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

METRIC SPECIFICATIONS FOR CONNECTORS, TYPE ST (FIBER OPTIC CABLE)

N.J. Specification No. EBM-FOC-ST-1 Effective Date: July 1, 2001

New Jersey Department of Transportation Specifications for Fiber Optic Cable Connectors Type ST.

The purpose of these specifications is to describe minimum acceptable design requirements for Fiber Optic Cable Connectors type ST, factory installed on fiber optic termination cable (also called break-out or distribution cable) or field installed on trunk cable.

GENERAL - I

1-1 Each fiber optic connector on termination cable (also called breakout cable) shall be a ceramic ferrule type ST for single mode fiber, and shall be factory installed as shown in the contract documents and shall conform to these special provisions.

1-2 Each terminated fiber on a trunk cable shall be terminated with fiber optic connectors type ST. The connectors shall be either factory installed or field installed by a factory certified technician.

1-3 The construction and testing of the fiber optic connectors and the attached cable shall comply with all applicable Electronic Industry Standards (EIA/TIA), International Telegraph and Telephone Consultative Committee (CCITT), ANSI, ASTM standards and FDDI specifications.

CONNECTOR CHARACTERISTICS - II

2-1 The factory installed fiber optic connectors shall be the 2.5 millimeter ceramic ferrule ST type for single mode applications with Zirconia Ceramic material.

2-2 The field installed fiber optic connectors shall be the 2.5 millimeter pre-radiused ceramic ferrule, ST type for single mode applications with Zirconia Ceramic material.

2-3 The fiber optic connectors shall be either installed at the factory where the cable has been manufactured by factory certified personnel, or installed at the construction site by factory certified technicians.

2-4 The ST connector operating temperature range shall be -40 °C to +80 °C.

2-5 Attenuation shall have a mean of 0.3 decibels and a maximum of 0.6 decibels.

2-6 Insertion loss shall not exceed 0.4 decibels and the return reflection loss on single mode connectors shall be at least 40 decibels.

2-7 Connection durability shall be less than a 0.2 decibels change per 500 mating cycles.

2-8 All terminations shall provide a minimum 222 newtons pull out strength.

COLOR CODING AND LABELING - III

3-1 Single mode connectors shall have a yellow color on the body and/or boot.

SHIPPING - IV

4-1 The fiber optic cable with attached connectors shall be shipped on a strongly constructed reel or in a flat crush proof container depending on the specific lengths of the shipped cable. The reel or flat container shall be designed to prevent damage to the fiber optic cable and connectors during shipment and installation.

4-2 All fiber optic cable ends shall be sealed to prevent the escape of the filling compound and the entry of moisture.

4-3 The end of the fiber optic cable that does not have connectors shall be equipped with flexible pulling eyes.

4-4 A thermal protective wrap shall be applied over the outer turns of the cable on each reel or wrapped around the cable in the flat container.

TESTING - V

5-1 Testing shall include the tests on fiber optic connectors at the factory or at the work site, wherever the connectors have been installed.

5-2 The Supplier shall provide all personnel, equipment, instrumentation and materials necessary to perform all testing.

5-3 Documentation of all test results shall be provided to the Engineer two working days before the material is scheduled to arrive on site for factory tests and two working days after the tests for connectors installed at the work site.

5-4 Attenuation tests shall be performed with an OTDR (Optical Time Domain Reflectometer) capable of recording and displaying anomalies of 0.3 decibels as a minimum. ST connectors shall be tested at 1 300 nanometers and 1 550 nanometers. The OTDR shall be designed for use on single mode fiber at 1 300 and 1 550 nanometers wavelength, and shall be a unit exhibiting the following characteristics:

A. dead zone: 15 meters or better

B. attenuation range: 15 decibels or better

C. distance range: 10 kilometers or longer

D. accuracy: ± 2.0 meters

E. printer: must be capable of printer output and internal storage.

5-5 The OTDR shall have a printer capable of producing a verifying test trace with fiber identification, numerical loss values, the date and the operator's name. It shall also have a DOS based 90 millimeter disk recording capability that has associated software to do comparisons and reproductions on A4 paper (210 by 297 millimeters), via a personal computer.

5-6 The test shall include verification of the ST connectors specifications as listed in Section II, Connector Characteristics and those which shall be supplied by the manufacturer with the appropriate documentation. After the cable with ST connectors has been placed on or in the shipping container and before shipping, 100 percent shall be tested for attenuation. Any materials that have been in storage shall be tested or retested before shipping. Copies of the results shall be maintained on file with a file identification number for a minimum of 10 years, attached to the cable container in a waterproof pouch, and submitted to the Engineer prior to the delivery of the cable with connectors to the job site.

5-7 The cable with connectors shall not be installed until all of the tests have been completed and with written approval by the Engineer. Copies of traces and test results shall be submitted to the Engineer. If the OTDR test results are unsatisfactory, the container of fiber optic cable with connectors shall be considered unacceptable and all records corresponding to that container shall be marked accordingly.

5-8 The unsatisfactory containers of cable with connectors shall be replaced with new containers at the Supplier's expense. The new containers shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

TRAINING - VI

6-1 Prior to the acceptance of the first OTDR unit or any cable, 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. The training shall be as follows:

6-2 Maintenance training of OTDR operation shall be provided for a minimum of 16 hours for at least 5 personnel with an electronics background. The training shall include operation instructions, theory of operation, circuit description, field adjustments, preventive maintenance procedures, troubleshooting, interpretation of results, and repair of all components.

6-3 Fiber optic cable installation and ST connector use training shall be provided for a minimum of 24 hours for at least 10 personnel with a background in cable installation. The cable training shall include operation of all cable laying equipment, theory of operation, field adjustments, preventive maintenance procedures, troubleshooting, and

repair of all components. The ST connector training shall include use, preventive maintenance, troubleshooting, and repair.

6-4 Engineering training shall be provided for a minimum of 16 hours for at least 20 engineering and operations personnel. The training shall include a complete demonstration of the operation, capabilities of the equipment, and interpretation of results of the OTDR and a complete demonstration of fiber optic cable laying and ST connector use.

INSTRUCTIONS AND GUARANTEES - VII

7-1 Ten sets of use, maintenance and repair manuals for the ST connectors shall be included with the furnished ST connectors and cable.

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 cable, approximately 600 millimeters in length with ST terminators on one end, to be supplied in compliance with these specifications for inspection and test before acceptance. The sample shall not be returned.

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