lighting fixture(s)] or other equipment.

*What does this mean?: 356.30(1) was revised and 356.30(4) was added to make it clear that LFNC-B in lengths of 6 feet or less is not required to be secured or supported with clamps or any other means. Securing and supporting is only required in lengths greater than 6 feet.*

**356.42 Couplings and Connectors.** Only fittings listed for the use with LFNC shall be used. Angle connectors shall not be used for concealed raceway installations. Straight LFNC fittings are permitted for direct burial or encasement in concrete.

*What does this mean?:* Section 356.42 was revised for two reasons:

1. The first sentence was added to indicate that fittings use with LFNC are required listed for the conduit. Rigid Nonmetallic Conduit fittings are not listed for the use with LFNC. Only listed liquidtight fittings are permitted to be used with LFNC.

2. The third sentence was added to indicate that it was acceptable to bury or concrete encase LFNC fittings as long as they are the straight version and not angle connectors.

## Article 362

### Electrical Nonmetallic Tubing: Type ENT

**362.10(2) Uses Permitted.** ...The 15-minute-finish-rated thermal barrier shall be permitted to be used for combustible or noncombustible walls, floors and ceiling.

*What does this mean?:* After two cycles NFPA remembered to add “or noncombustible” into section 362.10(2) in the first published editions.

**362.10(2) Uses Permitted Exception.** Where a fire sprinkler system(s) is installed in accordance with NFPA 13-2002, Standard for Installation of Sprinkler Systems, on all floors, ENT shall be permitted to be used within walls, floors, and ceilings, exposed or concealed, in buildings exceeding three floors above grade.

*What does this mean?:* The Exception of 362.10(2) was revised to state that ENT “shall be” permitted to be used within walls, floors, and ceiling, exposed or concealed, in buildings exceeding three floors above grade. The NFPA 13 standard was updated to the most recent version published in 2002.

**362.10(5) Uses Permitted Exception.** ENT shall be permitted to be used above suspended ceilings in buildings exceeding three floors above grade where the buildings is protected throughout by a fire sprinkler system installed in accordance with NFPA 13-2002, Standard for the Installation of Sprinkler Systems.

*What does this mean?:* The Exception of 362.10(5) was revised to clarify that ENT shall be permitted above suspended ceilings without the panels having a 15 minute finish rating if an approved sprinkler system is installed. The 2002 NEC was confusing since it made references to walls, floors and ceilings where as 362.10(5) only addresses suspended ceilings.

**362.12(4) Uses Not Permitted Exception.** Conductors or cables rated at a temperature higher than the ENT listed temperature rating shall be permitted to be installed in ENT, provided they are not operating at a temperature higher than the ENT listed temperature rating.

*What does this mean?:* The exception was added to permit conductors and cables rated at a higher temperature than the ENT listed temperature to be used as long as the cables or conductors are not operated at the higher temperature. Recognizing that most wire and cable manufacturers may not mark different types conductors or cables for 90°C since the conductors insulation met the 105°C requirements and are marked for the higher temperature rating, the Code Making Panel decided to add the exception. Carlon’s ENT is listed for 90°C. The rated temperature is based upon the rating of the insulation and jacketing material used in the construction of the cable, not the operational temperature.

**362.22 Number of Conductors.** ...Cables shall be permitted to be installed where such use is not prohibited by the respective cable articles. The number of cables shall not exceed the allowable percentage fill specified in Table 1, Chapter 9.

*What does this mean?:* 362.22 was revised to make it clear that cables can be used in ENT unless the appropriate cable article prohibits the use. The 2002 NEC stated that the respective cable articles had to

*permit the use of the cables in the raceway. Not all cable articles permitted nor prohibited the use of cable in the raceway. The previous language prohibited some cables from being used in a raceway even though a safety issue was not present.*

**362.24 Bends-How Made.** Bends shall be so made that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced. Field bends shall be made only with bending equipment identified for the purpose. The radius of the curve to the centerline of such bends shall not be less than shown in Table 2, Chapter 9.

*What does this mean?: Table 2 Radius of Conduit and Tubing Bends was relocated from Article 344 (Table 344.24) Rigid Metal Conduit. This prevents users from being sent back to a competitive metal raceway article when determining minimum bending radius for conduit or tubing.*

**362.30 Securing and Supporting Exception 2:** Lengths not exceeding 1.8 m (6 ft) from the last point where the raceway is securely fastened for connections within an accessible ceiling to Luminaire(s) [lighting fixture(s)] or other equipment.

*What does this mean?: Exception 2 is new and was added indicate that ENT in any length is permitted to connect to lighting fixtures or other equipment in accessible ceilings as long as the ENT is secured within 6 feet. Exception 1 addresses ENT whips.*

#### **Article 404 Switches**

**404.8(B) Voltage Between Adjacent Devices.** (Super Blue and ENT Boxes with Listed Dividers) A snap switch shall not be grouped or ganged in enclosures with other snap switches, receptacles, or similar devices, unless they are arranged so that the voltage between adjacent devices does not exceed 300 volts, or unless they are installed in enclosures equipped with identified, securely installed barriers between adjacent devices.

*What does this mean?: The words “identified, securely” replaced “permanently” before installed barriers. This new terminology permits the use of dividers in outlet boxes to be an acceptable barrier when separating adjacent devices that exceed 300 volts (difference). The voltage is not uncommon where 480Y/277 voltage systems are used to supply electrical discharge lighting.*

#### **Article 406 Receptacles, Cord Connectors, and Attachment Plugs (Caps)**

**406.4(D) Position of Receptacle Faces. Exception No. 2** (TBD) Listed nonmetallic faceplates that cover the receptacle face to a maximum thickness of 1 mm (0.040 in) shall be permitted.

*What does this mean?: This new exception permits the use of decorative faceplate to completely cover the face of the receptacle as long as they are listed and are no thicker than 1 mm (0.040 in).*

**406.8(B)(1) 15- and 20-Ampere Receptacles in a Wet Location.** (In-Use Weatherproof Covers) 15- and 20-ampere, 125- and 250-volt receptacles installed in a wet location shall have an enclosure that is weatherproof whether or not the attachment plug cap is inserted.

*What does this mean?: In the 2002 NEC this section stated that In-Use Weatherproof covers were only required for 15- and 20-ampere, 125- and 250-volt receptacles when installed “outdoors” where exposed to the weather. The 2005 NEC revised this section to state that all covers for 15- and 20-ampere, 125- and 250-volt receptacles in any area determined to be a wet location, such as car washes, are required to use in-use weatherproof covers.*

**Article 506**  
**Zone 20, 21 and 22 Locations for**  
**Combustible Dusts, Fibers, and Flyings**

**506.1 Scope.** (Liquidtight Flexible Nonmetallic Conduit) This article covers the requirements for the zone classification system as an alternative to the division classification system covered in Article 500, Article 502, and Article 503 for electrical and electronic equipment and wiring for all voltages in Zone 20, Zone 21, and Zone 22 hazardous (classified) locations where fire and explosion hazards may exist due to combustible dusts, or ignitable fibers or flyings. Combustible metallic dusts are not covered by the requirements of this article.

*What does this mean?: This is a new article for the 2005 NEC which provides an alternate method for atmosphere where fire and explosive hazards exist. This new article is a beginning in the harmonization of the requirements between the NEC and the IEC. At this time the article is not complete in its coverage and application, but it does provide a basis for future harmonization. LFNC (Carflex) and fittings are acceptable wiring methods for all three Zones per 506.15(A)(5), 506.15(B)(1) and 506.15(C)(1).*

**Article 682**  
**Natural and Artificially Made Bodies of**  
**Water**

**682.1 Scope.** (Carlson's Products Approved for Wet Locations) This article applies to the installation of electrical wiring for, and equipment in and adjacent to, natural or artificially made bodies of water not covered by other articles in this Code, such as but not limited to aeration ponds, fish ponds, storm retention basins, treatment ponds, irrigation (channels) facilities.

*What does this mean?: This is a new article for the 2005 NEC which provides requirements for the installation of electrical wiring and equipment. Per 682.13, wiring methods and installations of Chapter 3 and Articles 553 (Floating Buildings), 555 (Marinas and Boatyards), and 590 (Temporary Installations) shall be permitted where identified for use in wet locations.*

**Article 725**  
**Class 1, Class 2, and Class 3**  
**Remote-Control, Signaling, and**  
**Power-Limited Circuits**

**725.1 Scope.** (Plenum-Gard, Fire-Flex Plenum Duct, Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct, Resi-Gard, Fire-Flex GP Duct and fittings) This article covers remote-control, signaling, and power-limited circuits that are not an integral part of a device or appliance.

**FPN:** The circuits described herein are characterized by usage and electrical power limitations that differentiate them from electric light and power circuits; therefore, alternative requirements to those of Chapters 1 through 4 are given with regard to minimum wire sizes, derating factors, overcurrent protection, insulation requirements, and wiring methods and materials.

**725.3(C) Ducts, Plenum, and Other Air Handling Spaces.** (Plenum-Gard, Fire-Flex Plenum Duct, and fittings) Class 1, Class 2, and Class 3 circuits installed in ducts, plenums, or other space used for environmental air shall comply with 300.22. Type CL2P or CL3P cables and plenum signaling raceways shall be permitted for Class 2 and Class 3 circuits installed in other spaces used for environmental air.

**725.61(A) Plenums.** (Plenum-Gard, Fire-Flex Plenum Duct, and fittings) Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CL2P or CL3P. Listed wires and cables installed in compliance with 300.22 shall be permitted. Listed plenum signaling raceways shall be permitted to be installed in other spaces used for environmental air as described in 300.22(C). Only Type CL2P or CL3P cable shall be permitted to be installed in these raceways.

**725.61(B) Riser.** (Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct, and fittings) Cables installed in risers shall be as described in any of (B)(1), (B)(2), or (B)(3):

(1) Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type CL2R or CL3R. Floor penetrations requiring Type CL2R or CL3R shall contain only cables suitable for riser or plenum use. Listed riser signaling raceways shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type CL2R, CL3R, CL2P, or CL3P cables shall be permitted to be installed in these raceways.

(2) Other cables as covered in Table 725.61 and other listed wiring methods as covered in Chapter 3 shall be installed in metal raceways or located in a fireproof shaft having firestops at each floor.

(3) Type CL2, CL3, CL2X, and CL3X cables shall be permitted in one- and two-family dwellings. Listed general purpose signaling raceways shall be permitted for use with Type CL2, CL3, CL2X and CL3X cables.

**FPN:** See 300.21 for firestop requirements for floor penetrations.

**725.61(C) Cable Trays.** (Plenum-Gard, Fire-Flex Plenum Duct, Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct, Resi-Gard, Fire-Flex GP Duct and fittings) Cables installed in cable trays outdoors shall be Type PLTC. Cables installed in cable trays indoors shall be Types PLTC, CL3P, CL3R, CL3, CL2P, CL2R, and CL2.

Listed signaling raceways shall be permitted for use with cable trays.

**FPN:** See 800.133(B) for cables permitted in cable trays.

**725.82 Listing and Marking of Class 2, Class 3, and Type PLTC Cables.** (Plenum-Gard, Fire-Flex Plenum Duct, Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct, Resi-Gard, Fire-Flex GP Duct and fittings) Class 2, Class 3, and Type PLTC cables and nonmetallic signaling raceways installed as wiring methods within buildings shall be listed as being resistant to the spread of fire and other criteria in accordance with 725.82(A) through 725.82(K) and shall be marked in accordance with 725.82(L).

**725.82(I) Plenum Signaling Raceways.** (Plenum-Gard, and Fire-Flex Plenum Duct) Plenum signaling raceways shall be listed as having adequate fire-resistant and low smoke-producing characteristics.

**725.82(J) Riser Signaling Raceways.** (Riser-Gard, Fire-Flex Riser Duct, and HF Riser Duct) Riser signaling raceways shall be listed as having adequate fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.

**FPN:** One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the raceways pass the requirements of the Test for Flame Propagation (Riser) in UL 2024, *Standard for Optical Fiber Cable Raceway*.

**725.82(K) General-Purpose Signaling Raceways.** (Resi-Gard, and Fire-Flex GP Duct) General-purpose signaling raceways shall be listed as being resistant to the spread of fire.

**FPN:** One method of defining resistant to the spread of fire is that the raceways pass the requirements of the Vertical-Tray Flame Test (General Purpose) in UL 2024, *Standard for Optical Fiber Cable Raceway*.

**What does this all mean?:** Article 725 has been expanded to allow the use of Plenum-Gard, Fire-Flex Plenum Duct, Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct, Resi-Gard, Fire-Flex GP Duct and their associated fittings to be used with remote-control, signaling and power-limited cables. Article 725 is written very similarly to the Optical Fiber Cables (Article 770) and Communications Cables (Article 800) articles and requires the appropriate cable to be installed in the raceway (i.e. plenum rated cables in Plenum-Gard, and Fire-Flex Plenum Duct). All of Carlon's premise raceways are UL Listed to UL2024. This is a market expansion of the use of Plenum-Gard, Fire-Flex Plenum Duct, Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct, Resi-Gard, Fire-Flex GP Duct and their associated fittings.

**Article 770**  
**Optical Fiber Cables and Raceways**

**Article 770 Optical Fiber Cables and Raceways:** This article has been reorganized to relocate appropriate parts and sections for usability of the NEC.

**770.12 Raceways for Optical Fiber Cables.** (Plenum-Gard, Fire-Flex Plenum Duct, Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct, Resi-Gard, Fire-Flex GP Duct and fittings) Installations of raceways shall comply with 770.12(A) through 770.12(D).

**770.12(A) Listed Chapter 3 Raceways.** (ENT, LFNC and RNC) Listed optical fiber cable shall be permitted to be installed in any type of listed raceway permitted in Chapter 3 where the listed raceway is installed in accordance with Chapter 3. Where optical fiber cables are installed within raceway without current-carrying conductors, the raceway fill tables of Chapter 3 and Chapter 9 shall not apply. Where nonconductive optical fiber cables are installed with electric conductors in a raceway, the raceway fill tables of Chapter 3 and Chapter 9 will apply.

*What does this all mean?: Raceways such as ENT, LFNC and RNC are permitted raceways for use with optical fiber cables as long as the ENT, LFNC and RNC are installed per their appropriate articles. Section 770.133 permits optical fiber cables to be installed in raceways along with electrical conductors as long as the cables are the nonconductive type.*

**770.12(B) Optical Fiber Raceways.** (Plenum-Gard, Fire-Flex Plenum Duct, Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct, Resi-Gard, Fire-Flex GP Duct and fittings) Listed optical fiber cable shall be permitted to be installed in listed plenum optical fiber raceway, listed riser optical fiber raceway, or listed general-purpose optical fiber raceway installed in accordance with 770.154 and 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing shall apply.

*What does this mean?: This new section was derived from 770.6 of the 2002 NEC and makes it clear that all nonmetallic optical fiber raceways shall be "Listed" and are required to be installed in accordance with some of the sections pertaining to ENT in Article 362.*

**770.12(C) Innerduct.** (Plenum-Gard, Fire-Flex Plenum Duct, Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct, Resi-Gard, Fire-Flex GP Duct and fittings) Listed plenum optical fiber raceway, listed riser optical fiber raceway, Listed general-purpose optical fiber raceway installed in accordance with 770.154 shall be permitted to be installed as innerduct in any type of listed raceways permitted in Chapter 3.

*What does this mean?: This new section indicates that it is permissible to install Plenum-Gard, Fire-Flex Plenum Duct, Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct, Resi-Gard, and Fire-Flex GP Duct as an innerduct in those listed raceways specified in Chapter 3. This section did however fail to address whether a Riser rated innerduct is acceptable to be used in a metal raceway in a plenum. Possible proposal for the 2008 NEC.*

**770.12(D) Entering Building.** (HDPE Innerduct, Plenum-Gard, Fire-Flex Plenum Duct, Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct, Resi-Gard, Fire-Flex GP Duct and fittings) Unlisted underground or outside plant construction plastic innerduct entering the building from the outside shall be terminated and firestopped at the point of entrance.

*What does this mean?: This new section was derived from 770.6 of the 2002 NEC and makes it clear that all non-listed nonmetallic optical fiber raceways entering a building from the outside have to be terminated at the point of entry. 770.113 addresses the length of non-listed cable that is permitted to be installed in a building after entry from the outside.*

**770.113 Installation and Marking of Listed Optical Fiber Cables. Exception No. 2 (RNC)** Nonconductive optical fiber cables shall not require to be listed and marked where the cable enters the

building from the outside and is run in raceway systems installed in compliance with any of the following articles in Chapter 3: ... Article 352, Rigid Nonmetallic Conduit: Type RNC; ...

*What does this mean?: This new exception was revised from 770.50 Exception No.3 to the 2005 NEC and allows non-listed nonconductive optical fiber cable to be run throughout the building as long as it is installed in an approved raceway including RNC.*

**770.182 Optical Fiber Raceways.** (Plenum-Gard, Fire-Flex Plenum Duct, Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct, Resi-Gard, Fire-Flex GP Duct and fittings) Optical fiber raceways shall be listed in accordance with 770.182(A) through 770.182(C).

**770.182(A) Plenum Optical Fiber Raceway.** (Plenum-Gard, and Fire-Flex Plenum Duct) Plenum optical fiber raceways shall be listed as having adequate fire-resistant and low smoke-producing characteristics.

**FPN:** One method of defining that an optical fiber raceway is a low smoke producing raceway and a fire-resistant raceway is that the raceway exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5ft) or less when tested in accordance with the plenum test in UL 2024, *Standard for Optical Fiber Cable Raceway*.

**770.182(B) Riser Optical Fiber Raceway.** (Riser-Gard, Fire-Flex Riser Duct, and HF Riser Duct) Riser optical fiber raceways shall be listed as having adequate fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.

**FPN:** One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the raceways pass the requirements of the test for Flame Propagation (Riser) in UL 2024, *Standard for Optical Fiber Cable Raceway*.

**770.182(C) General-Purpose Optical Fiber Raceway.** (Resi-Gard, and Fire-Flex GP Duct) General-purpose optical fiber raceway shall be listed as being resistant to the spread of fire.

**FPN:** One method of defining resistant to the spread of fire is that the raceways pass the requirements of the Vertical-Tray Flame Test (General Purpose) in UL 2024, *Standard for Optical Fiber Cable Raceway*.

*What does this mean?: Fine Print Notes have been added to each of these sections to describe what an acceptable test criteria for each type of raceway would be. FPN are not enforceable and are only there for information purposes. All of Carlon's premise raceways are UL Listed to UL2024.*

## **Article 800 Communication Circuits**

**Article 800 Communication Circuits:** This article has been reorganized to relocate appropriate parts and sections for usability of the NEC.

**800.133(A)(1)(c) Exception No. 1** (Super Blue Outlet Boxes and Dividers) Where all of the conductors of electric light, power, Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits are separated from all of the conductors of communications circuits by a permanent barrier or listed divider.

*What does this mean?: Section 800.133(A)(1)(c) Exception No. 1 has been revised to require listed dividers to be used in outlet boxes to separate communication cables from other electrical conductors. The High Low Box has a permanent barrier as does the Sidecar.*

**800.182(A) Plenum Communication Raceways.** (Plenum-Gard, and Fire-Flex Plenum Duct) Plenum communication raceways listed as plenum optical fiber raceways shall be permitted for use in ducts, plenums, and other spaces used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

**FPN:** One method of defining that an optical fiber raceway is a low smoke producing raceway and a fire-resistant raceway is that the raceway exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5ft) or less when tested in accordance with the plenum test in UL 2024, *Standard for Optical Fiber Cable Raceway*.

**800.182(B) Riser Communication Raceways.** (Riser-Gard, Fire-Flex Riser Duct, and HF Riser Duct) Riser communication raceways shall be listed as having adequate fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.

**FPN:** One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the raceways pass the requirements of the test for Flame Propagation (Riser) in UL 2024, *Standard for Optical Fiber Cable Raceway*.

**800.182(C) General-Purpose Communication Raceways.** (Resi-Gard, and Fire-Flex GP Duct) General-purpose communication raceways shall be listed as being resistant to the spread of fire.

**FPN:** One method of defining resistant to the spread of fire is that the raceways pass the requirements of the Vertical-Tray Flame Test (General Purpose) in UL 2024, *Standard for Optical Fiber Cable Raceway*.

*What does this mean?: Fine Print Notes have been added to each of these sections to describe what an acceptable test criteria for each type of raceway would be. FPN are not enforceable and are only there for information purposes. All of Carlon's premise raceways are UL Listed to UL2024.*

## **Article 820 Community Antenna Television and Radio Distribution Systems**

**820.1 Scope.** (Plenum-Gard, Fire-Flex Plenum Duct, Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct, Resi-Gard, Fire-Flex GP Duct and fittings) This article covers coaxial cable distribution of radio frequency signals typically employed in community antenna television (CATV) systems.

**820.110 Raceways for Coaxial Cables.** (Plenum-Gard, Fire-Flex Plenum Duct, Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct, Resi-Gard, Fire-Flex GP Duct and fittings) Where coaxial cables are installed in a raceway, the raceway shall be either of a type permitted in Chapter 3 and installed in accordance with Chapter 3 or a listed nonmetallic raceway complying with 820.182(A), (B), or (C), as applicable, and installed in accordance with 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing.

**Exception:** Conduit fill restrictions shall not apply.

**820.133(A)(1)(2) Exception No. 1** (Super Blue Outlet Boxes and Dividers) Where all of the conductors of electric light, power, Class 1, non-power-limited fire alarm, and medium power network-powered broadband communications circuits are separated from all of the coaxial cables by a permanent barrier or listed divider.

*What does this mean?: Section 820.133(A)(1)(2) Exception No. 1 has been revised to require listed dividers to be used in outlet boxes to separate communication cables from other electrical conductors. The High Low Box has a permanent barrier as does the Sidecar.*

**820.154(A) Plenums.** (Plenum-Gard, Fire-Flex Plenum Duct, and fittings) Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CATVP. Abandon cables shall not be permitted to remain. Types CATVP, CATVR, CATV, and CATVX cables installed in compliance with 300.22 shall be permitted. Listed plenum CATV raceways shall be permitted to be installed in ducts and plenums as described in 300.22(B) and in other spaces used for environmental air as described in 300.22(C). Only Type CATVP cable shall be permitted to be installed in these raceways.

**820.154(B) Riser.** (Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct and fittings) Cables installed in risers shall comply with any of 820.154(B)(1) through (B)(3).

**(1) Cables in Vertical Runs.** Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type CATVR. Floor penetrations requiring Type CATVR shall contain only cables suitable for riser or plenum use. Abandon cables shall not be permitted to remain. Listed riser CATV raceways shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type CATVR and CATVP cables shall be permitted to be installed in these raceways.

**(2) Metal Raceway or Fireproof Shafts.** Types CATV and CATVX cables shall be permitted to be encased in a metal raceway or located in a fireproof shaft having fire-stops at each floor.

**(3) One- and Two-Family Dwellings.** Types CATV and CATVX cables shall be permitted in one- and two-family dwellings.

**FPN:** See 820.3(A) for firestop requirements for floor penetrations.

**820.154(D) Other Wiring Within Buildings.** (Resi-Gard, Fire-Flex GP Duct and fittings) Cables installed in building locations other than the locations covered in 820.154(A) and 820.154(B) shall be with any of the requirements in 820.154(D)(1) through (D)(5). Abandon cables in hollow spaces shall not be permitted to remain.

**(1) General.** Type CATV shall be permitted. Listed CATV general-purpose raceways shall be permitted. Only Types CATV, CATVX, CATVR, or CATVP cables shall be permitted to be installed in general-purpose communication raceways.

**820.182 CATV Raceways.** (Plenum-Gard, Fire-Flex Plenum Duct, Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct, Resi-Gard, Fire-Flex GP Duct and fittings) CATV raceways shall be listed in accordance with 820.182(A) through 820.182(C).

**820.182(A) Plenum CATV Raceways.** (Plenum-Gard, and Fire-Flex Plenum Duct) Plenum CATV raceways shall be listed for use in other spaces used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

**FPN:** One method of defining that an optical fiber raceway is a low smoke producing raceway and a fire-resistant raceway is that the raceway exhibits a maximum peak optical density of 0.5 or less, an average optical density of 0.15 or less, and a maximum flame spread distance of 1.52 m (5ft) or less when tested in accordance with the plenum test in UL 2024, *Standard for Optical Fiber Cable Raceway*.

**820.182(B) Riser CATV Raceway.** (Riser-Gard, Fire-Flex Riser Duct, and HF Riser Duct) Riser CATV raceways shall be listed for use in risers and shall also be listed as having adequate fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.

**FPN:** One method of defining fire-resistant characteristics capable of preventing the carrying of fire from floor to floor is that the raceways pass the requirements of the test for Flame Propagation (Riser) in UL 2024, *Standard for Optical Fiber Cable Raceway*.

**820.182(C) General-Purpose CATV Raceway.** (Resi-Gard, and Fire-Flex GP Duct) General-purpose CATV raceway shall be listed suitable for general-purpose use and shall also be listed as being resistant to the spread of fire.

**FPN:** One method of defining resistant to the spread of fire is that the raceways pass the requirements of the Vertical-Tray Flame Test (General Purpose) in UL 2024, *Standard for Optical Fiber Cable Raceway*.

***What does this all mean?:*** Article 820 for CATV cables has been expanded to allow the use of Plenum-Gard, Fire-Flex Plenum Duct, Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct, Resi-Gard, Fire-Flex GP Duct and their associated fittings to be used with CATV cables. Article 820 is written very similar to the Optical Fiber Cables (Article 770) and Communications Cables (Article 800) articles and requires the appropriate cable to be installed in the raceway (i.e. plenum rated cables in Plenum-Gard, Fire-Flex Plenum Duct). All of Carlon's premise raceways are UL Listed to UL2024. This is a market expansion of the use of Plenum-Gard, Fire-Flex Plenum Duct, Riser-Gard, Fire-Flex Riser Duct, HF Riser Duct, Resi-Gard, Fire-Flex GP Duct and their associated fittings.

## Chapter 9 Tables

### Table 2 Radius of Conduit and Tubing Bends (Electrical Raceways)

*What does this mean?: Table 2 Radius of Conduit and Tubing Bends was relocated from Article 344 (Table 344.24) Rigid Metal Conduit. This prevents users from being sent back to a competitive metal raceway article when determining minimum bending radius for conduit or tubing.*

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