



**CARLTON®MULTI-GARD®PRE-LUBRICATED MULTI-CELL SYSTEM -
PRODUCT SPECIFICATIONS**

PART 1 GENERAL

1.01 SECTION INCLUDES

This specification covers Carlton Multi-Gard multiple cell conduit system for installation of voice, data, video, and other low voltage cabling. This system may be installed in direct buried, concrete encased, or aboveground applications, including areas of physical damage in accordance with manufacturers installation instructions. Carlton Multi-Gard is a complete multiple cell system including fittings, adaptors, and sweeps.

1.02 REFERENCES

- A. Bellcore CAO-8546 Specification for Type B, C, and D Plastic Conduit.
- B. NEMA TC 6&8-1999 PVC Plastic Utilities Duct for Underground Installation.
- C. Bellcore TA-NWT-000356 April 1991 General Requirements for Optical Cable Innerduct for Coefficient of Friction.
- D. Type C and Type 40 to have UL Listing (Optical Fiber Assembly).
- E. UL Specification 797 and ANSI C80.3 for EMT elbows.
- F. ASTM A-53 for Galvanized Rigid Steel.
- G. UL 6 and UL514B for Standard for Safety; ASTM D1308 for PVC Coated Galvanized Rigid Steel.

PART 2 PRODUCT

2.01 PRODUCT SPECIFICATIONS

- A. Carlton manufactures Multi-Gard conduit systems in accordance with the specifications listed below:

**CARLON®MULTI-GARD®PRE-LUBRICATED MULTI-CELL SYSTEM -
PRODUCT SPECIFICATIONS**

2.02 MATERIALS

A. Outerducts

1. Type C PVC outerduct and associated fittings meeting CAO-8546 shall be provided for direct burial and concrete encased applications with a 5-1/2" integral bell in place of standard 3" bell.
2. Type 40 PVC outerduct and associated fittings meeting NEMA TC-2 shall be provided for normal aboveground applications with a 5-1/2" integral bell in place of standard 3" bell.
3. Type 80 PVC outerduct and associated fittings meeting shall be provided for normal aboveground applications with a 5-1/2" integral bell in place of standard 3" bell.
4. Fiberglass reinforced epoxy outerduct and associated fittings shall be provided for aboveground applications including bridge crossings for lightweight. Fiberglass outerduct shall meet NEMA TC-14B with a 5" integral bell. The following wall thickness shall be available:
 - a. .070" standard wall
 - b. .090" heavy wall
 - c. .250 bullet resistant
5. Galvanized steel outerduct and associated fittings shall meet ASTM A-53 dimensions for Schedule 40. For aboveground applications requiring heavy-duty physical protection such as bridge abutment walls. Threads shall be on both ends of steel for a spin coupling. Spin coupling shall have three setscrews 120° apart to stabilize coupling. The conduit shall be hot dipped galvanized inside and out. Threads shall be coated with Zinc Oxide metalizing. Galvanized coating shall be applied at a minimum of one ounce per square foot per ANSI C80.1 specification providing minimum of .0008" coating.

**CARLON®MULTI-GARD®PRE-LUBRICATED MULTI-CELL SYSTEM -
PRODUCT SPECIFICATIONS**

6. Electrical Metallic Tubing (EMT) galvanized steel outerduct shall be a UL listed EMT for inside building applications including Plenums, Risers, and General Purpose Areas.
7. PVC Coated Galvanized Steel outerduct shall conform to the methods described in ASTM D1308, UL 6 and UL514B.

B. INNERDUCTS

1. PVC innerducts shall be made from PVC compound which meets cell classification PVC 12254 A, B, or C as defined in ASTM D1784. This requirement insures innerduct stiffness to avoid crushing ends of innerduct during assembly.
2. Innerducts shall contain a chamfer on the spigot end to avoid gasket damage during in assembly.
3. One white innerduct shall be provided under the print line stating, "Install This Side Up" to insure proper alignment. Other innerducts shall be grey. In a multi-color innerduct arrangement, drawings will be provided showing the innerduct configuration.
4. Dimensions for PVC innerduct shall be maximum 1.19" I.D. and maximum 1.31" O.D. for 4-cell and maximum 1.51" I.D. and maximum 1.66" O.D. for 3-cell.
5. The innerducts in the straight 20 foot sections shall be made from PVC to match the expansion and contraction rates of the PVC outerduct.
6. All bends shall be provided with Nylon innerducts to prevent burn through during installation of rope, tape, and/or cable. All Nylon shall meet cell classification.
7. Innerducts shall be belled and glued to the coupling body on the internal connection. This will avoid separation of the innerduct from the coupling during transportation and during the expansion and contraction of the innerducts.

**CARLON®MULTI-GARD®PRE-LUBRICATED MULTI-CELL SYSTEM -
PRODUCT SPECIFICATIONS**

8. All innerducts shall be pre-lubricated to increase pulling distance capabilities and reduce risk of damaging cable by reducing the coefficient of friction to levels set forth in the performance section of this specification.

C. COUPLING SYSTEM

1. Coupling system shall be an injection molded coupling body with a gasket system to prevent air loss and provide a locking mechanism to secure the spigot and bell ends once assembled.
2. Coupling system shall incorporate an anti-reversing gasket able to hold up to 200 pounds pull out force.
3. Coupling system shall be able to hold 120 psi per Bellcore.
4. Coupling system shall have a glued connection on the internal attachment of the innerducts to prevent separation of the innerducts during transportation and during expansion and contraction of the system.
5. Coupling system shall allow for the expansion and contraction of the multi-cell system due to temperature changes. The means by which this is accomplished is the gasketed system between the OD of the innerducts and the ID of the gasketed coupling system chambers.
6. Coupling system shall have a sealing mechanism to prevent the infiltration of ground water.

D. SPACERS

1. Spacers need to be designed to “snap in” place to secure the innerducts in a 3-cell or 4-cell conduit system. No glue shall be used to hold the spacers in place.
2. The spacers need to allow for expansion and contraction of innerducts relative to the outerducts.



**CARLON®MULTI-GARD®PRE-LUBRICATED MULTI-CELL SYSTEM -
PRODUCT SPECIFICATIONS**

- 3. The spacers need to be placed every five feet to allow for proper support of the innerducts.
- 4. An end spacer shall be installed at the spigot end of the multi-cell system to assist in securing the innerducts to the outerduct.

E. PERFORMANCE REQUIREMENTS REQUIRED RESULTS

1. Outerduct (CAO-8546 Test Procedures for Stiffness)	120 lbs/in/in
Innerduct (NEMA TC 6&8 Test Procedures for Stiffness)	180lbs/in/in
2. Impact Values - 32°F	
Outerduct 4" Type C (Bellcore CAO-8546 Test Procedures for Impact)	50 ft. lb.
Innerduct (NEMA TC 6&8 Test Procedures for Impact)	
1" Nom. (1.19 I.D.)	10 ft. lb.
1- _" Nom. (1.51 I.D.)	15 ft. lb.
Joint Tests	
Installation Force	80 lbs. or <
Joint Separation	200 lbs. or >
Water infiltration (Bellcore TA-NWT-000356 Test Procedures for Water Infiltration)	11-foot head or more for 7 days

**CARLON®MULTI-GARD®PRE-LUBRICATED MULTI-CELL SYSTEM -
PRODUCT SPECIFICATIONS**

4. Pre-Lubricant	<u>Required Results</u>
a. Co-efficient of friction using Bellcore TA-NWT-000356 test procedures for C.O.F.	
(1.) _” polypropylene rope	.090 or <
(2.) MDPE jacketed FO cable	.072 or <
(3.) HDPE jacketed cable	.030 or <
b. Cable sheath stress cracking results (F.O. cable to be submersed in pre-lubricant)	No negative effect after 7 days
c. MSDS sheets showing safe use for application to persons and environment	Safe
d. Compatibility with other possible field applied lubricants. Bellcore TA-NWT- 000356 test procedures on F.O. cable using common polymer based lubricants added to pre-lubricated duct	Coefficient of friction shall not be higher than if field applied lubricant used alone on dry duct
e. Evaporation of pre-lubricant	.05% @ 500° F
f. Water flush test 5 gallons/min for 1 hour	0% loss of coefficient of friction capabilities



**CARLON®MULTI-GARD®PRE-LUBRICATED MULTI-CELL SYSTEM -
PRODUCT SPECIFICATIONS**

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| 5. Customer drawings showing conformance to Dimensions and offering of complete system | Available upon request |
| 6. Cut through testing on innerduct in bends using NEPTCO® duct cutting procedure of 450 lbs. of Tension at 100 ft./min | No abrasion cut through outside wall after 120 minutes |
| 7. Linear Rigidity | |
| (1) Outerduct with components installed (20' section) | Max 2" from centerpoint on bottom section to flat surface with both ends touching |
| (2) Innerducts within outerduct | Max .05" sag between 36" space @ 100° F |

2.03 MANUFACTURERS UNITS

- A. Raceway shall be available in a 3-cell or 4-cell configuration with supporting spacers non-cemented within the outerduct supporting the innerducts. Each bell end shall be a minimum of 5-1/2" to allow for cold field bends of 60 feet by 90 degrees and feeding over a trenching machine. Each 20' lay length section shall be provided with a gasketed coupling system to allow system to be assembled without the use of solvent cement and meet all performance requirements set forth in this specification.

**CARLON®MULTI-GARD®PRE-LUBRICATED MULTI-CELL SYSTEM -
PRODUCT SPECIFICATIONS**

2.04 FITTINGS

A. Manufacturer shall make available:

1. Bends in 48" radius, 11-1/4°, 22-1/2°, 45°, and 90° fixed and 4 foot to 9 foot by 0° to 90° flexible bends. All bends must have Nylon innerducts meeting the performance requirements of this specification.
2. Slip couplings to allow male/male connections where space is limited.
3. Standard couplings to allow male/male connections.
4. Terminator kits meeting duct requirements for air and water integrity for manholes, hand holes and enclosures.
5. Repair kits for future repair of empty or occupied duct systems.
6. Pass-through terminator to allow express through hand hole of pull line or cable.
7. Expansion joints are required for above ground applications. The appropriate expansion joint should be used relative to the outerduct material. i.e. Fiberglass outerduct should use a Fiberglass expansion joint.

2.05 ACCESSORIES

- A. Manufacturer shall make available line blowing kits including blowing projectiles and 1-1/4" threaded seal-off for 4-cell and 1-1/2" seal-off for 3 cell.
- B. All spigot ends and belled ends shall be shipped with protective caps.
- C. Recommended pull lines shall be provided by multi-cell manufacturer.



**CARLTON®MULTI-GARD®PRE-LUBRICATED MULTI-CELL SYSTEM -
PRODUCT SPECIFICATIONS**

PART 3 EXECUTION

3.01 INSTALLATION

A. To be provided in manufacturers installation procedures.

B. Complete multi-cell system shall include pull lines installed in all cells to proof system.

END OF SPECIFICATION