STATE OF NEW JERSEY
DEPARTMENT OF TRANSPORTATION
TRENTON, NEW JERSEY 08625

METRIC SPECIFICATIONS FOR TYPE F (FIBERGLASS MULTIDUCT) (COMMUNICATIONS CONDUIT)

N.J. Specification No. EBM-MULTI-2 Effective Date: July 1, 2001

New Jersey Department of Transportation Specifications for Fiberglass Multiduct Conduit.

The purpose of these specifications is to describe minimum acceptable design requirements for Fiberglass, Multiduct Conduit with 4 inner ducts, as specified for Type F construction for the installation of fiber optic cable.

GENERAL - I

1-1 The Fiberglass multiduct conduit shall be a 103 millimeter diameter outer conduit with four, 35 millimeter preassembled inner ducts. The complete conduit sections, including both outer conduit and inner ducts shall use a bell and spigot type connection.

1-2 This conduit design is for installation on structures such as bridges.

1-3 The outer conduit, inner ducts, and any spacers used internally, shall be all dielectric.

1-4 The construction and testing of the conduit shall comply with all applicable Electronic Industry Standards (EIA/TIA), National Electrical Manufactures Association, International Telegraph and Telephone Consultative Committee (CCITT), ANSI, UL, ASTM standards, National and State Electric Codes, and FDDI specifications.

CONDUIT GENERAL - II

2-1 The outer conduit shall be a tubular 103 millimeter fiberglass conduit, suitable for exposed installation, with a 106 millimeter average outside diameter and 2.3 millimeter minimum wall thickness, and shall conform to NEMA-TC-14B.

2-2 The inner duct assembly shall consist of four PVC color coded ducts. Each duct shall have a minimum inside diameter of 30 millimeters and a minimum wall thickness of 1.6 millimeters. The four ducts shall be preassembled in the factory and inserted into the outer conduit. As an alternate, the inner duct assembly shall consist of 4 ribbed 90% virgin High Density Polyethylene, HDPE, color coded ducts. Each duct shall have a minimum inside diameter of 32 millimeters and a minimum wall thickness of 1.9 millimeters. The four ducts shall be preassembled in the factory and inserted into the outer conduit. The inner ducts shall have a minimum burn through time of 90 minutes based upon Bellcore's Technical Reference TR-NWT-000356 Coefficient of Friction Test.

2-3 The inner ducts shall be prelubicated to meet a dynamic coefficient of friction of 0.027 according to Bellcore TA-NWT-000356 procedure using HDPE Jacketed Fiber Optic Cable.

2-4 The conduit system shall provide mechanisms to ensure that the expansion and contraction stresses are normalized.

2-5 Internal spacers shall be factory installed to hold the inner ducts in proper spacing and alignment. Spacers shall be molded from a high impact plastic, and be factory certified to withstand all handling pressures and stresses.

2-6 External spacers for the support of the conduit on a structure and separation of conduits on a structure shall be molded from a high impact plastic or fabricated from aluminum (such as Uni-Strut), and be factory certified to withstand all handling pressures and stresses.

2-7 The conduit shall be designed to provide for connecting (coupling) one complete section of conduit assembly to the next section by use of a tapered bell and spigot adhesive joint on one end of the outer conduit and gasket each of the four inner ducts, and a spigot end at the other end of the conduit and inner ducts. The outer conduit bell shall extend 150 millimeters minimum beyond the inner ducts. The conduit sections shall be designed to assemble spigot into bell. Fiberglass epoxy cement shall be used at each joint when the conduit is installed on bridge structures.

2-8 The seals at the outer conduit and the inner ducts shall be anti-reversing.

2-9 The coupling shall be manufactured from a high impact thermoplastic, shall be factory assembled in the bell end of the outer conduit, and shall be supplied with lead-ins to facilitate assembly. The couplings shall be designed and factory certified to handle normal expansion and contractions.

2-10 Each complete conduit section shall be identically keyed to provide for proper alignment of the inner ducts. The spigot end of the conduit section shall have a circumferential ring to assure proper depth engagement during connection.

2-11 Conduit couplings shall be provided to couple the following conduit combinations:

A. HDPE to HDPE inner duct

B. PVC to Fiberglass outer duct

C. Galvanized steel to fiberglass outer duct

2-12 Special termination kits shall be provided by the conduit manufacturer for terminating the conduit in manholes and junction boxes. The kits shall provide for a water tight seal of conduit to structure wall and between inner ducts and outer ducts.

2-13 Complete conduit sections, including outer conduit and inner ducts, shall be manufactured in 6 meter sections and shall have a midbody gasket to provide for water

tight integrity. The installation instructions shall carry a warning that the installer shall not use an unauthorized solvents on the conduit.

2-14 Complete conduit rigid bend sections, including outer conduit and high temperature burn through resistant inner duct, shall be manufactured, and shall be complete with bell and spigot. Standard bend sections shall be available in the following sizes:

Radius (meters)	Bend
1.2	11-1/4°
1.2	22-1/2°
1.2	45°
1.2	90°
1.8	11-1/4°
1.8	22-1/2°
1.8	45°
1.8	90°
2.7	11-1/4°
2.7	22-1/2°
2.7	45°
2.7	90°

COLOR CODING AND LABELING - III

3-1 Inner ducts shall be distinguishable from each other by color coding as indicated in the contract documents. The entire duct shall be colored by industry standard coloring additive to the duct material, not by an external applied coloring.

3-2 The outer duct shall have a longitudinal print line that denotes, "Install This Side Up, NJDOT ITS Engineering, Fiber Optic Cable", to allow for the proper alignment of the inner ducts. The outer duct shall be marked with data to trace the plant location, date, shift, and machine used in the manufacturing process.

SHIPPING - IV

4-1 The conduit shall be packaged for shipment at the factory. The conduit shall be assembled into manageable bundles. Each section of conduit shall be shipped with protective caps over each end of the section. Conduit that arrives at the job site without the protective cover in place over both ends, will be rejected by the Engineer.

TESTING - V

5-1 The complete conduit sections including outer conduits, inner ducts, and all spacers and connection parts shall be certified by the manufacturer as complete and free of defects.

TRAINING - VI

6-1 Prior to the acceptance of the first shipment of conduit, training shall be provided for the Department's engineering, maintenance and operations staff, at a facility provided by

the Department. The training shall include all material and manuals required for each participant.

6-2 Installation and Maintenance training of conduit installation shall be provided for a minimum of 16 hours for at least 10 personnel with a background in conduit and cable installation. The training shall include installation, preventive maintenance procedures, troubleshooting, and repair of all components.

INSTRUCTIONS AND GUARANTEES - VII

7-1 One set of maintenance and repair manuals shall be included with each 1 500 meters of furnished conduit.

7-2 No changes or substitutions in these requirements will be acceptable unless authorized in writing. Inquiries regarding this specification shall be addressed to the Manager, Office of ITS Engineering, New Jersey Department of Transportation, P.O. Box 613, 1035 Parkway Avenue, Trenton, New Jersey 08625.

7-3 The supplier agrees upon the request of the Manager, Office of ITS Engineering to deliver to the Office, a sample of the complete conduit including one straight section and one rigid bend section, each approximately one meter in length, to be supplied in compliance with these specifications for inspection and test before acceptance. The sample shall be returned.

7-4 The supplied conduit shall carry a two-year warranty, from the date of project acceptance by the State, to be free of defects. The installer shall fully inspect the conduit prior to installation and within the warranty period. The installer shall be fully responsible for the installation of defect free conduit and for the replacement of any conduit found to be defective due to improper construction or improper installation for two years after the State's acceptance of the project.