

Carlon®

Structured Cable Management Systems Handbook



INTEGRITY



CUSTOM
ELECTRONIC
DESIGN &
INSTALLATION
ASSOCIATION



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Introduction

This pocket handbook is intended to be used as a guide for the installation of the Carlon® Structured Cable Management Systems to answer general questions relating to installation procedures. For information on part numbers or pricing, please refer to the appropriate Carlon catalog (2F54). Should the installer develop any unique installation or support methods not shown in this manual, please photograph the method with a 35mm or digital camera and contact your local Carlon sales representative.

THIS POCKET HANDBOOK IS INTENDED AS A GUIDE FOR GENERAL PURPOSES ONLY. CARLON ACCEPTS NO LIABILITY FOR ANY DAMAGES OR LOSS WHICH MAY RESULT FROM IMPROPER INSTALLATION OF CARLON STRUCTURED CABLE MANAGEMENT SYSTEMS AND CARLON® RESI-GARD™.

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Section 1

Questions about Carlon® Structured Cable Management Systems and Carlon® Resi-Gard®

1. WHAT ARE THE COMPONENTS OF THE CARLON STRUCTURED CABLE MANAGEMENT SYSTEM?

Carlon Structured Cable Management Systems include exclusive low voltage brackets, combination dual voltage box-bracket, Resi-Gard (flexible raceways), floor boxes, and accessories designed to be used in residential structured cabling applications.

2. WHAT IS CARLON RESI-GARD?

Resi-Gard is a pliable, nonmetallic, industry standard orange raceway manufactured of PVC and is designed to identify, protect, and future-proof residential structured cabling and telecommunications cabling systems.

Cabling standards and technology requirements change constantly. Installing Resi-Gard throughout the house will give you the opportunity to easily remove outdated cable and replace it with new cable without tearing up the walls.

3. ARE CARLON STRUCTURED CABLE MANAGEMENT SYSTEMS UL LISTED?

Yes. Our new and innovative bracket, box, flexible raceway, and accessories product line has been tested and UL listed for low voltage structured cabling applications and especially designed for residential applications.

4. IS RESI-GARD UL LISTED?

Yes. Carlon Resi-Gard has been tested to UL 2024 as a General Purpose Raceway.

5. IS RESI-GARD RECOGNIZED BY THE NATIONAL ELECTRICAL CODE® (NEC®)?

Yes. See Article 770 – Optical Fiber Cables and Raceways and Article 800 – Communication Circuits.

6. IS THERE ANY CONCERN REGARDING THE TOXICITY OF RESI-GARD DURING A FIRE?

- a. PVC raceways have never caused death in a fire situation; however, improperly grounded steel raceways have ignited fires by arcing and sparking.
- b. Smoke from PVC raceways is no more hazardous than smoke from other materials commonly used in the construction and contents of a building such as furniture, wall coverings, carpeting, drapes, wood, and paper. Wool carpeting and upholstery produce deadly hydrogen cyanide gas. Wood produces carbon monoxide, a primary cause of fire deaths. These materials ignite at a much lower temperature than Resi-Gard.
- c. Various tests conducted by combustion toxicologists, third party certifying agencies, and testing laboratories conclusively prove:
 - PVC Raceways DO NOT generate HCl (Hydrogen Chloride) in lethal concentrations.
 - In an actual large scale fire test, PVC conduit maintained the integrity of electrical circuits, even in the case of flashover.
 - In a fire situation, PVC conduit will protect the integrity of conductors significantly longer than steel conduit.
 - PVC is a practical conduit material.
 - Metallic conduit systems do not guard against fire ignition (may promote arcing if not properly grounded.)

National Electrical Code and NEC are registered trademarks of the National Fire Protection Association, Quincy, MA.

- PVC conduit is superior to metallic conduit in most applications.
- Since both metallic and nonmetallic raceways are recognized by **NEC**, the buyer can decide which product is best suited to the installation requirement.
- A real concern for life safety in fires must be directed toward eliminating fire ignition, providing better control of burnables in the room and providing state-of-the-art fire protection and sprinkler systems. These are the goals of many recognized fire authorities.

7. HOW EASY IS RESI-GARD TO HANDLE ON THE JOB?

Let's take a look:

- 3/4" Resi-Gard weighs 11.5 pounds per 100 feet
- 1" Resi-Gard weighs 17.9 pounds per 100 feet
- 1 1/4" Resi-Gard weighs 21.5 pounds per 100 feet
- 1 1/2" Resi-Gard weighs 11.2 pounds per 50 feet
- 2" Resi-Gard weighs 13.4 pounds per 50 feet

8. HOW EASY IS RESI-GARD TO INSTALL?

Very easy! All that is needed for installation is a Carlon conduit cutter, an electrician's knife or utility knife, conduit clamps (or tie wraps or tie wire), and a pair of side cutter pliers. That's all!

9. HOW IS RESI-GARD PACKAGED?

Resi-Gard is packaged in coils and reels:

- 3/4" Resi-Gard – 100' per coil
1000' per reel (made to order)
- 1" Resi-Gard – 100' per coil
1500' per reel (made to order)
- 1 1/4" Resi-Gard – 100' per coil
- 1 1/2" Resi-Gard – 50' per coil
- 2" Resi-Gard – 50' per coil
500' per reel (made to order)

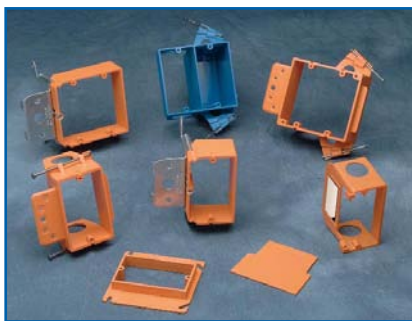
10. WHAT KIND OF RESI-GARD FITTINGS DOES CARLON OFFER?

Carlton offers a complete line of orange one-piece Quick Connect fittings in sizes $\frac{3}{4}$ inch through 1 inch. For sizes $1\frac{1}{4}$ inch through 2 inch, the use of orange PVC cemented fittings is necessary.



11. WHAT DEVICES MOUNTING COMPONENTS DOES CARLON OFFER?

Carlton offers 1- and 2-gang low voltage brackets, a dual voltage box/bracket, an add-on bracket (to attach to an existing nonmetallic electrical box), 1- and 2-gang adjustable brackets, a divider plate for Carlton® SuperBlue™ boxes, and a mud ring.



Boxes, Brackets, & Divider Plate

12. WHERE CAN I USE RESI-GARD?

Resi-Gard can be used in concrete slabs, walls – wood stud, masonry and metal stud, ceilings – permanent or dropped (free air only), and in exposed or concealed locations indoors.

Resi-Gard is designed for Residential Structured Cabling applications. Carlon offers a product called Plenum-Gard® for plenum air-handling areas.

Contact your Carlon Sales Representative for more information.



Resi-Gard® Flexible Raceway & Fittings

13. WHAT IF I HAVE ANY QUESTIONS THAT WERE NOT COVERED IN THIS MANUAL?

- Just call Carlon at (216) 766-6532 or 1-800-321-1970 (outside of Ohio) or contact your local Carlon sales representative.
- Visit our website at www.carlon.com.

With so many products to choose from, this manual helps you choose the right product for your specific application.

Section 2

Defining The Application

Carlson's boxes and brackets are used to protect and terminate cables, connectors and wall plates. Since there are a variety of applications, Carlson has developed a full line of products to meet these needs. To determine what boxes and brackets you need, ask yourself the following questions:

WHAT KIND OF DEVICE WILL BE INSTALLED INSIDE THE BOX OR BRACKET?

- A structured cabling or low voltage device only? For example, a CAT5e cable or a volume control.
- A high voltage device only? For example, a light switch.
- A high voltage device and structured cabling device side by side? For example, a duplex receptacle for power for your computer and a CAT5e or cable modem jack for an Internet connection.



The term “low voltage” will refer to any device that uses a Class 2 circuit per **NEC** Article 725 or any typical structured cabling device or cable such as a CAT5e, coax, or security. A high voltage device will refer to any device that is installed in a standard box in compliance with **NEC** Article 370.

Low Voltage Devices Only

So, you are installing low voltage or structured cabling devices only. The next questions to be answered are:

1. DO YOU REQUIRE A LOW VOLTAGE BRACKET (OR OPEN BACKED BOX)?

Refer to Section 3 (page 11).

2. WILL YOUR LOW VOLTAGE DEVICE BE INSTALLED IN A FIRE-RATED WALL?

Refer to Section 4 (page 14).

3. WILL THIS BRACKET BE INSTALLED IN A LOCATION WHERE THE WALL THICKNESS MAY INCREASE IN THE FUTURE SUCH AS LOCATIONS WHERE CERAMIC TILE OR WOOD PANELING IS ADDED?

Refer to Section 5 (page 16).

High And Low Voltage Device Combination

Do you have an application where you would like to put a high and low voltage device side by side, under one cover plate? For example, how much nicer would one wall plate look in the den where you need a receptacle to power your computer and a CAT5 connector to hook your computer up to the Internet instead of two separate plates? Another example is in your home theatre where a power connection is

needed for your television and a coax and phone jack are needed for your satellite system? Or even your kitchen where your phone/answering machine requires a phone and power outlet!



The 2002 **National Electrical Code (NEC)**, per section 800-52 (a)(1)(c) Exception No.1, allows electrical conductors to share an outlet box when the conductors and communication cables are separated by a barrier within the box.

One instant advantage in using a Dual Voltage Box/Bracket is that the homeowner will see less "wall acne." As more homes are being installed with structured cabling, more wall plates are cluttering up the walls. After a while, this becomes very unsightly for the homeowner.

And one advantage for the installer is fewer complaints will be heard from the homeowner. Have you ever installed a low voltage device and cover plate a few inches away from a light switch or a duplex? Has the homeowner ever complained that the two plates were vertically uneven?

Which installation looks better to you?



Another advantage for the installer is faster installation times – it takes less time to install one box than two!

Now that you need a dual voltage product, which product is right for your application?

- **DO YOU HAVE A TYPICAL DUAL VOLTAGE APPLICATION?**

Refer to Section 6 (page 19).

- **WOULD YOU PREFER JUST TO “ADD-ON” TO AN EXISTING ELECTRICAL BOX?**

Refer to Section 7 (page 20).

- **DO YOU REQUIRE A DUAL VOLTAGE PRODUCT WITH A FIRE RATING?**

Refer to Section 8 (page 21).

Section 3.

Low Voltage Brackets (or Open Backed Boxes)

If you require an open backed box, then Carlon has developed 1-Gang and 2-Gang Low Voltage Brackets.



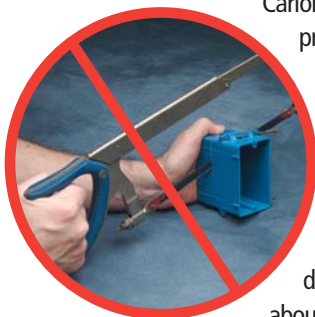
**1-Gang Low Voltage
Bracket SC100A**



**2-Gang Low Voltage
Bracket SC200A**

Our Low Voltage Brackets are designed with a hard shell thickness for increased durability, less racking, and to provide you with an overall better quality product.

Are you cutting off the backs of boxes in order to accommodate the cable-bending radius?

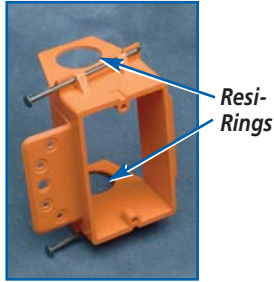


Carlon's solution to this problem is providing a "box" with the back already removed. This saves you the time and expense of cutting the back off yourself. And – you don't have to worry about sharp corners or burrs that will snag your cable.

ANOTHER INSTALLATION ISSUE IS WHAT TO DO WITH THE CABLE FROM THE TIME YOU INSTALL THE BOX TO THE TIME YOU CONNECT THE CABLE?

Resi-Rings

The 3/4" Resi-Rings attached directly to the box serve more than one purpose. You can run the cable through both rings and let the cable hang loose.



Or – for extra security, run the cable through the Resi-Rings and then wire-tie the cable directly to the ring.



Using this feature allows you easy accessibility to the cable later on and keeps the cable safely out of the way from other trades.

What other uses do the rings have? The Resi-Rings also accommodate Resi-Gard flexible raceway. Resi-Gard is Carlon's newest flexible raceway system for cable protection, management, and future-proofing applications.



WHAT ABOUT THOSE SMALL, CONFINED AREAS WHERE IT IS DIFFICULT TO USE A HAMMER TO ATTACH THE BRACKET TO THE STUD?



Not only can Carlon's low voltage bracket be nailed to the stud, it can also be screwed in to the stud for those confined areas. (Screws not provided.)



Carlon also realizes that not all construction consists of wood studs.

Some constructions consist of steel studs. That same bracket can be used to attach the brackets to steel studs.

Carlon's 2-Gang Low Voltage Bracket also has mounting holes for 4" square devices, such as fire alarms.



4-Inch Square Device Mounting Holes

Section 4.

Fire-Rated Applications

If your low voltage device will be installed in a fire-rated wall then you need a classified fire resistive enclosure for your device. Per the International Building Code a fire wall is defined as a fire-resistive rated wall having protected openings which restricts the spread of fire and extends continuously from the foundation to or through the roof, with sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall. A firewall is classified with a fire-resistive rating. A fire resistive rating is the period of time a building element, component, or assembly maintains the ability to confine a fire, continues to perform a given structural function, or both. Carlon's closed back boxes are classified for two hour or less fire resistive wall assemblies.

Therefore, a closed back box should be used in these applications. Carlon recommends using our Carlon SuperBlue line of products.





Molded out of specially formulated thermoplastic material, Carlon SuperBlue hard shell wiring boxes are so strong they won't crack or break, even in extreme environments. So rigid, they resist flexing and hold their shape even under the worst conditions. They also offer the largest wirefill capacity in their class, and come with molded-in nailing flanges as well as molded-in cable clamps to make installation faster. All that plus the lightweight, noncorrosive, nonconductive benefits of nonmetallic construction.

New Work

Description	Part No.	Volume in ³
1 Gang	† • BH122A	22.0
2 Gang	• BH235A	34.6
3 Gang	• BH353A	52.0
4 Gang	• BH464A	69.0
Ceiling Box	† BH525A	24.5

- Classified for two hour fire resistive wall assemblies
- † Classified for two hour fire resistive ceiling assemblies

Old Work

Description	Part No.	Volume in ³
1 Gang	BH118R	18.0
2 Gang	BH234R	34.0

Two-Gang Flexible Raceway Box with Adapters

For a complete fire rated system using Resi-Gard, install Carlon's Flexible Raceway Box with Adapters. It is classified for two-hour fire resistive wall assemblies and decreases your installation time by providing molded-in couplings to attach Resi-Gard® Flexible Raceway.



Part No.	Size	Cu. in
• A5329DE	4" x 4" x 1 3/4" (1/2" & 3/4" KO's)	24.75

Section 5.

Varying Finished Wall Thickness

Will this bracket be installed in a location where the wall thickness may increase in the future due to the additions of ceramic tile or wood paneling? Have you ever installed a box or bracket and then 1/2" wood paneling is placed over the drywall? How difficult was it to make that final connection or attach the wall plate to the box?



Did you know that per the 2002 **National Electrical Code (NEC)**, Section 314.20, "In walls or ceilings of concrete, tile, or other noncombustible material, boxes shall be installed so that the front edge of the box will not be set back of the finished surface more than 6 mm (1/4 in.). In walls and ceilings constructed of wood or other combustible surface material, boxes shall be flush with the finished surface or project therefrom."

Carlson's solution to this problem is our Low Voltage Adjustable Brackets.



**1-Gang Adjustable
Low Voltage Bracket
SC100ADJC**

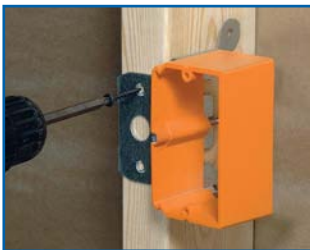


**2-Gang Adjustable
Low Voltage Bracket
SC200ADJC**

And installation is a snap!



To install, simply clip the included bracket onto any stud, the bracket mounts square and secure every time.



Securing the bracket to the stud ensures that the box will not move.

These brackets can be used on both wood and steel studs. For steel stud installation, locate the box on the stud and immediately add a screw (not included) for attachment.

After the paneling, tile, or stucco is installed adjusting the bracket is easy.



Then, by turning the screw clockwise or counter clockwise, you can adjust the box in or out to make it flush with any wall covering

Carlson Adjustable Brackets complement our standard one and two gang backed Adjust-A-Boxes™. These boxes are classified with Underwriters Laboratories Inc. for two-hour or less fire wall assemblies.



1-Gang Adjust-A-Box™
B121ADJ



2-Gang Adjust-A-Box™
B234ADJ

Carlson's Adjust-A-Box™ and Adjustable Low Voltage Brackets are the only electrical box and low voltage bracket product lines that allow you to change your mind.

Because the Adjust-A-Box and Adjustable Low Voltage Bracket can be easily removed, they can be easily upgraded from a 1-gang to a 2-gang box or bracket, which have a knockout clamp.

Section 6.

Dual Voltage Box/Bracket

If you have a typical dual voltage application, then Carlon's New Dual Voltage Box/Bracket will solve your needs.



*2-Gang Dual Voltage Box/Bracket
SC200DV*

Because high voltage wires will be installed in one side, Carlon kept the box our trademarked color, Carlon® Blue™. The high voltage side of the box has a capacity of 20.5 in³ to accommodate your deepest wiring requirements.

The low voltage bracket will be marked with a warning stating it is approved for low voltage devices only.

This box/bracket is listed for use per the 2002 **National Electrical Code**, Section 800.52 (A)(1)(c) Exception No. 1 for dual voltage applications because it has a built-in divider. It is designed to accept a standard NEMA 2-gang wall plate.

Other features include the Resi-Ring for a 3/4" Resi-Gard flexible raceway connection or it can be used to tie off your cables. And the open back on the low voltage bracket allows a generous bend radius for your sensitive structured cables.

Section 7.

Electrical Box “Add-On”

Carlson also has a product for those cases where the installer prefers just to add-on to an existing electrical box. That product from Carlson is our 1-Gang Add-On Low Voltage Bracket.



**1-Gang Add-On
Low Voltage Bracket
SC100SC**

This bracket can be added-on to practically any nonmetallic electrical box, and allows for the installation of most decora style yoke plates.



It's a snap to install!



1. Pull the adhesive tape tab.



2. Clip the Add-On Bracket onto the edge of the electrical box.



3. Press down to secure in place.

The Add-On Bracket has the Resi-Rings for cable or $\frac{3}{4}$ " Resi-Gard flexible raceway attachment and can be used in retrofit applications.

Section 8.

Fire Rated Dual Voltage Boxes

As described in Section 4, certain situations require a fire rated box. For those applications when a divided dual voltage closed back box is needed, such as placement in a fire rated wall, we offer our Carlon® SuperBlue™ 2-, 3-, and 4-Gang and Old Work wiring boxes with a divider that simply slides into place to give you the divided box you need.



*Low Voltage Divider Plate
SCDIV*

The 2002 **National Electrical Code (NEC)**, per section 800.52 (A)(1)(c) Exception No.1, allows electrical conductors to share an outlet box when the conductors and communication cables are separated by a barrier within the box.

Carlon's divider is offered in such a distinctive orange color because upon seeing this divider, inspectors will know immediately that high and low voltage conductors are on opposite sides of the divider and installed in an accepted Carlon box.

Section 9.

Resi-Gard® Flexible Raceway Systems

WHY INSTALL FLEXIBLE RACEWAYS?

How many years ago was just Plain Old Telephone Systems (POTS) the standard for the phone lines? What about Category 3 Cable? How long did Category 4 last? Now what do you install – Category 5? Category 5e? Are some cable companies pushing Category 6? Category 7? What about fiber? Fiber may be a few years away, but it's coming. Carlon's question to you is – **HOW DO YOU KNOW WHAT WILL BE REQUIRED 5 YEARS FROM NOW? 10 YEARS FROM NOW?** How are you protecting your homes against the technology changes of the future? How are you future-proofing your home? Installing bundled cable or CAT5e to every outlet in the house isn't the answer. What are you going to do when CAT5e is substandard? This is the first reason why Flexible Raceways should be installed.

FUTURE PROOFING

Even though you may run cable to each room in the house, changes will occur. Cabling standards will change. Homeowner technology requirements will change. Planning ahead for these changes is easy by installing Flexible Raceway. By installing raceways throughout the house will give you the opportunity to easily remove the outdated cable and replace it with new cable without tearing up the walls.

Even EIA/TIA-570-A states, "Within buildings, consideration should be given to establishing spare pathway capacity for future media additions or modifications that would be difficult or impossible to cable."

PROTECTION

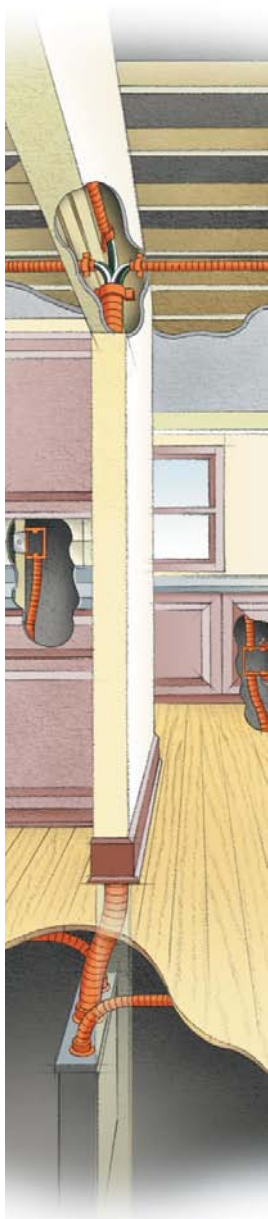
Protection is the second reason why a Flexible Raceway system should be installed. Installing cable takes a lot of time and money. By installing it in Flexible Raceway it's protected against other trades accidentally tampering or damaging it. (Resi-Gard has been tested to UL 2024 as a General Purpose Raceway.)

IDENTIFICATION

Just as Carlon® Blue™ is known synonymously throughout the electrical industry as carrying high voltage conductors, low voltage cabling is commonly associated with the color Orange. Installing your cable in Carlon's orange Resi-Gard Flexible Raceway will let everyone know that low voltage cabling is installed in that raceway.

HOW MUCH FLEXIBLE RACEWAY SHOULD YOU INSTALL?

Just as EIA/TIA-570A defines several Grades of



Residential Cabling, Carlon understands there is not an all-encompassing Resi-Gard solution that covers every home. Carlon answers this question by establishing Levels of Future-Proofing, Protection, and Identification to help you decide.

LEVEL 1 - MINIMUM

At a minimum, Carlon recommends installing 2-inch Resi-Gard Flexible Raceways from the distribution box area into the attic of your home, otherwise known as a vertical "main" chase. This chase creates a pathway inside the wall that allows you to easily distribute future cables. Depending upon the quantity and size of the cabling being installed and the number of distribution panels, more than one chase may be necessary.

LEVEL 2 - MODERATE

Moderate coverage includes a chase from the basement to the attic and one Resi-Gard Flexible Raceway run to every location where you think you may want to upgrade your cable in the future. For example, every room where there is a computer with an Internet connection. Therefore, as technology changes, those cables already have the pathway in place, so they can be easily upgraded. Carlon also offers a line of boxes and brackets that allows Resi-Gard Flexible Raceway to be attached directly to them.



LEVEL 3 – MAXIMUM

Maximum coverage includes a chase(s) and Resi-Gard Flexible Raceway runs to every outlet. This ensures maximum upgrade ability, protection, and identification. It does not matter what low voltage application your outlet will encounter, the pathway will be in place to allow for maximum flexibility.

Level	Description
1 – Minimum	Main Chase(s)
2 – Moderate	Main Chase(s) & 1 Resi-Gard Run to Every Low Voltage Outlet Where You Might Want to Upgrade.
3 - Maximum	Main Chase(s) & 1 Resi-Gard Run to Every Low Voltage Outlet



Installing Resi-Gard Flexible Raceway makes upgrading the home's existing cable easy, and increases the home's value. Future owners will appreciate the ability to add new cables without ripping up walls, digging through floors, and poking through ceilings.

INSTALLING FLEXIBLE RACEWAY

We cannot give specific directions on how to route Resi-Gard through your home because each home is constructed differently. However, we can give generic installation recommendations.

MAIN CHASE

When you run a Resi-Gard Flexible Raceway chase, it's run from the basement or equipment closet to the attic through common interior walls or up through an exterior wall.



From the First Floor

Run the Resi-Gard from the low voltage outlet location, down vertically through the sill plate and into the basement. Then in the basement, run it horizontally to the distribution panel.

From the Second Floor

Install the Resi-Gard from the outlet, through the sill plate and header and vertically down through the first floor wall cavity. Then from the first floor, run it through the first floor sill plate and into the basement. Then in the basement, run the Resi-Gard horizontally to the distribution panel.

Slab Applications

Resi-Gard can also be concrete encased for slab applications.



HOW MUCH DOES LEVEL 3 COVERAGE COST?

The material costs associated with installing a Structured Cable Management System in the average American family home is minimal. Following is a list price material cost calculation per run.

LIST PRICE PRODUCT COSTS:

- 3/4" Resi-Gard \$ 0.58 per ft.
- 3/4" Snap-In Adapter \$ 0.93 ea.
- 2" Resi-Gard \$ 1.50 per ft.
- 2" Male Terminal Adapter \$ 1.02 ea.
- 1-Gang Bracket \$ 1.00 ea.

MATERIAL COST PER OUTLET ASSUMING:

- 1st Floor** Average 32 feet from outlet to panel
- 2nd Floor** Average 44 feet from outlet to panel
- Chase** Average 30 feet main chase to panel

1st Floor

- 3/4" Resi-Gard Raceway (32 ft) \$ 18.56
- 1-Gang Bracket (1) \$ 1.00
- 3/4" Snap-In Adapter (1) \$ 0.93

Total List Price: \$ 20.49 per Outlet
 (Total Number of 1st Floor Outlets x \$ 20.49)

2nd Floor

- 3/4" Resi-Gard Raceway (44 ft) \$ 25.52
- 1-Gang Bracket (1) \$ 1.00
- 3/4" Snap-In Adapter (1) \$ 0.93

Total List Price: \$ 27.45 per Outlet
 (Total Number of 2nd Floor Outlets x \$ 27.45)

Main Chase

- 2" Resi-Gard Raceway (30 ft) \$ 45.00
- 2" Male Terminal Adapter (1) \$ 1.02

Total List Price: \$ 46.02

Level 3 Coverage List Price Cost:

- \$ 46.02** Main Chase
- + \$ 20.01** x Number of First Floor Outlets
- + \$ 27.45** x Number of Second Floor Outlets

RESI-GARD® FLEXIBLE RACEWAY SYSTEM

Carlson's Resi-Gard Flexible Raceway System consists of raceway and fittings. Resi-Gard is available in sizes 3/4", 1", 1 1/4", 1 1/2", and 2" and is supplied with pull tape (except 3/4".) Other tools to aid in the installation are Carlson conduit cutters, Resi-Gard solvent cement, conduit clamps and cable clips. We also have boxes and brackets for every need and application.



And besides the new and innovative boxes and brackets discussed in this Handbook, other great Carlson products that complement the Resi-Gard flexible raceway system are our Floor Boxes, Quick Connect Outlet and Switch Boxes, Flexible Raceway Box with Adapters, and Old Work Brackets to name a few.



General Information About Carlon® Resi-Gard®

FEATURES:

- Resi-Gard is designed to identify, protect, and future-proof residential structured cabling and telecommunications cabling systems.
- Resi-Gard systems are color coded ORANGE to identify structured cabling and telecommunications systems.
- UL Listed, Trade Sizes ($\frac{3}{4}$ " to 2")
- UL recognizes the use of orange Quick-Connect fittings with $\frac{3}{4}$ " and 1" sizes of Resi-Gard. UL recognizes the use of orange PVC cement type fittings with all sizes of Resi-Gard.
- Resi-Gard ambient minimum installation temperature: -4°F.
- Resi-Gard is rated as a general-purpose raceway per **National Electrical Code (NEC)** Article 770, for Optical Fiber Cables and Raceways and Article 800 for Communications Circuits.
- Nonconductive/noncorrosive pliable raceway system
- Packaged in coils
- Complete line of fittings & accessories specifically designed for use with Resi-Gard
- Hand bendable – does not require special tools
- Easy to cut length needed for installation – reduces scrap
- Cables easily pull through the raceway
- Lightweight makes it easy to handle on the job





SECTION 16130 - RESIDENTIAL STRUCTURED CABLING RACEWAYS, BOXES, AND BRACKETS

PART 1. GENERAL

1.1 Related Documents

- A. ANSI/TIA/EIA 570-A
- B. NFPA 70

1.2 Summary

- A. This Section includes raceways, fittings, boxes, and brackets for residential structured cable management.

1.3 Definitions

- A. **Bracket** - orange backless box intended for telecommunications and fiber-optic applications.
- B. **Divider** - orange partition used to separate power from telecommunications/fiber-optic cabling.
- C. **Box/Bracket** - blue two-gang enclosure. One side is a box intended for power applications. One gang is a bracket intended for telecommunications and fiber-optic applications. Both sides are separated by a partition.
- D. **Flexible Raceways** - orange corrugated conduit systems intended for telecommunications and fiber-optic applications.

1.4 Submittals

- A. **Product Data:** Copies of literature or website pages.

1.5 Quality Assurance

- A. UL Listed and labeled by a testing agency acceptable to authorities having jurisdiction. Exception: Cable Clips, Clamps, and Solvent Cement.

1.6 Coordination

- A. Coordinate layout and installation of raceways, boxes, and brackets with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2. PRODUCTS

2.1 Manufacturer(s)

- A. Carlon, Lamson & Sessions • 25701 Science Park Drive
Cleveland, OH 44122 • 1-800-3Carlon (322-7566)
www.carlon.com

2.2 Residential Structured Cabling Raceways, Boxes, and Brackets

- A. **Resi-Gard® Flexible Raceway:** UL Listed, orange, PVC, corrugated, raceways available in 3/4" (SCE4X1C-100), 1" (SCF4X1C-100), 1 1/4" (SCG4X1C-100),

1½" (SCH4X1C-50), and 2" (SCJ4X1C-50) trade sizes. Pull tape pre-installed in 1", 1¼", 1½", and 2" trade sizes.

- B. Fittings for Resi-Gard® Flexible Raceway:** UL Listed, orange, Quick Connect ¾" and 1" Couplings (SCA240E, SCA240F), Threaded Adapters (SCA243E, SCA243F) or Snap-In Adapters (SCA253E, SCA253F) and/or 1¼", 1½", or 2" Male Terminal Adapters (SCE943G, SCE943H, SCE943J), or Standard Couplings (SCE940G, SCE940H, SCE940J).
- C. Nonmetallic Outlet and Device Boxes:** UL Listed Blue Boxes manufactured by Carlon.
- D. Brackets:** UL Listed, orange, Add-On Bracket with (2) ¾" flexible raceway connections (SC100SC), UL Listed, orange, Adjustable Brackets (SC100ADJC, SC200ADJC), or UL Listed, orange Brackets with (2) ¾" flexible raceway connections and (2) pre-installed nails and flange (SC100A, SC200A).
- E. Divider Plate:** UL Listed, orange partition (SCDIV) used with Carlon® SuperBlue™ Boxes (BH235A, BH353A, BH464A, and BH234R).
- F. Dual Voltage Box/Bracket:** UL Listed, blue with (2) ¾" flexible raceway connections and (2) pre-installed nails (SC200DV).
- H. Mud Ring:** UL Listed, orange (SCA410).
- I. Cable Clips:** ¼" (SC14CC), ½" (SC12CC), ¾" (SC34CC) orange clips with pre-installed nails.
- J. Conduit Clamps:** Orange ¾" (SCE977EC), 1" (SCE977FC), 1¼" (SCE977GC), 1½" (SCE977HC), and 2" (SCE977JC) sizes.
- K. Solvent Cement:** Resi-Gard® Solvent Cement (VC9963SC).

PART 3. EXECUTION

3.1 Raceway Application

- A. Indoor Use Only:**
- B. Raceway Fittings:** Compatible with raceways and suitable for use and location.

3.2 Installation

- A.** Keep raceways at least 6 inches (150mm) away from parallel runs of flues and steam or hot-water pipes.
- B.** Do not use Resi-Gard in Air Handling Plenums.
- C.** Maintain separation between power wiring and telecommunications/fiber-optic cabling.
- D.** Use proper solvent cement and adhere to safety precautions.
- E.** Consult Carlon® Structured Cable Management Systems Handbook for more detailed information.

3.3 Protection

- A.** Maintain conditions that ensure products are without damage or deterioration at time of Substantial Completion.

3.4 Cleaning

- A.** After completing installation of exposed, factory-finished raceways, boxes, and brackets, inspect exposed finishes and repair damaged finishes.

Section 10.

Interference and Installation Issues Affecting Structured Cable Management Systems

RESI-GARD® GENERAL PURPOSE RACEWAY

Builders and their homeowners use Structured Cable Management Systems to address their needs for ever increasing levels of capability and convenience in their homes and places of business for electronic devices requiring cable connections for signals and data. Not only are more types of cable needed today, but the pace of technological innovation assures that in the near future one will have to install additional, new and different types of cables to meet growing needs. Carlon Structured Cable Management Systems make it easy to keep up with such changing needs.

Resi-Gard General Purpose Raceways and Accessories are a new system of products from Carlon that is accepted as safe and compliant with building codes for Structured Cable Management Systems. The non-power types of cable that are generally used in Structured Cable Management Systems have special functions to perform. It's a good idea to consider what is needed to be sure the cables and their electronic systems will work well. A condition that the cables can encounter that might affect their operation is Electromagnetic Interference, or EMI.

WHAT IS EMI?

Electromagnetic Interference (EMI) is a potential problem which can affect all kinds of electronic circuits, including cables in raceways. Simply put, EMI is noise in an electronic circuit caused by some other electrical or electronic source.

How does it happen? When electrons move they

generate electric and magnetic fields. These fields in turn can move electrons in nearby conductors, causing an electrical disturbance. EMI occurs when electrical energy causes an undesired response in a piece of electrical equipment.

- **The source can be natural.** It can be caused by lightning or electrostatic discharge.
- **The source can be human-made.** It can be caused by another piece of electrical or electronic equipment.

EMI is any unwanted electrical energy that interferes with the intended operation of a piece of electronic equipment or reception of a signal. EMI is also called electronic noise.

The degree of EMI can vary:

NUISANCE: The microwave oven makes the TV noisy while you are making popcorn.

MODERATE: Static or sounds from another line makes it hard to talk on the phone.

SERIOUS: Voltage spikes on a bank's internal network cause the bank's computers to lose a day's transaction records.

WHAT CAUSES EMI?

EMI can arrive through a direct connection. For example, currents in earth ground wires can cause EMI, where two pieces of equipment have the same ground. Also, a failed component in one piece of equipment anywhere on a shared circuit can cause EMI.

EMI can enter a circuit by radio wave or magnetic field coupling from a nearby electrical device. For example, a power cable or an electric motor close to a data cable can interfere with the signal in a data cable.

WHAT TYPES OF CIRCUITS ARE AFFECTED BY EMI?

Resi-Gard General Purpose Raceway is approved and acceptable for a wide variety of signals.

These include:

- Telephone.
- Audio/Video distribution and Home Theater applications, at speaker level or signal level.
- Cable or Satellite incoming television signals.
- Low voltage (less than 50 volts) DC Remote Control circuits.
- Data lines such as Ethernet, Digital Subscriber Lines or Modem.
- Local Area Networks.
- Security Monitoring or Alarm: signal, control, and continuity loop.
- Home automation.

Many different cable types are commonly used for these signals. Each cable type is well-suited for certain types of signals.

Because signal circuits are vulnerable to EMI, the user has to consider the EMI resistance of the cable type. The cable types below are listed in order of increasing resistance to EMI:

- Single or Multi-conductor wire.
- 300 ohm twin-lead cable; for example, old style television antenna wire.
- **Twisted-pair wire**; for example, telephone wire.
- **Shielded cable**; for example, audio component interconnect cables.
- **Shielded Coaxial cable**; for example, 75 ohm cable television.
- **Shielded twisted-pair**; for example, XLR type microphone cable.
- **Optical fiber**; for example, TOS Link. Optical fiber is immune to EMI.

110-VOLT AC CIRCUITS

Signal circuits installed in Resi-Gard allow the user to run 110-volt AC power circuits in a separate approved raceway and then terminate both circuits in a shared box. Remember however, that such installations must maintain a code-required barrier between the 110-volt AC power circuits and signal circuits. The two circuits

must not be mixed in the same raceway or box without a divider or barrier.

EMI PROBLEM IDENTIFICATION

EMI can cause equipment operation problems from time to time, even when you have properly and carefully installed a Structured Cable Management System. You might discover EMI problems through testing after installation or the equipment users may find problems later. Once an EMI problem has appeared, the best place to start is by defining the problem. This can be done by answering some questions.

- Where does the problem occur?
- What pieces of equipment are affected?
- What are the symptoms, when do they happen, for how long?
- What standards or contracts apply? Is the performance within acceptable limits?
- Is there any defective, old or non-compliant equipment in the area of the affected equipment, or along the path of the Structured Cable Management System?
- Does the affected equipment share any power or signal wiring with some potentially defective, old, or non-compliant equipment?
- Is there any intrinsically noisy equipment, like a large industrial motor nearby?
- Is there any improperly installed or ungrounded cabling within the setup?
- Is the affected equipment unusually sensitive?

WHAT IS THE SOURCE OF THE EMI?

Once you have answered the problem identification questions, the next step is to track down the source of the noise.

- Which circuit or individual piece of equipment is the source of the power behind the noise?
Only something that uses electrical power can produce EMI. You can often develop a “feel” for what type of equipment is making the noise through experience. Hair dryers, fluorescent light fixtures,

cellular phones, food processors, and rotary saws each have their own noise signatures. Become familiar with these and the culprit will be easier to track down.

- Does the EMI happen continuously, at regular intervals or at random? Answering this question helps you to narrow down your search for the source of the EMI to devices that match the time pattern of the noise.
- An easy way to check if you have identified the source correctly is by turning the suspect piece of equipment off and confirming that the EMI stops and that the EMI starts again when the suspect goes back on.
- Devices that are nearby are much more likely to have an impact than those that are farther away. Conduct your search for the source of the EMI starting from the place where you have noticed the problem. Pay special attention to powered devices that are physically close to the equipment that is experiencing the problem or close to the cables leading up to that equipment.
- If the EMI problem has developed over time, or has occurred suddenly in a setup that had been performing acceptably in the past, look for what has changed since the original installation. Has new equipment been added? Have environmental conditions, such as humidity or temperature, changed? Has anything deteriorated as a result of weather or sunlight exposure? Have animals gnawed through the insulation somewhere?

EMI "VICTIMS"

The simpler the piece of equipment involved the less likely it is to be disturbed by EMI. EMI can't do much to an electric clock, but a clock radio can be sensitive. The higher the power of the input signal that a piece of equipment uses, the less likely it is to be disturbed by EMI. The same television will display less "snow" if it is getting a strong signal from a set-top cable box than a weak signal from a rabbit ear antenna.

COUPLING PATHS

The coupling path is the route the EMI takes to get from the source to the victim. Four important coupling paths are:

Conducted Interference: The source and victim are electrically connected by power, signal or ground wires.

Radiated Interference: The source generates electromagnetic waves (usually radio waves) which travel through space and affect the victim. Noisy, powerful electronic sources can be strong generators of electronic interference.

Inductive Interference: The wiring of the source and the victim are close enough together to create coupling due to mutual inductance. Inductive interference is often associated with overlapping loops of wire.

Capacitive Interference: The wiring of the source and the victim are close enough together to create coupling due to mutual capacitance. Capacitive interference is often associated with wires or metal surfaces which are very close, say, less than an inch apart.

EMI TROUBLESHOOTING AND FIXES

At this point in EMI problem solving, have a good idea of where the noise is coming from (source), which piece of equipment is being affected (victim), and what path the noise is traveling to get from source to victim. Now the job is to do something to reduce or eliminate the problem. Trying some of the different approaches listed below and testing the results is a straightforward method of troubleshooting. Trained technicians can use more advanced troubleshooting methods which require special instruments. This may be necessary for particularly troublesome situations.

As is usually the case, it is best to eliminate problems at the source.

The easiest thing to do is to eliminate the source itself. Is it still really required or desired? Can the source be moved farther away, or transferred to a different, separate circuit? Does the source need to be repaired, replaced or fitted with design improvements or

modifications to make it less productive of EMI?

Is the source properly grounded? Is it shielded, that is, surrounded by a metallic enclosure that can block radio waves? If not, can one be added, if so, can it be improved? Can the source be isolated, for instance with an isolation transformer, or with a commercially available power-conditioning device?

Many of the same approaches apply to the victim as well. Can the victim be moved farther away, or transferred to a different, separate circuit? Does the victim need to be repaired, replaced or fitted with design improvements or modifications to make it less vulnerable to EMI? Is the victim properly grounded? Is it shielded? If not, can shielding be added, or if so, can the shield be improved? Can the victim be isolated, with an isolation transformer, or with a commercially available power-conditioning device? Can you replace the wiring with a more EMI resistant type of wire?

Once you have found an effective approach, put the fix into the installation in a permanent way. This is the final step of the process.

FOR FURTHER INFORMATION

Many knowledgeable experts have written on the topic of reducing EMI. Here are some suggested resources:

- Mardiguian, M., EMI Troubleshooting Techniques, McGraw Hill, 1999.
- Ott, H., Noise Reduction Techniques in Electronic Systems, Wiley-Interscience, 1976
- Morrison, R., Grounding and Shielding Techniques in Instrumentation, Third Edition, Wiley-Interscience, 1986
- IEEE Industrial Applications Society, IEEE Guide for the Installation of Electrical Equipment to Minimize Noise Inputs to Controllers from External Sources, IEEE, 1982

Section 11.

Codes and Standards Affecting Installation of Carlon® Structured Cable Management Systems

A). BUILDING CODES AND FIRE SAFETY

As with any building element, the components of structured cable management systems, such as Resi-Gard raceways and accessories must meet the requirements of the local adopted building code as relates to their installation.

A primary issue addressed by building code regulation involves fire safety in particular fire spread. Where non-structural systems including those associated with wiring, HVAC and plumbing systems, the codes address them by insuring that the addition of these systems does not unacceptably reduce the fire performance of an assembly in which they are installed.

FIRES IN BUILDINGS

When early fire growth occurs, a fire that begins within a room will not generally threaten cabling or wiring installed in wall cavities until well after the whole room is involved. There are two types of fires – differentiated by their intensity as relate to fire growth - that occur in buildings and their effects on wire and cable installations are different.

Growth of a fire from a small, innocuous event to one which threatens a room is divided into two regimes or periods:

- (a) The pre-flashover period.
- (b) The post-flashover period.

During a **pre-flashover fire** regime or the pre-flashover period of a fire, the physical boundaries of a room

(walls, floor, doors, windows, etc.) are not threatened. By definition, a pre-flashover fire will be contained within the boundaries of the room of occurrence. Occupants of rooms where such fires occur are usually not at risk and, unless they are confined, can generally reach safety readily in the absence of extremely rapid fire growth. For such fires, the nature of wire and cable installed there are unimportant since the walls are not breached and the quality of the room boundaries are not at issue.

In **post-flashover fires**, the situation is reversed, and barriers and boundaries (walls, doors, floor/ ceilings, etc.) are threatened with destruction due to high temperatures and heat transfer conditions present. To reach this situation, a post-flashover fire must first fully involve the space in which it occurs, before it will spread. Spread, either by convection of flames and hot gases, or by destruction through boundary burn-through or fracture, may then occur. Thus, the post-flashover fire performance of a room is strongly influenced by the integrity of its boundaries. Since maintenance of boundary integrity is important in fire rated buildings, specific construction techniques are used to insure that installations such as those associated with piping, wire and cable and HVAC do not contribute unduly to fire spread and spread of fire related products.

As such wire and cable installations like those associated with Carlon Structured Cable Management Systems must follow certain guidelines – especially when the installations are made in buildings having fire resistive construction features whose integrity must not be altered by the wire or cable installation.

Penetrations – Penetrations take a variety of forms in buildings – floor-to-floor, room to room, within room to an interstitial space, etc. As one can see the number of permutations and combinations possible are large.

It is generally considered that when items such as wire, piping or ducting completely penetrate (i.e. through penetrate) a fire resistive assembly a more critical situation exists than when a single side of an assembly

is penetrated, such as when an electrical box for a termination device or a plumbing drain exists on a single side of a wall. The latter is characterized as a membrane penetration and electrical boxes in ceilings, walls and floors are typical examples.

In all of these cases, the penetrating element should be installed tightly with provisions being made to install smoke and fire stopping materials as needed. Where raceways go from room to room or floor-to-floor – especially out of sight in wall or ceiling cavities – detailing installed is important as without proper detailing a wall or floor ceiling expected to remain intact for intended periods of up to three hours may fail significantly sooner creating unexpected and undesirable life and property safety hazards.

The model codes also address sizes of openings permitted as well as detailing required to insure that penetrations made meet local, adopted criteria. It is important to review local requirements before proceeding with a project so that correct detailing is installed.

Smoke and Draft Stops – Too frequently, when structured cable management components are run, little attention is paid to the way in which they are installed at fire and smoke barriers. While some of these are actual through penetrations (as discussed above) compromising of code mandated smoke barriers – as in attics – leads to unwanted smoke spread in the case of fires. This must be avoided.

Flamespread and Products of Combustion – Occasionally, misinterpretation of the flamespread requirements in the code occurs and an installer may be asked about the flamespread of products such as Resi-Gard raceways and accessories. Because these are not finish materials – materials not used to line rooms – and they are generally not exposed in room areas, their flamespread properties are not generally applied. In fact, there is no convenient way to even measure this variable for any type of raceway!

When Carlon Structured Cable Management Systems' products burn, they, like the wiring they contain and the combustible furnishing in the rooms around which they are installed will produce smoke and other products of combustion. Various tests conducted by combustion toxicologists, third party certifying agencies and testing laboratories conclusively have shown that the materials from which these products are made are in no way unusual in the threat they may pose in a fire situation.

Where specific applications in air handling spaces – such as return air spaces or for risers from floor to floor in fire rated buildings – the guidelines in the **National Electrical Code**, the NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems and the local adopted Mechanical Code must be fully addressed.

B). EIA/TIA INFORMATION

Electronic Industries Association (EIA) and Telecommunication Industry Association (TIA) have developed engineering standards and publications designed to serve the public interest by attempting conformity between manufacturers and consumers, facilitating the interchangeability of products and assisting buyers to meet their particular building needs.

(BICSI) is a telecommunications association. Their target audience is specifiers and users. They have their own standards that are built primarily around other major industry standards.

C). RESI-GARD INSTALLATIONS AND THE NEC

For conductors within buildings the following **NEC** sections, Article 770 (Optical Fiber Cables and Raceways) and Article 800 (Communications Circuits), are relevant in particular when Resi-Gard products are being installed.

Note: All references to the National Electrical Code are based on the 2002 Edition.

Article 770 - Optical Fiber Cables and Raceways

I. GENERAL

770.1 Scope. The provisions of this article apply to the installation of optical fiber cables and raceways. This article does not cover the construction of optical fiber cables and raceways.

770.2 Definitions

Abandoned Optical Fiber Cable. Installed optical fiber cable that is not terminated at equipment other than a connector and not identified for future use with a tag.

Exposed. The circuit is in such a position that, in case of failure of supports and insulation, contact with another circuit may result.

FPN: See Article 100 for two other definitions of Exposed.

Optical Fiber Raceway. A raceway designed for enclosing and routing listed optical fiber cables.

Point of Entrance. The point at which the wire or cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit or an intermediate metal conduit grounded to an electrode in accordance with Section 800.40(B).

770.3 Locations and Other Articles. Circuits and equipment shall comply with (A) and (B). Only those sections of Article 300 referenced in this article shall apply to optical fiber cables and raceways.

(A) Spread of Fire or Products of Combustion. The requirements of 300.21 for electrical installations shall also apply to installations of optical fiber cable cables and raceways. The accessible portion of abandoned optical fiber cables shall not be permitted to remain.

(B) Ducts, Plenums, and Other Air-Handling Spaces. Section 300.22, where installed in ducts or plenums or other space used for environmental air.

Exception: As permitted in Section 770.53(A).

770.4 Optical Fiber Cables. Optical fiber cables transmit light for control, signaling, and communications through an optical fiber.

770.5 Types. Optical fiber cables can be grouped into three types.

- (A) **Nonconductive.** These cables contain no metallic members and no other electrically conductive materials.
- (B) **Conductive.** These cables contain noncurrent-carrying conductive members such as metallic strength members, metallic vapor barriers, and metallic armor or sheath.
- (C) **Composite.** These cables contain optical fibers and current-carrying electrical conductors, and shall be permitted to contain noncurrent-carrying conductive members such as metallic strength members and metallic vapor barriers. Composite optical fiber cables shall be classified as electrical cables in accordance with the type of electrical conductors.

770.6 Raceways for Optical Fiber Cables. The raceway shall be of a type permitted in Chapter 3 and installed in accordance with Chapter 3.

Exception: Listed nonmetallic optical fiber raceway identified as general purpose, riser, or plenum optical fiber raceway in accordance with Section 770.51 and installed in accordance with Sections 362.24 through 362.56, where the requirements applicable to electrical nonmetallic tubing shall apply. Unlisted underground or outside plant construction plastic innerduct shall be terminated at the point of entrance.

FPN: For information on listing requirements for optical fiber raceways, see Standard for Optical Fiber Raceways, UL 2024.

Where optical fiber cables are installed within the 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 shall apply.

III. CABLES WITHIN BUILDINGS

770.49 Fire Resistance of Optical Fiber Cables.

Optical fiber cables installed as wiring within buildings shall be listed as being resistant to the spread of fire in accordance with Sections 770.50 and 770.51.

770.51 Listing Requirements for Optical Fiber Cables and Raceways. Optical fiber cables shall be listed in accordance with 770.51(A) through 770.51(D), and optical fiber raceways shall be listed in accordance with 770.51(E) through (G).

(A) Types OFNP and OFCP. Types OFNP and OFCP nonconductive and conductive optical fiber plenum cables shall be listed as being suitable for use in ducts, plenums, and other space used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

FPN: One method of defining low smoke-producing cables is by establishing an acceptable value of the smoke produced when tested in accordance with NFPA 262-1999, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces, to a maximum peak optical density of 0.5 and a maximum average optical density of 0.15. Similarly, one method of defining fire-resistant cables is by defining maximum allowable flame travel distance of 1.52 m (5 ft) when tested in accordance with the same test.

(B) Types OFNR and OFCR. Types OFNR and OFCR nonconductive and conductive optical fiber riser cables shall be listed as being suitable for use in a vertical run in a shaft or from floor to floor and shall also be listed as having 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 cables pass the requirements of the ANSI/UL 1666-1997 Standard Test for Flame Propagation Height of Electrical and Optical-Fiber Cable Installed Vertically in Shafts.

(C) Types OFNG and OFCG. Types OFNG and OFCG nonconductive and conductive general-purpose optical

fiber cables shall be listed as being suitable for general-purpose use, with the exception of risers and plenums, and shall also be listed as being resistant to the spread of fire.

FPN: One method of defining resistance to the spread of fire is for the damage (char length) not to exceed 1.5m (4 ft 11 in) when performing the vertical flame test — cables in cable trays, as described in Test Methods for Electrical Wires and Cables, CSA C22.2 No. 0.3-M 1985.

(D) Types OFN and OFC. Types OFN and OFC non-conductive and conductive optical fiber cables shall be listed as being suitable for general-purpose use, with the exception of risers, plenums, and other space used for environmental air, 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 cables do not spread fire to the top of the tray in the vertical-tray flame test in the Reference ANSI/UL 1581-1991, Standard for Electrical Wires, Cables and Flexible Cords.

Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in) when performing the vertical flame test – cables in cable trays, as described in CSA C22.2 No. 0.3-M-1985 Test Methods for Electrical Wires and Cables.

(E) Plenum Optical Fiber Raceway. Plenum optical fiber raceways shall be listed as having adequate fire-resistant and low smoke-producing characteristics.

(F) Riser Optical Fiber Raceway. Riser optical fiber raceways shall be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.

(G) General-Purpose Optical Fiber Cable Raceway. General-purpose optical fiber cable raceway shall be listed as being resistant to the spread of fire.

770.53 Applications of Listed Optical Fiber Cables and Raceways. Nonconductive and conductive optical fiber cables shall comply with any of the requirements given in 770.53(A) through (E) or where cable substitutions are made as shown in 770.53(F).

(A) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type OFNP or OFCP. Abandoned cables shall not be permitted to remain. Types OFNR, OFCR, OFNG, OFN, OFCG, and OFC cables

installed in compliance with 300.22 shall be permitted. Listed plenum optical fiber 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 Types OFNP and OFCP cables shall be permitted to be installed in these raceways.

(B) Riser. Cables installed in risers shall be described in any of the following:

- (1) Cables installed in vertical runs and penetrating more than one floor, or cables installed in vertical runs in a shaft, shall be Type OFNR or OFCR. Floor penetrations requiring Types OFNR or OFCR shall contain only cables suitable for riser or plenum use. Abandoned cables shall not be permitted to remain. Listed riser optical fiber raceways shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Types OFNP, OFCP, OFNR and OFCR cables shall be permitted to be installed in these raceways.
- (2) Types OFNG, OFN, OFCG, and OFC cables shall be permitted to be encased in a metal raceway or located in a fireproof shaft having firestops at each floor.
- (3) Types OFNG, OFN, OFCG, and OFC cables shall be permitted in one- and two-family dwellings.

FPN: See 300.21 for firestop requirements for floor penetrations.

(C) Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in 770.53(A) and (B) shall be Type OFNG, OFN, OFCG, or OFC. Such cables shall be permitted to be installed in listed general-purpose optical fiber raceways.

(D) Hazardous (Classified) Locations. Cables installed in hazardous (classified) locations shall be any type indicated in Table 770.53.

(E) Cable Trays. Optical fiber cables of the types listed in Table 770.50 shall be permitted to be installed in cable trays.

FPN: It is not the intent to require that these optical fiber cables be listed specifically for use in cable trays.

(F) Cable Substitutions. The substitutions for optical fiber cables listed in Table 770.53 shall be permitted.

Table 770.53 Cable Substitutions

Cable Type	Permitted Substitutions
OFNP	None
OFCP	OFNP
OFNR	OFNP
OFCR	OFNP, OFCP, OFNR
OFNG, OFN	OFNP, OFNR
OFCCG, OFC	OFNP, OFCP, OFNR, OFCR, OFNG, OFN

Article 800 - Communications Circuits

I. GENERAL

800.1 Scope. This article covers telephone, telegraph (except radio), outside wiring for fire alarm and burglar alarm, and similar central station systems; and telephone systems not connected to a central station system but using similar types of equipment, methods of installation, and maintenance.

FPN No. 1: For further information for fire alarm, guard tour, sprinkler water flow, and sprinkler supervisory systems, see Article 760.

FPN No. 2: For installation requirements of optical fiber cables, see Article 770.

FPN No. 3: For installation requirements for network-powered broadband communications circuits, see Article 830.

800.2 Definitions

...**Abandoned Communications Cable.** Installed communications cable that is not terminated at both ends at a connector or other equipment and not identified for future use with a tag.

...**Exposed.** A circuit that is in such a position that, in case of failure of supports and insulation, contact with another circuit may result.

FPN: See Article 100 for two other definitions of Exposed.

V. COMMUNICATIONS WIRES AND CABLES WITHIN BUILDINGS

800.48 Raceways for Communications Wires

and Cables. Where communications wire and 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 800.51(J), (K), or (L), as applicable, and installed in accordance with 362.24 through 362.56, where the requirements applicable to electrical non-metallic tubing apply.

Exception: Conduit fill restrictions shall not apply.

800.49 Fire Resistance of Communications

Wires and Cables. Communications wires and cables installed as wiring within a building shall be listed as being resistant to the spread of fire in accordance with Sections 800.50 and 800.51.

800.50 Listing, Marking, and Installation of Communications Wires and Cables.

Communications wires and cables installed as wiring within buildings shall be listed as being suitable for the purpose and installed in accordance with Section 800.52. Communications cables and under-carpet communications wires shall be marked in accordance with Table 800.50. The cable voltage rating shall not be marked on the cable or on the under-carpet communications wire.

FPN: Voltage markings on cables may be misinterpreted to suggest that the cables may be suitable for Class 1, electric light, and power applications.

Exception No. 1: Voltage markings shall be permitted where the cable has multiple listings and voltage marking is required for one or more of the listings.

Exception No. 2: Listing and marking shall not be required where the cable enters the building from the outside and is continuously enclosed in a rigid metal conduit system or an intermediate metal conduit system and such conduit systems are grounded to an electrode in accordance with Section 800.40(B).

Exception No. 3: Listing and marking shall not be required where the length of the cable within the building, measured from its point of entrance, does not exceed 15 m (50 ft) and the cable enters the building from the outside and is terminated in an

enclosure or on a listed primary protector.

FPN No. 1: Splice cases or terminal boxes, both metallic and plastic types, are typically used as enclosures for splicing or terminating telephone cables.

FPN No. 2: This exception limits the length of unlisted outside plant cable to 15 m (50 ft), while Section 800.30(B) requires that the primary protector shall be located as close as practicable to the point at which the cable enters the building. Therefore, in installations requiring a primary protector, the outside plant cable may not be permitted to extend 15 m (50 ft) into the building if it is practicable to place the primary protector closer than 15 m (50 ft) to the entrance point.

Exception No. 4: Multipurpose cables shall be considered as being suitable for the purpose and shall be permitted to substitute for communications cables as provided for in Section 800.53(G).

Table 800.50 Cable Markings

Cable Marking	Type	Reference
MPP	Multipurpose plenum cable	800-51(g) and 800-53(a)
CMP	Communications plenum cable	800-51(a) and 800-53(a)
MPR	Multipurpose riser cable	800-51(g) and 800-53(b)
CMR	Communications riser cable	800-51(b) and 800-53(b)
MPG	Multipurpose general-purpose cable	800-51(g) and 800-53(d)
CMG	Communications general-purpose cable	800-51(c) and 800-53(d)
MP	Multipurpose general-purpose cable	800-51(g) and 800-53(d)
CM	Communications general-purpose cable	800-51(d) and 800-53(d)
CMX	Communications cable, limited use	800-51(e) and 800-53(d), <i>Exception Nos. 1, 2, 3, and 4</i>
CMUC	Under-carpet communications wire/cable	800-51(f) and 800-53(d) <i>Exception No. 5</i>

FPN No. 1: Cable types are listed in descending order of fire resistance rating, and multipurpose cables are listed above communications cables because multipurpose cables may substitute for communications cables.

FPN No. 2: See the referenced sections for permitted uses.

800.51 Listing Requirements for Communications Wires and Cables and Communications Raceways.

Communications wires and cables shall have a voltage rating of not less than 300 volts and shall be listed in accordance with 800.51(A) through (J), and communications raceways shall be listed in accordance with 800.51(K) through (L). Conductors in communications cables, other than in a coaxial cable, shall be copper.

FPN: See Section 800.4 for listing requirement for equipment.

(A) Type CMP. Type CMP communications plenum cable shall be listed as being suitable 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 low smoke-producing cables is by establishing an acceptable value of the smoke produced when tested in accordance with the NFPA 262-1999 Standard Method of Test for Fire and Smoke Characteristics of Wires and Cables, to a maximum peak optical density of 0.5 and a maximum average optical density of 0.15. Similarly, one method of defining fire-resistant cables is by establishing a maximum allowable flame travel distance of 1.52 m (5 ft) when tested in accordance with the same test.

(B) Type CMR. Type CMR communications riser cable shall be listed as being suitable for use in a vertical run in a shaft or from floor to floor and shall also be listed as having 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 cables pass the requirements of the ANSI/UL 1666-1997 Standard Test for Flame Propagation Height of Electrical and

Optical-Fiber Cable Installed Vertically in Shafts.

(C) Type CMG. Type CMG general-purpose communications cable shall be listed as being suitable for general-purpose communications use, with the exception of risers and plenums, 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 for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the vertical flame test — cables in cable trays, as described in CSA C22.2 No. 0.3-M 1985 Test Methods for Electrical Wires and Cables.

(D) Type CM. Type CM communications cable shall be listed as being suitable for general-purpose communications use, with the exception of risers and plenums, 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 cables do not spread fire to the top of the tray in the vertical-tray flame test in ANSI/UL 1581-1991 Reference Standard for Electrical Wires, Cables and Flexible Cords. Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the vertical flame test — cables in cable trays, as described in CSA C22.2 No. 0.3-M-1985 Test Methods for Electrical Wires and Cables.

(E) Type CMX. Type CMX limited use communications cable shall be listed as being suitable for use in dwellings and for use in raceway and shall also be listed as being resistant to flame spread.

FPN: One method of determining that cable is resistant to flame spread is by testing the cable to the VW-1 (vertical-wire) flame test in ANSI/UL 1581-1991 Reference Standard for Electrical Wires, Cables and Flexible Cords.

(F) Type CMUC Under-Carpet Wire and Cable. Type CMUC under-carpet communications wire and cable shall be listed as being suitable for under-carpet use and shall also be listed as being resistant to flame spread.

FPN: One method of determining that cable is resistant to flame spread is by testing the cable to the VW-1 (vertical-wire) flame test in ANSIIUL 1581-1991 Reference Standard for Electrical Wires, Cables and Flexible Cords.

(G) Multipurpose (MP) Cables. Cables that meet the requirements for Types CMP, CMR, CMG, and CM and also satisfy the requirements of Section 760.71(B) for multiconductor cables and Section 760.71(H) for coaxial cables shall be permitted to be listed and marked as multipurpose cable Types MPP, MPR, MPG, and MP, respectively.

(H) Communications Wires. Communications wires, such as distributing frame wire and jumper wire, 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 cables do not spread fire to the top of the tray in the vertical-tray flame test in ANSIIUL 1581-1991 Reference Standard for Electrical Wires, Cables and Flexible Cords.

Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the vertical flame test – cables in cable trays, as described in CSA C22.2 No. 0.3-M-1985 Test Methods for Electrical Wires and Cables.

(I) Hybrid Power and Communications Cable.

Listed hybrid power and communications cable shall be permitted where the power cable is a listed Type NM or NM-B conforming to the provisions of Article 334, and the communications cable is a listed Type CM, and the jackets on the listed NM or NM-B and listed CM cables are rated for 600 volts minimum, and the hybrid cable is listed as being resistant to the spread of fire.

FPN: One method of defining resistant to the spread of fire is that the cables do not spread fire to the top of the tray in the vertical-tray flame test in ANSIIUL 1581-1991 Reference Standard for Electrical Wires, Cables and Flexible Cords.

Another method of defining resistant to the spread of fire is for the damage (char length) not to exceed 1.5 m (4 ft 11 in.) when performing the vertical flame

test — cables in cable trays, as described in CSA C22.2 No. 0.3-M-1985 Test Methods for Electrical Wires and Cables.

(J) Plenum Communications Raceways. Plenum communications 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.

(K) Riser Communications Raceway. Riser communications raceways shall be listed as having adequate fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.

(L) General-Purpose Communications Raceway. General-purpose communications raceways shall be listed as being resistant to the spread of fire.

800.52 Installation of Communications Wires, Cables, and Equipment. Communications wires and cables from the protector to the equipment or, where no protector is required, communications wires and cables attached to the outside or inside of the building shall comply with 800.52(A) through (E).

(A) Separation from Other Conductors.

(1) In Raceways, Boxes, and Cables.

- (a) Other Power-Limited Circuits. Communications cables shall be permitted in the same raceway or enclosure with cables of any of the following:
 - (1) Class 2 and Class 3 remote-control, signaling, and power-limited circuits in compliance with Article 725
 - (2) Power-limited fire alarm systems in compliance with Article 760
 - (3) Nonconductive and conductive optical fiber cables in compliance with Article 770
 - (4) Community antenna television and radio distribution systems in compliance with Article 820
 - (5) Low power network-powered broadband communications circuits in compliance with Article 830

- (b) Class 2 and Class 3 Circuits. Class 1 circuits shall not be run in the same cable with communications circuits. Class 2 and Class 3 circuit conductors shall be permitted in the same cable with communications circuits, in which case the Class 2 and Class 3 circuits shall be classified as communications circuits and shall meet the requirements of this article. The cables shall be listed as communications cables or multipurpose cables.

Exception: Cables constructed of individually listed Class 2, Class 3, and communications cables under a common jacket shall not be required to be classified as communications cable. The fire-resistance rating of the composite cable shall be determined by the performance of the composite cable.

- (c) Electric Light, Power, Class 1, Nonpower-Limited Fire Alarm, and Medium Power Network-Powered Broadband Communications Circuits.

- (1) In Raceways, Compartments, and Boxes. Communications conductors shall not be placed in any raceway, compartment, outlet box, junction box, or similar fitting with conductors of electric light, power, Class 1, nonpower-limited fire alarm or medium power network-powered broadband communications circuits.

Exception No. 1: Where all of the conductors of electric light, power, Class 1, nonpower-limited fire alarm, and medium power network-powered broadband communications circuits are separated from all of the conductors of communications circuits by a barrier.

Exception No. 2: Power conductors in outlet boxes, junction boxes, or similar fittings or compartments where such conductors are introduced solely for power supply to communications equipment. The power circuit conductors shall be routed within the enclosure to maintain a minimum of 0.25-in. (6.35-mm) separation from the communications circuit conductors.

Exception No. 3: As permitted by 620.36.

(2) Other Applications. Communications wires and cables shall be separated at least 50 mm (2 in.) from conductors of any electric light, power, Class 1, nonpower-limited fire alarm, or medium power network-powered broadband communications circuits.

Exception No. 1: Where either (1) all of the conductors of the electric light, power, Class 1, nonpower-limited fire alarm, and medium power network-powered broadband communications circuits are in a raceway or in metal-sheathed, metal-clad, nonmetallic-sheathed, Type AC, or Type UF cables, or (2) all of the conductors of communications circuits are encased in raceway.

Exception No. 2: Where the communications wires and cables are permanently separated from the conductors of electric light, power, Class 1, nonpower-limited fire alarm, and medium power network-powered broadband communications circuits by a continuous and firmly fixed nonconductor, such as porcelain tubes or flexible tubing, in addition to the insulation on the wire.

(B) Spread of Fire or Products of Combustion.

Installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion is not substantially increased. Openings around penetrations through fire resistance-rated walls, partitions, floors, or ceilings shall be firestopped using approved methods to maintain the fire resistance rating.

The accessible portion of abandoned communications cables shall not be permitted to remain.

FPN: Directories of electrical construction materials published by qualified testing laboratories contain many listing installation restrictions necessary to maintain the fire resistive rating of assemblies where penetrations or openings are made.

(C) Equipment in Other Space Used for Environmental Air. Section 300.22(C) shall apply.

(D) Cable Trays. Types MPP, MPR, MPG, and MP multi-purpose cables and Types CMP, CMR, CMG, and CM communications cables shall be permitted to be

installed in cable trays.

(E) Support of Conductors. Raceways shall be used for their intended purpose. Communications cables or wires shall not be strapped, taped, or attached by any means to the exterior of any conduit or raceway as a means of support.

Exception: Overhead (aerial) spans of communications cables or wires shall be permitted to be attached to the exterior of a raceway-type mast intended for the attachment and support of such conductors.

800.53 Applications of Listed Communications Wires and Cables and Communications

Raceways. Communications wires and cables shall comply with the requirements of 800.53(A) through (F) or where cable substitutions are made in accordance with 800.53(G).

(A) Plenum. Cables installed in ducts, plenums, and other spaces used for environmental air shall be Type CMP. Abandoned cables shall not be permitted to remain. Types CMP, CMR, CMG, CM, and CMX and communications wire installed in compliance with 300.22 shall be permitted. Listed plenum communications 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 CMP cable shall be permitted to be installed in these raceways.

(B) Riser. Cables installed in risers shall comply with 800.53(B)(1), (B)(2), or (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 CMR. Floor penetrations requiring Type CMR shall contain only cables suitable for riser or plenum use. Abandoned cables shall not be permitted to remain. Listed riser communications raceways shall be permitted to be installed in vertical riser runs in a shaft from floor to floor. Only Type CMR and CMP cables shall be permitted to be installed in these raceways.

(2) Metal Raceways or Fireproof Shafts. Listed communications cables shall be encased in a metal raceway or located in a fireproof shaft having firestops at each floor.

(3) One- and Two-Family Dwellings. Type CM and CMX cable shall be permitted in one- and two-family dwellings.

FPN: See 800.52(B) for firestop requirements for floor penetrations.

(C) Distributing Frames and Cross-Connect Arrays. Listed communications wire and Types CMP, CMR, CMG, and CM communications cables shall be used in distributing frames and cross-connect arrays.

(D) Cable Trays. Types MPP, MPR, MPG, and MP multi-purpose cables and Types CMP, CMR, CMG, and CM communications cables shall be permitted to be installed in cable trays.

(E) Other Wiring Within Buildings. Cables installed in building locations other than the locations covered in 800.53(A) through (D) shall be in accordance with 800.53(E)(1) through (E)(6).

(1) General. Cables shall be Type CMG or Type CM.

Listed communications general-purpose raceways shall be permitted. Only Types CMG, CM, CMR, or CMP cables shall be permitted to be installed in general-purpose communications raceways.

(2) In Raceways. Listed communications wires that are enclosed in a raceway of a type included in Chapter 3 shall be permitted.

(3) Nonconcealed Spaces. Type CMX communications cable shall be permitted to be installed in nonconcealed spaces wherever the exposed length of cable does not exceed 3 m (10 ft).

(4) One- and Two-Family Dwellings. Type CMX communications cable less than 6 mm (0.25 in) in diameter shall be permitted to be installed in one- and two-family dwellings.

(5) Multi-Family Dwellings. Type CMX communications cable less than 6 mm (0.25 in) in diameter shall be permitted to be installed in nonconcealed spaces in multi-family dwellings.

(6) **Under Carpets.** Type CMUC under carpet communications wires and cables shall be permitted to be installed under carpet.

(F) **Hybrid Power and Communications Cable.** Hybrid power and communications cable listed in accordance with 800.51(J) shall be permitted to be installed in one-and two-family dwellings.

(G) **Cable Substitutions.** The uses and permitted substitutions for communications cables listed in Table 800.53 shall be considered suitable for the purpose and shall be permitted.

FPN: For information on Types CMP, CMR, CMG, CM, and CMX cables, see 800.51

Table 800.53 Cable Uses and Permitted Substitutions

Cable Type	Use	References	Permitted Substitutions
CMP	Communications plenum cable	800-53(a)	MPP
CMR	Communications riser cable	800-53(b)	MPP, CMP, MPR
CMG, CM	Communications general-purpose cable	800-53(d)	MPP, CMP, MPR, CMR, MPG, MP
CMX	Communications cable, limited use	800-53(d)	MPP, CMP, MPR, CMR, MPG, MP, CMG, CM

Note: See Figure 800.53, Cable substitution hierarchy.

D) HIGH AND LOW/NO VOLTAGE COMBINATIONS.

TIA/EIA 570-A 8.1.5.1. states that when “telecommunications cable containing metallic elements (e.g., UTP, coaxial cable) is placed alongside unshielded electrical power conductors inside wall space or ceiling space, it shall have a minimum separation of 50.4 mm (2 in.) from power wire.” This section also states “Separation of telecommunications cable with respect to electrical power conductors shall meet applicable electrical codes.”

The **National Electrical Code (NEC)**, Article 800.52(A)(1)(c) Exception 1 allows high voltage (power conductors) and low voltage (telecommunications) cables be placed in raceways, compartments, and boxes, as long as the two types of circuits are separated by a barrier.

While the **NEC** may seem inconsistent with the requirements of TIA/EIA 8.1.5.1., it is expected that the **NEC** take precedence since it is an adopted code.

Section 12.

Abandoned Cables

The 2002 National Electrical Code (NEC) took the first steps in addressing the issue of removing abandoned cables for air handling spaces. Cables abandoned and left in the plenums becomes a safety hazard to the occupants of a building in case of a fire by adding to the fuel source in the plenum.

Cables approved for the Plenum have been evaluated for a maximum peak optical density, a maximum average optical density, and a maximum flame spread per UL 910 (NFPA 262) "Test for Flame-Propagation and Smoke-Density Values for Electrical and Optical-Fiber Cables Used in Spaces Transporting Environmental Air." These cables are listed for use within a plenum without being enclosed in a metal raceway system as described in Sections 300.22(B) and (C) of the National Electrical Code (NEC).

A series of proposals were submitted to the National Fire Protection Association (NFPA) to revise the 1999 NEC for Articles 300, 640, 645, 725, 760, 770, 800, 820, and 830 to require all abandoned cables to be removed from the plenum.

Only Code Making Panel 3, who oversees Article 300 of the NEC, rejected this proposal with the following substantiation:

"The submitter's own substantiation states there is no indication that the additional cables in plenums caused an added fire hazard and that the fire record of cables in plenums is excellent. Requiring abandoned cables to be removed that are not intended for future use would be almost impossible to enforce. Many cables are installed for future use and cables are often swapped at patch panels to provide a very effective method of moving a computer or a piece of telecommunications equipment without having to pull a new cable."

The other panels did not agree with Panel 3 and have adopted language to require abandoned cables to be removed. Section 90.3, Code Arrangements, allows Chapters 5, 6 and 7 to supplement or modify the general rules found in Chapters 1 through 4 for particular conditions. Chapter 8 covers communications systems and is not subject to the rules of Chapter 1 through 7 except where the requirements are specifically referenced in Chapter 8.

Each Article adopted a definition of abandoned cables, and the rule for removal. For example, Article 770, Optical Fiber Cables and Raceways, added the following definition to 770.2 Definitions:

Abandoned Optical Fiber Cable. Installed optical fiber cable that is not terminated at equipment other than a connector and not identified for future use with a tag.

The rule was added to 770.3(A):

(A) Spread of Fire or Products of Combustion. The requirements of 300.21 for electrical installations shall also apply to installations of optical fiber cables and raceways. The accessible portion of abandoned optical fiber cable cables shall not be permitted to remain. Several organizations such as BICSI, TIA and NECA are working on designing a "Tag" that would be acceptable for identifying a cable intended for future use.

Article 645 for Information Technology Equipment, indicates that all abandoned cables installed under raised floors shall not be permitted to remain unless contained in metal raceways. A "Tag" indicating future use for abandoned cables will not be considered an option to allow these cables to remain.

Architects, designers, engineers and contractors will need to take the abandoned cable rule into account when designing new buildings and retrofitting older buildings. The easiest way to remove and/or replace a cable is to have it installed in a raceway.

Each of these articles defines the raceways acceptable for use in a Plenum. Those raceways defined in Section 300.22, which consists of metal raceways, are permitted to be used with each of these cable installations. Section 645.5(D)(2) expands the types of raceways per-

mitted and allows nonmetallic raceways such as Electrical Nonmetallic Tubing (ENT), Rigid Nonmetallic Conduit (RNC), nonmetallic Wireway and nonmetallic Surface Raceway to be used under a raised floor for information technology equipment.

Articles 770 and 800 recognize listed nonmetallic raceways for use in a plenum. These listed raceways are classified under Optical Fiber/Communications Cable Raceway (QAZM) in the Electrical Construction Equipment Directory published by Underwriters Laboratories Inc.

Nonmetallic plenum raceways are suitable for use in ducts, plenums or other spaces used for environmental air as described in Section 300.22. These raceways are permitted to be used with Types OFNP and OFCP nonconductive and conductive optical fiber plenum cables as described in Section 770.53(A) and Type CMP communications plenum cable as described in Section 800.53.

Nonmetallic plenum rated raceways have the same fire-resistant and low smoke-producing characteristics as the plenum rated cables. These raceways exhibit a maximum peak optical density of 0.5, a maximum average optical density of 0.15, and a maximum flame spread distance of 5 feet when tested in accordance with UL standard UL2024, *Optical Fiber Cable Raceway*.

The 2002 National Electrical Code (NEC) took the first steps in addressing the issue of removing abandoned cables for air handling spaces. Cables abandoned and left in the plenums becomes a safety hazard to the occupants of a building in case of fire by adding to the fuel source in the plenum.

Raceways are the solution to the abandoned cable issue. A building designed or retrofitted with raceways will easily allow the building to be code compliant and up to date with technology as technology continues to grow and obsoletes current optical fiber and communications cabling methods.

Section 13.

Carlson Structured Cable Management Systems

Resi-Gard® Flexible Raceway (3/4" to 2")



Ideal for providing a main chase from the main distribution panel to a secondary hub in the attic or basement, Resi-Gard nonmetallic flexible raceway is available in 3/4" to 2" diameter sizes with factory installed pull tape in sizes 1" to 2". The raceway is hand bendable, lightweight and easily cut to length to reduce scrap. Bright orange color clearly signifies a low voltage installation.

Standard Length Coils

Size	Pull Tape	Part No.	Coil Length	Prod. Wt. Coil (lbs.)
3/4"	Empty	SCE4X1-100	100	11.5
1"	900 lbs.	SCF4X1C-100	100	17.9
1 1/4"	900 lbs.	SCG4X1C-100	100	21.5
1 1/2"	900 lbs.	SCH4X1C-50	50	11.2
2"	900 lbs.	SCJ4X1C-50	50	13.4

Made To Order Length Reels

Size	Pull Tape	Part No.	Coil Length	Prod. Wt. Coil (lbs.)
3/4"	Empty	SCE4X1-1000	1000	115.0
1"	900 lbs.	SCF4X1C-1500	1500	268.5
2"	900 lbs.	SCJ4X1C-500	500	133.5

Resi-Gard® Fittings

A complete line of Carlon one-piece quick connect couplings, threaded adapters, and snap-in terminator adapters are available for quick, easy professional installation of Resi-Gard Flexible Raceway.



Quick Connect Coupling

Part No.	Size	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
SCA240E	3/4"	25	.783
SCA240F	1"	20	.972



Quick Connect Threaded Adapter

Part No.	Size	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
SCA243E	3/4"	25	.633
SCA243F	1"	20	.778



Quick Connect Snap-In Adapter

Part No.	Size	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
SCA253E	3/4"	25	.783
SCA253F	1"	20	.918



Male Terminal Adapter*

Part No.	Size	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
SCE943G	1 1/4"	50	3
SCE943H	1 1/2"	25	2.5
SCE943J	2"	50	6.8



Standard Couplings*

Part No.	Size	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
SCE940G	1 1/4"	30	3.5
SCE940H	1 1/2"	25	3.9
SCE940J	2"	30	5.2

* Must be cemented to Resi-Gard® Flexible Raceway using ONLY Resi-Gard Solvent Cement



PVC Lock Nut

Part No.	Size	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
LT9LE	3/4"	700	4
LT9LF	1"	600	4

Structured Cabling Boxes and Brackets

Carlson's new and innovative family of Structured Cabling Boxes and Brackets for all your installation requirements.



Dual Voltage Box/Bracket

Part No.	Size	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
SC200DV	1-Gang	16	6.4

* U.S. Patent D463,376



* Allows for the installation of most decora style yoke plates

Low Voltage Add-On Bracket

Part No.	Size	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
SC100SC	1-Gang	24	2.3

* U.S. Patent D459,312



SC100ADJC



Low Voltage Adjustable Brackets

Part No.	Size	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
SC100ADJC	1-Gang	24	7.5
SC200ADJC	2-Gang	20	6.9

Structured Cabling Boxes and Brackets



SC100A

Low Voltage Brackets

Part No.	Size	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
SC100A	1-Gang	24	5.3
SC200A	2-Gang	24	7.7

* U.S. Patent D457,140
D462,664



Low Voltage Divider Plate

Part No.	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
SCDIV	50	2.2

For use with Carlon® SuperBlue™ boxes



Mud Ring (4" sq. 1/2" Raised Cover)

Part No.	Size	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
SCA410	1-Gang	20	1.54

Cable Clips

Carlson's cable clips with pre-installed nails provide fast and easy installation for either a single cable, 2-3 cables, or 1 bundled cable.



SC34CC



SC12CC



SC14CC

Size	Part No.	Std. Order Qty.	Std. Ctn. Wt. (lbs.)	Std. Ctn. Qty.
1/4"	SC14CC	1 ea. (Equals one bag of 100 Clips)	2.23	10 Bags of 100
1/2"	SC12CC	1 ea. (Equals one bag of 25 Clips)	2.31	10 Bags of 25
3/4"	SC34CC	1 ea. (Equals one bag of 10 Clips)	2.96	20 Bags of 10

Conduit Clamps



Carlon's orange conduit clamps are designed specifically for the installation of Resi-Gard.

Size	Part No.	Std. Order Qty.	Std. Ctn. Wt. (lbs.)	Std. Ctn. Qty.
3/4"	SCE977EC	1 ea. (Equals one bag of 5 Clamps)	1.5	20 Bags of 5
1"	SCE977FC	1 ea. (Equals one bag of 5 Clamps)	1.3	12 Bags of 5
1 1/4"	SCE977GC	1 ea. (Equals one bag of 5 Clamps)	1.1	8 Bags of 5
1 1/2"	SCE977HC	1 ea. (Equals one bag of 5 Clamps)	1.0	6 Bags of 5
2"	SCE977JC	1 ea. (Equals one bag of 5 Clamps)	1.5	6 Bags of 5

NOTE: Each clamp requires 2 screws, 2 nuts, and 2 bolts

Resi-Gard® Solvent Cement



Resi-Gard Solvent Cement is ideal for easy, tight installation of all Resi-Gard flexible nonmetallic raceway and fittings and accessories. Available in pint sizes with convenient brush top applicator.

Part No.	Std. Ctn. Qty.	Std. Ctn. Wt. (lbs.)
VC9963SC	24	28.6

Resi-Gard® Cutters

Kwikcut Cutter

For fast, smooth field cuts of 1/2" through 1" innerduct.



Part No.	Size	Std. Ctn. Qty.
CC120B	8"	10

Large Cutter

For clean cuts of conduit 1/2" through 2".



Part No.	Size	Std. Ctn. Qty.
CC122	17 1/2"	1

More Great Carlon Products

Adjustable Residential Floor Box



Offering a full 21 cubic inch capacity, this easy-to-install floor box provides a clean, attractive duplex outlet for home offices, recreation rooms, and other residential applications. A simple adjusting mechanism allows you to adjust height from 0" to 1 7/8" to accommodate any floor covering height. Classified for two hour or less fire resistive floor assemblies.

Part No.	Cover	Cu. in.	Std. Ctn. Qty.	Std. Ctn. Wt. (lbs.)
NEW! B121BFBB	Brass	20	8	14.50
B121BFBR	Nonmetallic - Ivory	20	8	7.02
B121BFBRW	Nonmetallic - White	20	8	7.02

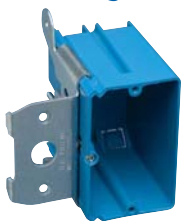
NOTE: Classified for two hour or less fire resistive floor assemblies

1- and 2-Gang Adjust-A-Boxes™

Carlson Adjust-A-Boxes are the only boxes that allow you to change your mind. Its patented design provides simple, goof-proof installation and allows you to adjust the box to any thickness with the turn of a screw. If you like our Adjustable Bracket but require a backed box, then our Adjust-A-Boxes are the right choice for you.



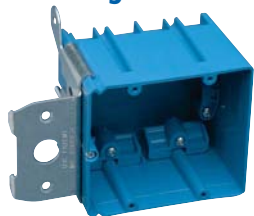
One-Gang



Part No.	Cu. In.	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
B121ADJ	21	24	10

NOTE: Classified for two hour or less fire resistive wall assemblies

Two-Gang



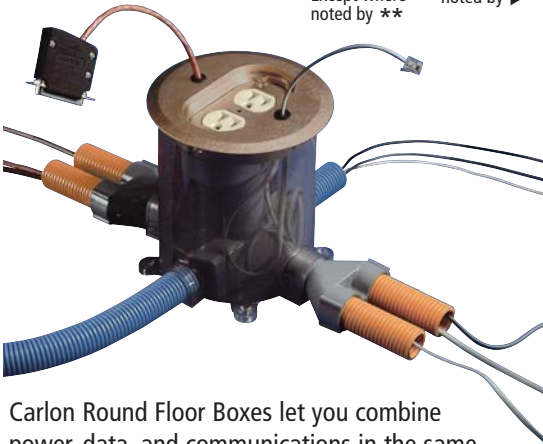
Part No.	Cu. In.	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
B234ADJ	34	16	8.5

NOTE: Classified for two hour or less fire resistive wall assemblies

Round Floor Box and Covers

UL US
LISTED
E42728
Except where
noted by **

SP
LR31146
Except where
noted by ►



Carlson Round Floor Boxes let you combine power, data, and communications in the same box to dramatically reduce your installation time and cost compared to other nonmetallic boxes.

A choice of solid brass covers plus a wide range of high impact resistant thermoplastic covers offers compatibility with standard NEMA single, duplex, or GFCI receptacles and 1 1/4" NPS applications.

Main Base

Floor Box Base – Grey

Part No.	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
E971FB	10	15.6

Multi-Service Divider Kit – Grey

Part No.	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
E973K	10	3

3/4" Y-Fitting – Grey

Part No.	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
**E972Y	10	2

NOTE: UL Listed

Reducer Plugs

Part No.	Size	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
E971C	3/4" x 1/2"	100	2.1
E971D	1" x 3/4"	100	3.2

Metal Cover Adapter – Grey

Part No.	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
▶ E97ABR2	10	3.3

Cover Ring – Clear

Part No.	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
**▶ E97CCR	10	1.1

*Accepts 3 7/8" diameter plates

Covers

Brass Two Door Duplex Cover

Part No.	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
E97BR2	5	7



Brass Duplex/GFCI Cover

Part No.	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
E97BR	5	7



Brass 1 1/4" NPS/Single Receptacle Cover

Part No.	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
E97BRG	5	7.5



Nonmetallic Covers with 1 1/4" NPS Opening

Part No.	Color	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
E97SSRS	Slate	10	3.8
E97SSRB	Brown	10	3.8
E97SSRC	Caramel	10	3.8

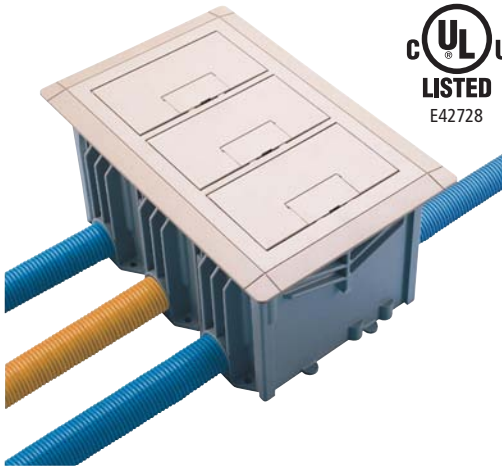


Nonmetallic Designer Series Duplex Receptacle Flush Mount Covers

Part No.	Color	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
E97DSB	Brown	10	5.8
E97DSC	Caramel	10	5.7
E97DSI	Ivory	10	5.2
E97DSS	Slate	10	5.6
E97DST	Taupe	10	5.7



Rectangular Floor Box and Covers



Compared to metal boxes, Carlon Rectangular Floor Boxes cost less and install faster to save you money on every job. Three-in-one power, data, and communications capability cuts installation time and cost even more, while simple one-, two-, and three-gang modularity gives you the flexibility, installation ease, and cost savings no other non-metallic boxes can match. Cover options include solid brass or thermoplastic (brown, slate, and caramel).

Main Base

Rectangular Floor Box – Grey

Part No.	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
E976RFB	3	7

Rectangular Floor Box Activation Kit

Part No.	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
E976AK2	3	1.3

Reducer Plugs

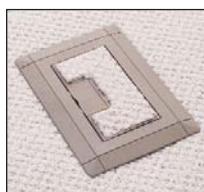
Part No.	Size	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
E971C	3/4" x 1/2"	100	2.1
E971D	1" x 3/4"	100	3.2

Covers



Brass

Part No.	Size	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
E9761BR	Single-Gang	3	7.0
E9762BR	Double-Gang	3	10.0
E9763BR	Triple-Gang	3	12.0

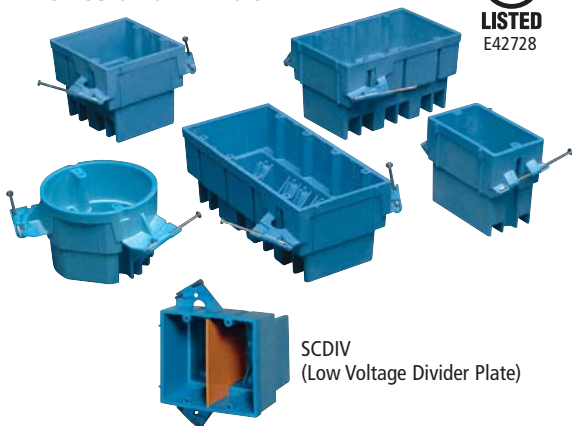


Nonmetallic Cover/ Carpet Flange

Part No.	Size	Std.Ctn. Qty.	Std. Ctn. Wt. (lbs.)
E9761*	Single-Gang	3	1.7
E9762*	Double-Gang	9	8.5
E9763*	Triple-Gang	6	7.5

*Add suffix for color: B = Brown, C = Caramel, S = Slate

Carlton® SuperBlue™ Boxes and Divider



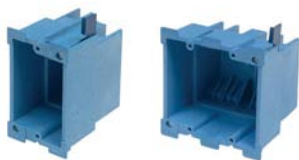
SCDIV
(Low Voltage Divider Plate)

Carlton SuperBlue wiring boxes won't crack or break like other hard shell boxes, even in extreme environments, and they are so rigid that they resist flexing and hold their shape even under the worst conditions. Available in one-, two-, three-, and four-gang wall boxes plus a ceiling box, they offer the largest wirefill in their class along with molded-in nailing flanges and molded-in cable clamps to speed installation. We also offer a special barrier where a divided closed back box is required.

Part No.	Description	Cu. In.	Std. Ctn. Qty.	Std. Ctn. Wt. (lbs.)
• † BH122A	Single-Gang Wall Box	22.0	100	34.3
• BH235A	Two-Gang Wall Box	34.6	48	26.9
• BH353A	Three-Gang Wall Box	52.0	24	14.6
• BH464A	Four-Gang Wall Box	69.0	24	16.5
† BH525A	Ceiling Box	24.5	48	19.5
SCDIV	Low Voltage Divider Plate	—	50	2.2

• Classified for two hour or less fire resistive wall assemblies

† Classified for two hour fire resistive ceiling assemblies



Old Work

Part No.	Description	Capacity	Std. Ctn. Qty.	Std. Ctn. Wt. (lbs.)
BH118R	Single Gang Old Work	18 cu. in.	36	10.9
BH234R	Two Gang Old Work	34 cu. in.	18	7.71

Two-Gang Flexible Raceway Box with Adapters



Except where noted by ►

Carlson's Flexible Raceway Box with Adapters decreases your installation time by providing molded-in couplings to attach Resi-Gard™ Flexible Raceway. If you prefer to bring your cables directly into the box, just remove any of the knockouts on either the sides or back of the box.



Part No.	Size	Cu. in.	Std. Ctn. Qty.	Std. Ctn. Wt. (lbs.)
• A5329DE	4" x 4" x 1 3/4" (1/2" & 3/4" KO's)	24.75	50	14.8

- Classified for two hour fire resistive wall assemblies

Back Wall Support

Part No.	Std. Ctn. Qty.	Std. Ctn. Wt. (lbs.)
► A540DS	100	2.1



For use with 1/2" knockout

Quick Connect Outlet and Switch Boxes



Made from high-impact, lightweight PVC with clean and easy knockouts, these outlet and switch boxes are designed for use with your structured cabling or with nonmetallic sheathed cable. Many are available in single- and multiple-gang configurations for on-the-job convenience.

Single-Gang – 16 Cu. In.



Part No.	Size	Std. Ctn. Qty.	Std. Ctn. Wt. (lbs.)
•† A58381D	3" x 2 1/4" x 3" (1/2" KO's)	25	4.6
•† A58381E	3" x 2 1/4" x 3" (3/4" KO's)	25	4.6

4 x 4 x 1 1/2 – 20 Cu. In.



Part No.	Size	Std. Ctn. Qty.	Std. Ctn. Wt. (lbs.)
•† A52151D	4" x 4" x 1 1/2" (1/2" KO's)	100	22.6
•† A52151E	4" x 4" x 1 1/2" (3/4" KO's)	100	22.6
•† A521DE	4" x 4" x 1 1/2" (1/2" & 3/4" KO's)	100	22.6

• Classified for two hour fire resistive ceiling assemblies

† Suitable for masonry walls & Classified for two hour fire resistive wall assemblies

**4 x 4 x 2³/₈ –
30.3 Cu. In.**



Part No.	Size	Std. Ctn. Qty.	Std. Ctn. Wt. (lbs.)
•† A52171D	4" x 4" x 2 ³ / ₈ " (1/2" KO's)	25	7.6
•† A52171E	4" x 4" x 2 ³ / ₈ " (3/4" KO's)	25	7.6
•† A5217DE	4" x 4" x 2 ³ / ₈ " (1/2" & 3/4" KO's)	25	7.6

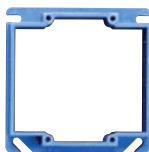
• Classified for two hour fire resistive ceiling assemblies

† Suitable for masonry walls & Classified for two hour fire resistive wall assemblies



Single-Gang – Covers

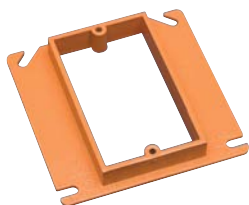
Part No.	Size	Cu. in.	Std. Ctn. Qty.	Std. Ctn. Wt. (lbs.)
A410	1/2"	3.5	100	7.7
A411	5/8"	4.2	50	4.6
A412	3/4"	5.0	50	5.1
A413	1"	6.6	40	5.0
A414	1 1/2"	8.1	30	4.4



Two-Gang – Covers

Part No.	Size	Cu. in.	Std. Ctn. Qty.	Std. Ctn. Wt. (lbs.)
A400	Blank	–	100	7.7
A420	1/2"	6.1	75	5.0
A421	5/8"	7.4	50	4.2
A422	3/4"	8.8	50	4.8

Mud Ring (4" Square 1/2" Raised Cover)



A great alternative to metallic mud rings, this nonmetallic version is lighter in weight, has no sharp corners or edges that can

damage cable or cut your hands, and is offered in the distinctive orange color that signifies structured cabling components. The back is open to accommodate appropriate bend radiuses.

Part No.	Size	Std. Ctn. Qty.	Std. Ctn. Wt. (lbs.)
SCA410	Single-Gang Cover	20	1.54

NOTE: Classified for two hour fire resistive wall assemblies when used with Two-Gang Quick Connect Outlet and Switch Boxes.

Old Work Brackets

Carlson Old Work Brackets are designed specifically for the installation of low-voltage devices such as a cable television, datacommunication or telephone jacks in an existing wall. The Backless Box design accommodates the space and bend radius requirements of coaxial or data/communication cables. It also eliminates the need for metal plates, lags or screws, and can be installed vertically or horizontally. Available in one-and two-gang styles.



One-Gang

Part No.	Size	Std. Ctn. Qty.	Std. Ctn. Wt. (lbs.)
† SC100R	2 1/4" x 3 1/4"	12	1.4



Two-Gang

Part No.	Size	Std. Ctn. Qty.	Std. Ctn. Wt. (lbs.)
† SC200R	3.92" x 4.00"	6	.9



Single Gang Box Extender

Part No.	Size	Std. Ctn. Qty.	Std. Ctn. Wt. (lbs.)
B1EXTB	2 1/4" x 3 1/4"	25	3



† Not UL Classified for fire resistance

Carlson® Nonmetallic Handy Box and Covers



The Carlson Handy Box is a nonmetallic switch and outlet box specifically designed for use with nonmetallic conduit systems and nonmetallic sheath cabling. Unlike metal boxes, the Carlson Handy Box has two integral cable clamps. These clamps hold nonmetallic cable firmly in place without the need for separate clamps. The Carlson Handy Box also comes with six 1/2" knockouts on the sides and back for easier wiring and a variety of mounting options.



Box

Part No.	Description	Dimensions	Std. Ctn. Qty.	Std. Ctn. Wt. (lbs.)
B112HB	Handy Box – Single Gang	1 7/8" × 4" × 2 1/8"	50	10.96

Covers

Part No.	Description	Dimensions	Std. Ctn. Qty.	Std. Ctn. Wt. (lbs.)
HB1BL	Single Gang Nonmetallic Cover – Blank	.25" × 4.30" × 2.38"	25	1.0
HB1SW	Single Gang Nonmetallic Cover – Toggle Switch	.25" × 4.30" × 2.38"	25	1.0
HB1DP	Single Gang Nonmetallic Cover – Duplex Receptacle	.25" × 4.30" × 2.38"	25	1.0
HB1GF	Single Gang Nonmetallic Cover – GFCI Cover	.25" × 4.30" × 2.38"	25	1.0

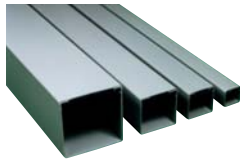


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Except where noted by ►

Carlson® Wiresafe® Wireway and Fittings

Carlson Wire Safe Wireway is the perfect solution for containing electrical, electronic, and communication wire and cable. It's easy to install, provides durable protection, and eliminates the need to pull conductors.



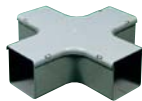
Wireway

Part No.	Outside Nominal Dimensions	Length	Std. Ctn. Qty.	Wt. (lbs.) per 10'
17011	2 x 2	10'	1	4.7
17013	3 x 3	10'	1	11.2
17015	4 x 4	10'	1	11.2
17017	6 x 6	10'	1	21.4

Fittings

Flat Cross (Clip-on Cover)

Part No.	Size	Std. Ctn. Qty.	Wt. (lbs.) ea.
* EGFCJ	2 x 2	1	0.5
* EGFLC	3 x 3	1	1.3
† EGFCN	4 x 4	1	1.7
† EGFCR	6 x 6	1	4.8



90° Bend Flat Cover (Clip-on Cover)

Part No.	Size	Std. Ctn. Qty.	Wt. (lbs.) ea.
* EGLFJ	2 x 2	1	0.3
* EGLFL	3 x 3	1	0.6
† EGLFN	4 x 4	1	1.1
† EGLFR	6 x 6	1	3.3



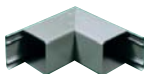
* Molded fitting—couplings not needed

† Fabricated fitting—order couplings separately

†† No coupling is required for 6" fabricated end cap

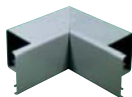
90° Bend External Cover (Clip-on Cover)

Part No.	Size	Std. Ctn. Qty.	Wt. (lbs.) ea.
* EGLEJ	2 x 2	1	0.3
† EGLEL	3 x 3	1	0.8
† EGMEN	4 x 4	1	1.2
† EGMER	6 x 6	1	3.3



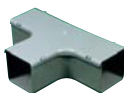
90° Bend Internal Cover (Clip-on Cover)

Part No.	Size	Std. Ctn. Qty.	Wt. (lbs.) ea.
* EGLIJ	2 x 2	1	0.3
† EGLIL	3 x 3	1	0.7
† EGLIN	4 x 4	1	1.1
† EGLIR	6 x 6	1	3.0



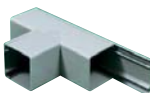
Tee Flat Cover (Clip-on Cover)

Part No.	Size	Std. Ctn. Qty.	Wt. (lbs.) ea.
* EGTFJ	2 x 2	1	0.4
* EGTFL	3 x 3	1	0.9
† EGTFN	4 x 4	1	1.4
† EGTFR	6 x 6	1	3.8



Tee External Cover (Clip-on Cover)

Part No.	Size	Std. Ctn. Qty.	Wt. (lbs.) ea.
† EGTEJ	2 x 2	1	0.4
† EGTEL	3 x 3	1	0.9
† EGTEN	4 x 4	1	1.4
† EGTER	6 x 6	1	3.8



* Molded fitting-couplings not needed

† Fabricated fitting-order couplings separately

†† No coupling is required for 6" fabricated end cap



Except where noted by ►

Flange

Part No.	Size	Std. Ctn. Qty.	Wt. (lbs.) ea.
EGFJ	2 x 2	10	1.1
EGFL	3 x 3	10	1.4
EGFN	4 x 4	10	2.2
EGFR	6 x 6	10	3.0



End Cap (UL NEMA 12 Rated)

Part No.	Size	Std. Ctn. Qty.	Wt. (lbs.) ea.
* EGSEJ	2 x 2	10 Pair	0.6
* EGSEL	3 x 3	10 Pair	0.9
* EGSEN	4 x 4	10 Pair	1.6
†† EGSER	6 x 6	10 Pair	5.0



External Coupling

Part No.	Size	Std. Ctn. Qty.	Wt. (lbs.) ea.
EGCEJ	2 x 2	10	1.3
EGCEL	3 x 3	10	2.2
EGCEN	4 x 4	10	2.5
EGCER	6 x 6	10	7.8



* Molded fitting—couplings not needed

† Fabricated fitting—order couplings separately

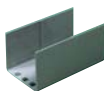
†† No coupling is required for 6" fabricated end cap



Except where noted by ►

Internal Coupling

Part No.	Size	Std. Ctn. Qty.	Wt. (lbs.) ea.
EGCIJ	2 x 2	10	1.3
EGCIL	3 x 3	10	2.2
EGCIN	4 x 4	10	2.5
—	6 x 6	N/A	N/A



Push Rivets

Part No.	Size	Std. Ctn. Qty.	Wt. (lbs.) ea.
EGPR	N/A	200	0.4



Hangers

Part No.	Size	Std. Ctn. Qty.	Wt. (lbs.) ea.
EGSBJ	2 x 2	10	0.9
EGSBL	3 x 3	10	1.3
EGSBN	4 x 4	10	1.9
GSBR	6 x 6	10	2.8



* Molded fitting—couplings not needed

† Fabricated fitting—order couplings separately

†† No coupling is required for 6" fabricated end cap

Section 14.

Appendix - Reference List

ANSI American National Standards Institute (ANSI)

- ANSI/TIA/EIA 568-A, Commercial Building Telecommunications Cabling Standard
- ANSI/TIA/EIA 569-A, Commercial Building Standard for Telecommunications Pathways and Spaces, 1998.
- ANSI/TIA/EIA 570-A, Residential Telecommunications Cabling Standard, 1999
- ANSI/TIA/EIA 606, Administration Standard for the Telecommunication Infrastructure of Commercial Buildings
- ANSI/TIA/EIA 607, Commercial Building Grounding and Bonding Requirement for Telecommunications

TIA/EIA Telecommunications Industry Association (TIA)/ Electronic Industries Alliance (EIA)

- TIA/EIA TSB 67, 72, 95, 526, and OFSTP 7 and 14

BICSI A Telecommunications Association

- BICSI Telecommunications Distribution Methods Manual and LAN and Internetworking Design Manual
- Telecommunications Cabling Installation Manual

NFPA National Fire Protection Association

- 2002 National Electrical Code

HANA Home Automation and Networking Association

CEDIA Custom Electronic Design and Installation Association

Notes

Notes

Carlton[®]
LAMSON & SESSIONS