

**SECTION 16725
TELECOMMUNICATIONS - CABLE**

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Inter-building Copper Cable
- B. Copper Riser Cable
- C. Copper Station Cable
- G. Inter-building Coaxial Cable
- H. Coaxial Distribution Cable
- I. Coaxial Station Cable
- J. Headend Cable

1.2 RELATED SECTIONS

- A. Contract Terms and Conditions
- B. Section 16710 - Telecommunications - General Requirements
- C. Section 16715 - Telecommunications - Acceptance Testing
- D. Section 16720 - Telecommunications - Basic Materials and Methods
- E. Section 16721 – Telecommunication - Air Blown Fiber Basic Materials and Methods
- F. Section 16730 - Telecommunications - Underground Structures
- G. Section 16740 - Telecommunications - Building (RF) CATV / MATV System
- H. Section 16760 - Telecommunications - Grounding and Bonding

1.3 APPLICABLE PUBLICATIONS

- A. As defined in Section 16710 - Telecommunications General Requirements
- B. California State University, Office of the Chancellor - Telecommunications Infrastructure Planning (TIP) Standards – Adopted July 2003, plus the latest TIP updates
- C. North Orange County Community College Telecommunications Standards, dated January 2007.

1.4 SUBMITTALS

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

- A. Product data, including both product construction and performance specifications, for each type and configuration of cable to be supplied. In addition, the Contractor shall provide product data and installation instructions for all fire-stop materials.
- B. Proof of Systimax Solutions Inc. SYSTIMAX® certification.
- C. Copies of signed optical cable reel tests.
- D. Proof of Broadband Communications Engineer and Technician qualifications.
- E. Proof of required licenses.

PART 2 - MATERIALS

The products listed in this section represent the standards for materials, workmanship, and performance for a NOCCCD project.

2.1. INTER-BUILDING COPPER CABLE (GEL-FILLED)

- A. Material
 - (1) Application: Use for outside conduit and direct buried applications.
 - (2) Compliance: RUS Specification 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 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.

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- (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: Superior Essex AR series

Deleted: Systemax Solutions Inc. No Longer Available

2.2 COPPER RISER CABLE

A. Material

- (1) Application: Use for placement in vertical risers in buildings and in general horizontal applications within buildings.
- (2) Compliance: Bellcore Specification TS-TSY-000111, UL Listed Type MPR/CMR
- (3) Core Construction:
 - a. Conductors: Solid-copper conductors, 24 AWG.
 - b. Insulation: Dual insulation consisting of an inner layer of foamed polyolefin surrounded by a solid PVC skin, color coded in accordance with telephone industry standards.
 - c. Twisted Pairs: Insulated conductors twisted into pairs with varying lay lengths to minimize crosstalk.
 - d. Core Assembly: Cable cores made up of 100 pair super-units consisting of four (4) 25 pair sub-units. Each group individually identifiable by color coded unit binders. Each 25 pair-unit within the 100 pair super-unit identified with a different binder color. (Note: "PIC MIRROR IMAGE" multi-unit identification used in cables over 900 pairs.)
 - e. Core Wrap: Non-hygroscopic dielectric tape applied longitudinally with an overlap.
- (4) Alvyn Sheath:
 - a. Aluminum Shield: Corrugated, adhesive coated, 0.008" aluminum tape applied longitudinally with a n overlap.
 - b. Jacket: Gray, flame retardant PVC jacket bonded to the coated aluminum.
- (5) Cable sizes defined in Contract Documents.

B. Manufacturer: Superior Essex AR series

Deleted: Systemax Solutions Inc., Product Number: ARMM NCA 4051 xxx. No Longer Available

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2.3 COPPER STATION CABLE

A. Material

- (1) Use for voice 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, 24 AWG, Category X, UTP, as defined by the EIA/TIA standards intended for use with transmission rates up to and including 100 Mbps.
- (4) A different colored Category X cable is to be used consistently throughout the project for each different colored jack. Voice is to use white cable with the electrical ivory jack. Data-1 is to use yellow cable with the orange jack. Data-2 is to use blue cable (medium) with the gray jack.

B. Manufacturer: Systimax Solutions Inc., Plenum UL Verified Category X, 2071 004E(XX) LAN Cable Gigaspeed XL *** Note: "XX" is for jacket color. White= "WH", Yellow= "YL", Blue = "BL"

2.4 INTER-BUILDING AIR BLOWN FIBER OPTIC CABLE (MULTIMODE)

A. Materials

- (1) Application: Use for placement in outside plant conduit between buildings.
- (2) Compliance: Meet or exceed ANSI/EIA/TIA-492 AAAAA specifications and characteristics listed below.
- (3) Characteristics:
 - a. Water exclusion gel-filled
 - b. Dielectric
 - c. Loose tube construction
 - d. 50/125 μm (core/cladding) dual window (850 and 1300 nanometers)
 - e. Maximum attenuation: 3.00 dB/km @ 850 nm and 1.0 dB/km @ 1300 nm
 - f. Minimum LED bandwidth: 1500 MHz/km @ 850 and 500 MHz/km @ 1300 nm
Minimum Laser bandwidth: 2000 MHz/km @ 850 and 500 MHz/km @ 1300 nm
 - g. Gigabit Ethernet guaranteed distance: 1000m @ 850/1300 nm
 - h. Maximum short term pulling tension of 600 lbs and long term tension of 200 lbs.

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- i. Equipped with a breakout, furcation, or blocking kit to dress the end of the cable and eliminate the flow of fill compound.

B. Manufacturer: Sumitomo Lightwave Corporation FutreFlex system.

2.5 INTER-BUILDING FIBER OPTIC CABLE (SINGLEMODE)

A. Materials

- (1) Application: Use for placement in outside plant conduit between buildings.
- (2) Compliance: Meet or exceed ANSI/EIA/TIA-492 AAAA specifications and characteristics listed below.
- (3) Characteristics:
 - a. Water exclusion gel-filled
 - b. Dielectric
 - c. Loose tube construction
 - d. 9/125/250 μm (core/cladding/protective coating) dual window (1300 and 1550 nanometers)
 - e. Maximum attenuation: .35 dB/km @ 1310 nm and .24 dB/km @ 1550 nm
 - f. Maximum dispersion (1285 to 1330 nanometers): 3.5 ps/(nm/km)
 - g. Zero dispersion slope (1300 - 1322 nm): -0.095/(nm²/km)
 - h. Maximum short term pulling tension of 600 lbs and long term tension of 200 lbs.
 - i. Equipped with a breakout, furcation, or blocking kit to dress the end of the cable and eliminate the flow of fill compound.

B. Manufacturer: Sumitomo Lightwave Corporation FutreFlex system.

2.6 INTER-BUILDING FIBER OPTIC CABLE (COMPOSITE)

A. Materials

- (1) Application: Use for placement in outside plant conduit between buildings.
- (2) Compliance: Meet or exceed ANSI/EIA/TIA-492 AAAA specifications and characteristics listed below.
- (3) Characteristics - Cable:
 - a. Combined multimode fibers and singlemode fibers under one cable sheath.
 - b. Water exclusion gel-filled
 - c. Dielectric

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- d. Loose tube construction
 - e. Maximum short term pulling tension of 600 lbs and long term tension of 200 lbs.
 - f. Equipped with a breakout, furcation, or blocking kit to dress the end of the cable and eliminate the flow of fill compound.
- (4) Characteristics - Multimode Fibers:
- a. 50um/12(5)µm (core/cladding) dual window (850 and 1300 nanometers)
 - b. Maximum attenuation: 3.00 dB/km @ 850 nm and 1.0 dB/km @ 1300 nm
 - g. Minimum LED bandwidth: 1500 MHz/km @ 850 and 500 MHz/km @ 1300 nm
Minimum Laser bandwidth: 2000 MHz/km @ 850 and 500 MHz/km @ 1300 nm
- (5) Characteristics - Singlemode Fibers:
- a. 9/125/250 µm (core/cladding/protective coating) dual window (1300 and 1550 nanometers)
 - b. Maximum attenuation: .35 dB/km @ 1310 nm and .24 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)
- B. Manufacturer: Sumitomo Lightwave Corporation FutreFlex system.

2.7 FIBER OPTIC RISER RATED CABLE (MULTIMODE)

- A. Materials
- (1) Application: Use for placement in vertical riser backbone within buildings.
 - (2) Compliance: Meet or exceed ANSI/ICEA S-83-596 per requirements of ANSI/TIA/EIA-568A specifications and characteristics listed below.
 - (3) Characteristics:
 - a. OFNR/FT4 rated for riser applications
 - b. Dielectric strength member
 - d. 50um/125 µm (core/cladding) dual window (850 and 1300 nanometers)
 - e. Maximum attenuation: 3.4 dB/km @ 850 nm and 1.0 dB/km @ 1300 nm
 - f. Minimum bandwidth: 200 MHz/km @ 850 and 500 MHz/km @ 1300 nm
 - g. .275 numerical aperture
 - h. Maximum short term pulling tension of 600 lbs and long term tension of 200 lbs.

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- i. Equipped with a breakout, furcation, or blocking kit to dress the end of the cable and eliminate the flow of fill compound.

B. Manufacturer: Sumitomo Lightwave Corporation FutreFlex system.

2.8 FIBER OPTIC RISER rated CABLE (SINGLEMODE)

A. Materials

- (1) Application: Use for placement in vertical riser backbone within buildings.
- (2) Compliance: Meet or exceed ANSI/ICEA S-83-596 per requirements of ANSI/TIA/EIA-568A specifications and characteristics listed below.
- (3) Characteristics:
 - a. OFNR/FT4 rated for riser applications
 - b. 8.3/125/245 μm (core/cladding/protective coating) dual window (1300 and 1550 nanometers)
 - c. Maximum attenuation: .7 dB/km @ 1310 nm and .35 dB/km @ 1550 nm
 - d. Maximum dispersion (1285 to 1330 nanometers): 2.8 ps/(nm/km)
 - e. Zero dispersion slope (1300 - 1322 nm): -0.095/(nm²/km)
 - f. Maximum short term pulling tension of 600 lbs and long term tension of 200 lbs.
 - g. Equipped with a breakout, furcation, or blocking kit to dress the end of the cable and eliminate the flow of fill compound.

B. Manufacturer: Sumitomo Lightwave Corporation FutreFlex system.

2.9 FIBER OPTIC STATION CABLE (MULTIMODE)

A. Materials

- (1) Application: Use for placement in fiber to the workstation within building a building.
- (2) Compliance: Meet or exceed ANSI X3T9.5 PMD specifications and characteristics listed below.
- (3) Characteristics:
 - a. Plenum Rated OFNP/FT6.
 - b. Dual optic, multimode cable intended for use with transmission rates up to and including 155 Mbps in a network with ATM standards.
 - c. 50 μm /125 μm (core/cladding) dual window (850 and 1300 nanometers)

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- d. Maximum attenuation: 3.4 dB/km @ 850 nm and 1.0 dB/km @ 1300 nm
- e. Minimum bandwidth: 200 MHz/km @ 850 and 500 MHz/km @ 1300 nm
- f. .275 numerical aperture
- g. Strippable jacket and either a central strength member or high tensile strength yarn for mechanical protection.
- h. Maximum short term pulling tension of 600 lbs and long term tension of 200 lbs.

B. Manufacturer: Systemax Solutions Inc., Multimode LazrSpeed 150 Series Building Cable Plenum Rated Series, Product Number: 5301-0XXA-HPAQ.

2.10 COAXIAL RISER CABLE

A. Materials

- (1) Application: Use for placement between IDFs on separate floors to distribute RF television signals.
- (2) Compliance: Meet or exceed NEC specifications and characteristics listed below.
- (3) Characteristics:
 - a. .500 and .750 coaxial cable, riser-rated (CATVR) unless placed in an open cable tray in a plenum space (plenum-rated (CATVP))
 - b. 75 ohm, foamed Teflon dielectric cable
 - c. Support frequencies between 5 - 1000 MHz
 - d. Nominal attenuation not to exceed 4.31dB per 100 feet at 1000 MHz
 - e. Capacitance 16.4 pF/ft ± .5 pF/ft.
 - f. Impedance 75 ohms ± 3 ohms

B. Manufacturer: Comm/Scope P3-500JCAR (Riser),2312K Plenum Trunk

2.11 COAXIAL BACKBONE CABLE

A. Materials

- (1) Application: Use for placement between IDFs on same floors to distribute RF television signals.
- (2) Compliance: Meet or exceed NEC specifications and characteristics listed below.
- (3) Characteristics:
 - a. .500 and .750 coaxial cable, plenum-rated (CATVP)
 - b. 75 ohm, foamed Teflon dielectric cable

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- c. Support frequencies between 5 - 1000 MHz
- d. Nominal attenuation not to exceed 4.31dB per 100 feet at 1000 MHz
- e. Capacitance 16.4 pF/ft \pm .5 pF/ft.
- f. Impedance 75 ohms \pm 3 ohms

B. Manufacturer: Comm/Scope **2312K Plenum Trunk**

2.12 COAXIAL STATION CABLE DROPS

A. Materials

- (1) Application: Use for all in-building wiring of the RF distribution system drops.
- (2) Compliance: Meet or exceed NEC specifications and characteristics listed below.
- (3) Characteristics:
 - a. RG - 6 cable, plenum-rated with a bonded foil aluminum shield having 100% coverage
 - b. An outer aluminum braid shield with 67% minimum coverage
 - c. Quad shield RG - 6 cable, plenum-rated for all MATV drops
 - d. Foamed Teflon dielectric with a .04 inch copper clad steel center conductor
 - e. Impedance 75 ohms
 - f. Support frequencies between 5-1000 MHz
 - g. Nominal attenuation not to exceed 5.78 dB per 100 feet at 600 MHz

B. Manufacturer: Comm/Scope **#2227V**

2.13 HEADEND CABLE (HEC)

A. Materials:

- (1) Application: Use in connecting the output ports of a modulator or processor to the input ports of the combining network for all in-building wiring of the RF distribution system drops. Also use in configuring other radio frequency and baseband cabling applications in the headend facility.
- (2) Compliance: Meet or exceed NEC specifications and characteristics listed below.
- (3) Characteristics:
 - a. Silver-plated copper-clad steel center conductor
 - b. Two separate layers of laminated aluminum tape

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- c. Two separate layers of aluminum or copper braid
 - d. Low loss, high velocity foam dielectric
 - e. Flame retardant PVC jacket per NEC Article 820
- B. Manufacturers: Comm/Scope, Inc. **F59 HEC-2VV**

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 policies and procedures; then standards such as EIA/TIA; then guidelines from firms such as Building Industry Consulting Services International (BICSI), AT&T, GTE, Systemax Solutions Inc. SYSTIMAX® and Northern Telecom; then finally, manufacturer recommendations.
- B. The Contractor shall provide sufficient trained staff to monitor all work undertaken and to 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 make every effort to conduct all installation work in a manner so as to minimize the impact on the facilities. Whenever possible, all work will be hidden behind finished materials and all surfaces will 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 Systemax Solutions Inc. SYSTIMAX® certified.
- G. The Contractor shall provide all hardware, software, and miscellaneous components necessary to provide a complete system.

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- H. The Contractor and Campus's representative shall coordinate cutover schedules prior to installation. The work will be scheduled so that the voice and data networks will be out of service for a minimum period of time
- I. No cables (copper, coaxial and / or fiber optic) will be spliced without written authorization from the Campus's representative.
- J. The bend radius of any cable installed must not exceed the manufactures specifications. In those cases, such as in wire mold, where the minimum radius cannot be maintained, a 90 degree fitting is to be used provided the performance criteria is not jeopardized.

3.2 INTER-BUILDING COPPER CABLE

- A. The Inter-building cables shall be installed according to Systimax Solutions Inc. SYSTIMAX[®] Premises Distribution System procedures, by certified personnel.
- B. Cables shall be routed in such a manner as to allow other maintenance activities to occur without damage to the cable. All cables shall be routed as close to walls as possible in vaults 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 Contractor and Campus's representative 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 (Campus's representative to determine scheme), 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.
- 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 Campus's representative 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 Campus's representative.

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- I. All cable shields shall be bonded end-to-end and grounded per AT&T/Systimax Solutions Inc. Telecommunications Electrical Protection Specification.
- 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. Cable splices in utility tunnels may be placed in cable trays if available and adequate maintenance space is maintained. Otherwise the above supporting requirements apply. 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) All cables shall enter a building through rigid metal or PVC conduit. Spare innerduct will be placed to fill the conduit to ensure maximum utilization of the conduit.
 - (2) A separate conduit with innerduct shall be used for fiber optic and coaxial cables.
 - (3) Cables shall not penetrate more than 50 feet (except in metallic conduit) before a conversion splice is made to fire resistant type cable (ARMM).
 - (4) Filled cable shall not be terminated on 110 hardware without a transition splice to fire resistant type cable (ARMM) or tip cables.
 - (5) All entrance cables and protectors shall be grounded per AT&T / Systimax Solutions Inc. Telecommunications Electrical Protection Specification (Select code 350-060) and have continuous sheath continuity.
- L. All installed empty conduits shall be plugged with a neoprene or rubber duct plug to prevent water and/or gas seepage into a building or manhole. Conduit containing cable will be filled with the appropriate compound.

3.3 COPPER RISER CABLE

- A. All riser cables shall be installed in a neat and orderly manner that provides the maximum amount of room for future cable additions. All riser conduits shall be pulled as full as possible. All cables shall be supported on each floor using at least three straps (not more than 30 inches apart) per floor. Riser cable shields shall be grounded on any floor in which pairs enter or leave the sheath. All shields shall be bonded end-to-end.
- B. All riser conduits shall be sealed using a UL classified firestop. The Contractor shall provide a copy of the fire seal manufacturer's installation instructions and rating information prior to inspection of the installed materials.

3.4 COPPER STATION CABLE

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- 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. In station locations with walls that must be fished, the Contractor shall place a plaster wall retaining ring or metal supporting "ears" around the outlet location to secure the outlet and face plate. No exposed cable shall be permitted.
- E. In locations where the wall will not be fished and surface-mount raceways are utilized, all raceways must be mechanically secured to the structure a minimum of every four feet, must be routed at right angles to nearby structures or wall corners, and shall be neatly installed and trimmed to fit into and around other existing moldings or pathways such as the ceiling area. Raceways shall be placed vertically only in corners of rooms and horizontal raceway placed at baseboard height to extend the cable run to the actual outlet location.
- F. A sufficient maintenance loop (slack cable), neatly coiled and secured in the ceiling space above the BDF and IDF terminals, shall be placed for all station cables to allow for future rearrangement.
- G. The Contractor is responsible for removing, replacing, and repairing ceiling tiles in order to route all cables. If the ceiling tiles are concealed spline, the tiles shall not be replaced until installation work in that area has been inspected and reviewed with Campus's representative and approval given to re-fix the ceiling in place.
- H. Voice and data station cables shall be terminated on insulated displacement hardware (e.g., AT&T 110) and shall be clearly marked with a unique identification number following the Campus's standard.

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- 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 with a unique cable/optic numbering system as defined by the Campus's representative.
- E. All cables shall be installed using Systemax Solutions Inc. SYSTIMAX 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.
- F. All cables (and panels) must be clearly identified at both ends with the Campus's approved, cable/optic numbering system.

3.6 COAXIAL RISER CABLE

- A. The Contractor shall install the coaxial riser cables within a single 4" conduit in the riser pathway (sleeves only).
- B. All cables, devices, and equipment must be clearly identified using the Campus's labeling plan.
- C. All cables shall be installed using published industry standard procedures, tools, and equipment and must be protected from physical damage. The minimum bending radius must not be exceeded during cable placement.
- D. Proper connect tools must be utilized. "Quick connect" connectors will not be allowed.

3.7 COAXIAL BACKBONE CABLE

- A. The Contractor shall install the coaxial backbone cables on the outboard side of the distribution pathways (cable trays) in the ground support clamp specified. The equivalent PW Industries part number is 999-1873-05 which will hold a 4/0 cable. The video cable is to be placed in the lower section allowing EMS, fire alarm, etc. to ride in the upper section. The nuts for these clamps must be on the outside of the tray.
- B. All cables, devices, and equipment must be clearly identified using the Campus's labeling plan.

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- C. All cables shall be installed using published industry standard procedures, tools, and equipment and must be protected from physical damage. The minimum bending radius must not be exceeded during cable placement.
- D. Proper connect tools must be utilized. "Quick connect" connectors will not be allowed.

3.9 COAXIAL STATION CABLE

- A. The Contractor shall install the coaxial station cables within a single 4" conduit in the riser pathway (sleeves only).
- B. All cables and outlets must be clearly identified using the Campus's labeling plan.
- C. All cables shall be installed using published industry standard procedures, tools, and equipment and must be protected from physical damage. The minimum bending radius must not be exceeded during cable placement.
- D. Proper connect tools must be utilized. "Quick connect" connectors will not be allowed.
- E. A maintenance coil of three additional feet of station cable shall be secured in the ceiling space above or near the outlet.

3.10 HEADEND AND DISTRIBUTION CABLE INTERFACE

- A. The Contractor shall install and construct all new services in the CATV headend location to the extent possible without disruption to ongoing Campus's programming.
- B. If applicable, the Contractor shall be responsible for re-assembly of the Campus's relocated distribution equipment in the new remodeled space. The Contractor shall coordinate with other trades, Campus's representative, and other providers to ensure that the primary distribution trunk and headend is fully functional.
- C. The Contractor shall provide a minimum of two (2) qualified CATV headend engineers to work directly with Campus's representative in order to complete a professional installation of the associated CATV distribution system.
- D. The Contractor shall be fully responsible for providing the materials and labor necessary to implement this system.
- E. The Contractor shall be fully responsible for the installation, positioning, and interconnection of this CATV distribution system.
- F. The Contractor is responsible for coordinating the installation of the CATV headend system in conjunction with the existing building RF systems to ensure the completed system functions, as outlined in the Contract Documents and as recommended by NCTA.
- G. Headend cable connectors and crimping tools shall be used to terminate HEC.

NAME OF PROJECT
LOCATION OF PROJECT

TELECOMMUNICATIONS CABLE
16725-15
XX% CONSTRUCTION DOCUMENTS – DATE HERE

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**SECTION 16725
TELECOMMUNICATIONS - CABLE**

END OF SECTION

SAMPLE

**NAME OF PROJECT
LOCATION OF PROJECT**

**TELECOMMUNICATIONS CABLE
16725-16
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