SECTION 16725
TELECOMMUNICATIONS CABLE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Interbuilding Copper Cable

B. Copper Riser Cable

C. Copper Station Cable

D. Interbuilding Fiber Optic Cable

E. Fiber Optic Riser Cable

F. Fiber Optic Station Cable

1.2 RELATED SECTIONS

A. Contract Terms and Conditions

B. Section 16710 - Telecommunications General Requirements

C. Section 16715 - Acceptance Testing

D. Section 16720 - Basic Materials and Methods

E. Section 16730 - Underground Structures - Telecommunications

F. Section 16760 - Telecommunications Grounding and Bonding

1.3 APPLICABLE PUBLICATIONS

A. As defined in Section 16710 - Telecommunications General Requirements.

1.4 SUBMITTALS

The Contractor shall submit the following materials to the Engineer of Record prior to the placement of cable:

A. Product data, including manufacturer's catalog information showing dimensions, colors, configurations, construction and performance specifications for each type of cable to be supplied. In addition, the Contractor shall provide product data and installation instructions for all firestopping materials.

B. Pre-Qualification Certificate. (See paragraph 1.8 A in specification section 16710).

C. Copies of signed optical cable reel tests.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fiber optic cables shall be installed by certified installers under the Corning LANscape® Solutions Structured Cabling System. Horizontal copper cables shall be installed by certified installers under the SYSTIMAX® Structured Cabling System. The various sections of this specification pertain to specific products and/or installation requirements that must conform to the warranty requirements of the Structured Cabling Systems manufacturer.

2.2 INTERBUILDING COPPER CABLE (GEL-FILLED)

A. Material

1. Application: Use for outside conduit systems.

2. Compliance: ANSI/ICEA S-84-608-1994, RUS 7 CFR 1755.390 (PE-39)

3. Core Construction
   a. Conductors: Solid, annealed copper, 24 AWG unless noted on design documents.

   b. Insulation: Solid, high-density polyethylene, color-coded in accordance with telephone industry standards.

   c. Twisted Pairs: Insulated conductors twisted into pairs with varying lay lengths to minimize crosstalk. Standard capacitance of 83 to 87 nanofarads per mile and a staggered twist design.

   d. Core Assembly: Cables of 25 pairs and less formed by assembling pairs together in a single group. Cables of more than 25 pairs formed by twisted pairs arranged in groups with each group having a color coded unit binder.

   e. Filling Compound: Core assembly completely filled with a 80° C ETPR compound, filling the interstices between the pairs and under the core tape.

   f. Core Wrap: Non-hygroscopic dielectric tape applied longitudinally with an overlap.

4. Qualpeth Sheath
   a. Aluminum Shield: Corrugated, copolymer coated, .008” aluminum tape applied longitudinally with an overlap. The sheath interfaces are flooded with an adhesive water blocking compound.

   b. Jacket: Black, linear low density polyethylene.

5. Cable sizes defined in design documents.

B. Manufacturer: (OSP) Superior Essex SEALPIC®-F (Campus Standard)2.3 copper station Cable (CATEGORY 6, plenum)

A. Material

1. Use for voice and data applications to interconnect services from workstation to the wiring closet in a plenum or non-plenum rated space.

2. CMP/MPP rated.

3. Four pair, 23 AWG, UTP, meets or exceeds Category 6 requirements in TIA/EIA 568B.2-1.

B. Manufacturer: Systimax (GigaSPEED XL Cables, 2081 XL Plenum, 4-Pair Cable) (Campus Standard)

2.4 INTERBUILDING FIBER OPTIC CABLE (MULTIMODE/SINGLEMODE) HYBRID OUTSIDE PLANT CABLE (CORNING FREEDM® CABLES)

A. Materials

1. Application: Use for placement in outside plant conduit between buildings.

2. Compliance: NEC-OFNR, CSA”OFN FT-4”, NEC art. 770, ANSI/ICEA S-83-596, ANSI/ICEA S-87-640

3. Characteristics:

   a. Hybrid Fiber Optic Cable (singlemode/multimode), Outside Plant, Indoor/Outdoor, Riser Rated Loose Tube

   b. Water blocked

   c. Dielectric

   d. Minimum pulling tension of 600 lbf

   e. Equipped with breakout and furcation kits to dress the end of the cable.

4. Multimode Optics:

   a. 50/125 µm (core/cladding) dual window (850 and 1300 nanometers)

   b. Maximum attenuation: 3.5 dB/km @ 850 nm and 1.5 dB/km @ 1300 nm

   c. Minimum bandwidth:

      500 MHz/km overfilled bandwidth at 850 nm

      500 MHz/km overfilled bandwidth at 1300 nm

   d. 0.20 +/- 0.015 numerical aperture

5. Singlemode Optics:

   a. 9/125/250 µm (core/cladding/protective coating) dual window (1310 and 1550 nanometers)

   b. Maximum attenuation: .4 dB/km @ 1310 nm and .3 dB/km @ 1550 nm

   c. Maximum dispersion (1285 to 1330 nanometers): 3.5 ps/(nm/km)

   d. Zero dispersion slope (1300 - 1322 nm): -0.095/(nm2/km)

      Manufacturer: Corning Cabling Systems FREEDM® loose tube cables

2.5 FIBER OPTIC STATION CABLE MULTIMODE (MIC® PLENUM CABLES)

A. Materials

1. Application: Use for placement in fiber to the workstation within a building.

2. Compliance: NEC “OFNP”,CSA”FT-6” UL-910

3. Characteristics

   a. Dual optic, multimode cable intended for use with transmission rates up to and including 155 Mbps in a network with ATM standards

   b. 50/125 µm (core/cladding) dual window (850 and 1300 nanometers)

   c. Maximum attenuation: 3.0 dB/km @ 850 nm and 1.0 dB/km @ 1300 nm

   d. Minimum bandwidth:

      500 MHz/km overfilled bandwidth at 850 nm

      500 MHz/km overfilled bandwidth at 1300 nm

   e. 0.20 +/- 0.015 numerical aperture

   f. Strippable jacket and either a central strength member or high tensile strength yarn for mechanical protection

   g. Tension rating of 200 pounds or greater

   h. Equipped with breakout and furcation kits to dress the end of the cable.

B. Manufacturer: Corning Cabling Systems MIC® Plenum Cables

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. All installation work shall be performed according to published industry guidelines, rules, and regulations. If disputes occur, local, state, and national codes have precedence; then CSU polices and procedures; then standards such as EIA/TIA; then guidelines from firms such as Building Industry Consulting Services International (BICSI), Verizon, SYSTIMAX®; and Corning.

B. The Contractor shall provide sufficient trained staff to monitor all work undertaken and ensure that the requirements of these specifications are met throughout the installation process.

C. All tests will be conducted using equipment that has Laboratory or manufacturer certified calibration within six months of the tests. The Contractor shall provide a signed copy of the calibration test results for each item of test equipment with the acceptance documentation.

D. All installation work will be of the highest quality. The Contractor shall at all times conduct installation work in a manner so as to minimize the impact on the facilities. All work shall be hidden behind finished materials except in exposed ceiling spaces and in telecommunications rooms. All surfaces shall be returned to their original condition.

E. The Contractor shall provide and install all pathway and cable support hardware necessary to successfully complete the installation. This includes, but is not limited to, hangers, ladder racks, support brackets, conduit and sleeves, firestop materials, tie-wraps, and access openings such as core drills.

F. The Contractor shall ensure that only staff fully qualified to work on specific types of materials are allowed to undertake the required installation. Particularly, copper and fiber optic cable placement, termination, splicing, and testing shall only be undertaken by staff who are certified by the Structured Cabling System manufacturer.

G. The Contractor shall provide all hardware, software, and miscellaneous components necessary to provide a complete system.

3.2 INTERBUILDING COPPER CABLE

A. The interbuilding cables shall be installed by certified personnel according to the Superior Essex Outside Plant Cabling procedures.

B. Cables shall be routed in such a manner as to allow other maintenance activities to occur without damage to the cable. All cables in vaults shall be routed as close to walls as possible to reduce accidental damage. Cable routed through manholes shall be attached to the cable rack supports using "L" cable rack supports.

C. All cable runs installed in conduit or duct banks shall include a nylon pull cord (1/4 inch), tied off at each end of run, unless the conduit is full. A nylon or polyethylene pulling line shall be used in all fiber optics raceways. The pull cord shall be clearly labeled as "pulling line," indicating source and destination.

D. Placement of cable in individual conduits shall be determined by the Engineer of Record to ensure the best utilization of the distribution space. All conduits shall be pulled as full as possible without damage to the cable. All cables shall be secured to the wall of the BDFs, vaults, manholes, pull boxes, etc. using “L” cable rack supports.

E. All cables shall be clearly labeled with cable number and size at each end of the cable, when it enters or leaves a conduit, and at 30 foot intervals when run in accessible areas such as tunnels, manholes, ceilings, etc. See labeling requirements in specification section 16720.

F. All cables shall be placed using swivel pulling eyes to reduce cable coils.

G. All cables shall be routed with wide sweeps without bends or kinks in the cable or sheath. The

minimum bending radius for all cable is sixteen (16) times the cable diameter or manufacturer's specifications, whichever is greater.

H. Cuts and abrasions that penetrate the outer sheath of the cable shall be inspected by the Contractor and Inspector of Record to determine if the cable must be replaced or may be patched. Decisions regarding the suitability of cables damaged during placement will be the responsibility of the Contractor and Inspector of Record.

I. All cable shields shall be bonded end-to-end and grounded per TIA practices and the Telecommunications Electrical Protection Specification of Superior Essex.

J. Filled cables shall be spliced into shielded protector tails. Cable splices shall be attached to walls using "B" cable rack and "L" cable rack supports. Splices shall be properly secured to the "L" support preventing detachment by external forces. Splice cases shall be dressed and mounted to eliminate the movement of gel compound. All splice cases must be flooded with re-enterable compound.

K. Entrance Cables

1. A separate conduit with innerduct shall be used for fiber optic entrance cables.

2. Copper entrance cables shall not penetrate more than 50 feet (except in metallic conduit) before a conversion splice is made to fire resistant type cable (ARMM).

3. Filled cable shall not be terminated on 110 hardware without a transition splice to fire resistant type cable (ARMM) or tip cables.

4. All entrance cables and protectors shall be grounded per NEC article 800 and TIA/Systimax Telecommunications Electrical Protection Specification (Select code 350-060) and have continuous sheath continuity.

5. Indoor/outdoor type cable shall be used for the interbuilding fiber optic entrance cable eliminating the requirement for a transition splice from outdoor type to indoor type of cable.

3.3 COPPER STATION CABLE

A. All station cables shall be neatly dressed, secured, and concealed throughout the installation. Cables shall be secured with plastic ties to a snug fit but shall not deform the cable geometry. Ties shall be of a plenum-rated material if cable is installed within a plenum ceiling space.

B. All station cables shall be secured a minimum of six (6) inches above the ceiling T-bar grid. Ceiling grid supports, electrical conduit, water pipes, and HVAC ducting may not be used to support cables. In those areas without adequate support structures, the Contractor shall install "J" hooks or additional ceiling grid hangers on five-foot centers. No more than 12 individual cables will be secured to a single ceiling hanger without the use of a two-inch wide saddle to eliminate strain on individual cables. Cables shall not be placed within 24 inches of overhead lights or any other potential source of electrical interference.

C. In any area in which a fire-rated wall, partition, floor, or ceiling is penetrated, the Contractor shall be responsible for creating the pathway and sealing around all cables and sleeves with a UL classified fire seal sufficient to return the structure to its original rating. Creation of such openings as are necessary for cable passage between locations as shown on the drawings shall be the responsibility of the Contractor. Any opening in a rated structure created by the Contractor that is larger than one inch in diameter shall be equipped with a metal sleeve secured and fire-stopped in place.

D. No exposed cable shall be permitted in areas other than spaces above dropped ceilings.

E. All station cables shall be placed with a 1 meter maintenance loop (slack cable) neatly coiled and secured in the ceiling space above the BDF and IDF terminals to allow for future rearrangement.

F. The Contractor is responsible for removing, replacing, and repairing ceiling tiles in order to route all cables. Concealed spline ceiling tiles shall not be replaced until installation work in that area has been inspected and reviewed with Inspector of Record and approval given to re-fix the ceiling in place.

G. Voice station cables shall be terminated on insulated displacement hardware (e.g., Systimax 110) and shall be clearly marked per labeling requirements in specification section 16720.

H. Data station cables shall be terminated on Systimax, rack-mounted, data jack patch panels.

3.4 INTERBUILDING FIBER OPTIC CABLE

A. All fiber cable will be pre-tested by the manufacturer, before shipping, to guarantee there are no defective fibers. These cables shall be re-tested, on the reels, before installation to ensure no damage occurred during shipping.

B. No splices shall be made in the installed fiber optic cable except where noted on construction prints. Any other splice must have the agreement of the Engineer of Record. Any splices allowed must be fusion splices, and splice loss must not exceed .2dB at 1300 nm.

C. All splices must be fusion splices, any pigtails used must be tight buffered Kevlar, and splice loss must not exceed .2dB at 1300 nm.

D. All fiber optic cable must be coiled and securely mounted to the wall in a manner that will prevent physical damage and per the manufacturer's specifications of the selected Structured Cabling System.

E. All cables (and panels) must be clearly identified per labeling requirements in specification section 16720. All labels will be securely attached to each end of the cable whenever it enters or leaves a conduit and at 30 foot intervals when run in accessible areas such as tunnels, manholes, ceilings, etc.

F. Interbuilding fiber optic cable shall be placed within innerduct.

G. Direct termination of the interbuilding fibers is recommended; however, if pigtail splices are used, the terminating patch panels must provide adequate enclosed splice trays to secure the splices.

H. The Contractor shall ensure proper placement and pulling techniques are employed throughout the installation and testing of this cable. Breakaway swivel grips shall be used to reduce coiling of cable during the pull and to limit the potential of exceeding the stated pulling tension. Any observed bending of fiber cable during and after the installation that exceeds the manufacturer's recommended bending radius shall be cause for complete replacement of that cable by the Contractor.

I. All fiber must be terminated in a patch panel with LC style connectors. Field termination kits shall be utilized for all fiber terminations and shall be properly secured and protected from mechanical damage.

J. Coils of slack cable shall be provided in each fiber termination unit (patch panel) prior to terminating the cable on connectors. The amount of cable should comply with the manufacturer's requirements that are specified for the fiber termination unit.

K. At least 5 meters of cable (maintenance loop) neatly coiled and secured to the wall is required at each end of the fiber optic run.

L. Fiber cables shall be composite (hybrid) type cables consisting of multimode fibers and singlemode fibers under a single sheath as shown on the interbuilding fiber cable drawings.

3.5 FIBER OPTIC STATION CABLE

A. All fiber cable will be pre-tested by the manufacturer, before shipping, to guarantee there are no defective fibers. These cables should be re-tested, on the reels, before installation to assure no damage occurred during shipping.

B. No splices shall be made in the installed fiber optic station cable.

C. All fiber optic cable must be coiled and secured in a manner that will prevent physical damage.

D. All cables (and panels) must be clearly identified at both ends per labeling requirements in specification section 16720.

E. All cables shall be installed using Corning LANscape Cabling System standard procedures, tools, and equipment and must be protected from physical damage. All fiber cables must be installed so as to protect the optical fibers and connectors from strain and physical damage. The minimum bending radius must not be exceeded during cable placement.

END OF SECTION