SECTION 27 1300 – COMMUNICATIONS BACKBONE CABLING

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Maintain Section format, including the UH Master spec designation and version date in bold in the center columns in the header and footer. Complete the header and footer with Project Information.

Designer is required to adhere to the University's "Network Infrastructure Design Standards" and "Electronic Access Control Design Guide" available in Owner's Design Guidelines on the University's Facilities Planning and Construction web site.

This Section uses the term "Architect" or "Engineer." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

Delete hidden text after this Section has been edited for the Project.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this Section.

B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:

1. The current version of the *Uniform General Conditions for Construction Contracts*, State of Texas available on the web site of the Texas Facilities Commission.
2. The University of Houston's Supplemental General Conditions and Special Conditions for Construction.

1.2 SUMMARY

A. Section Includes:

1. Coordination with other trades and parts of the Contract.
2. Submittals.
3. Quality Assurance.
4. Parts and Manufacturers.
5. Installation and Testing.

B. The building backbone riser system connects Network Facilities to each other, to the Main Service Entrance Room, and to the Equipment Room. The Owner specifies separate cable systems to provide data, video and voice needs. The backbone riser system consists of plenum-rated, multi-pair twisted pair copper cables, coaxial, and single mode fiber cables along with

associated termination systems. This Section covers labor, equipment, supplies, materials and testing involved in installing, terminating and labeling copper and fiber backbone infrastructure as described on the Drawings or required by these Specifications.

1.3 COORDINATION

A. New cable plant requiring connection to, or disconnection from, University of Houston campus networks is to be performed the UIT Project Manager. Campus networks include telephone, local and wide area, video, cable television, and fiber optic networks.

B. Drawings in general are diagrammatic. It is the full responsibility of the Contractor to be familiar with the location of equipment involved under the work of other trades to eliminate conflicts between fiber and copper cable installation and the work of other trades.

C. Direct questions and issues regarding IT coordination to the UIT Project Manager.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Follow the Submittal Administrative Requirements as stated in Section 01 3300 “Submittal Procedures.” Use electronic format only.

1.5 ACTION SUBMITTALS

A. Submit installation plan, and keep up-to-date throughout the Project, indicating:

1. Equipment and personnel.
2. Materials and staging area.
3. Start and completion dates.
4. Locations, including floor, room and building.
5. Installation plan shall be reviewed, approved and stamped by the Contractor's on-site RCDD prior to submittal for review and approval by the UIT Project Manager.

B. Submit copper cable pulling plan for all multi-pair copper cables with a pair count of 25 pairs or greater, that includes, but is not limited to, the following:

1. Each cable run and route.
2. Date and duration of the pull.
3. Pulling methodology and equipment setups.
4. Pulling tension calculations for each pull in the run.
5. Safety issues and precautions to be taken.

C. Submit cable pulling plan, as follows:

1. Indicate the installed backbone conduit layout in schematic format, including junction boxes and distances between junction boxes.
2. Indicate contents of each conduit.

3. Indicate the cable pulling calculations, conduit fill ratios and actual cable runs and tensions.
4. Cable pulling plan and calculations shall be reviewed, approved and stamped by the Contractor's on-site RCDD prior to submittal for review and approval by the UIT Project Manager.

D. Cable Splicing Submittals

1. Fiber fusion splicing method and procedures.
2. Schedules of copper and fiber cables to be spliced.
3. Copper splicing method and procedures.
4. Certification documents for all splicing personnel.
5. Cut sheets of accurate locations of fiber and copper splice closures.

E. Shop Drawing Submittals to include:

1. Room penetration Drawing.
2. Communications extension pathway Drawing.
3. Riser conduit anchoring Drawing.
4. Conduit chase Drawing.
5. Communications pathway Drawing.
6. Junction box, gutter and pull box labeling Drawing.
7. Cabinet / rack elevation Drawing.
8. Floor plan for all NF rooms.
9. Wall elevation Drawings for all NF rooms.

F. Manufacturer's data, including part numbers, cut sheets and detailed descriptions, for all proposed equipment.

G. Submit cable inventory data for all fiber, copper, and coaxial cabling and termination equipment. Submit data in Microsoft Excel format (current version), listing products furnished, including:

1. Manufacturer's name.
2. Manufacturer's part numbers and com code numbers.
3. Cable numbers as described in Section 27 0553 “Identification for Communications Systems.”
4. Location and riser assignments.
5. Installed lengths for all fibers.
6. This requirement applies to copper cable, fiber optic cable, and all termination equipment.

H. Product data for all termination and test equipment to be used by Contractor to perform work.

1. Calibrate equipment with traceability to National Institute of Standards and Technology (NIST) requirements.
2. Include a copy of calibration and certification that equipment calibration meets NIST standards and has been calibrated at least once in the previous calendar year.
3. Test equipment data shall be reviewed, approved and stamped by the Contractor's on-site RCDD prior to submittal for review and approval by the UIT Project Manager.

1.6 INFORMATIONAL SUBMITTALS – Not Used

1.7 QUALITY ASSURANCE

A. Verification

1. Verify that the installation and material used has been inspected by the UIT Project Manager before it is enclosed within building features, or otherwise hidden from view. Contractor shall bear costs associated with uncovering or exposing installations or features that have not been inspected.

B. Equipment

1. Use equipment and rigs designed for pulling, placement and termination of multi-pair copper and fiber optic cabling ; including reel trucks, mechanical mules, sheaves, shoes, anchors etc., and equipment for drilling masonry, installing anchors, etc., to install support and cable management hardware.

PART 2 - PRODUCTS

2.1 PARTS AND MANUFACTURERS

A. Refer to Section 01 2500 “Substitution Procedures” for variations from approved manufacturers or parts. Obtain prior written approval for substitutions from both the Owner’s Project Manager and the UIT Project Manager.

B. Backbone Cables

1. Berk-Tek

a. Part Number: 10032113 - Solid Copper Backbone/Tie Copper Cable: 24 AWG, UTP, Category 3, OSP Backbone Cables with an overall metallic shield.

C. Protector Panels.

1. Circa Enterprises

a. Entrance Terminals: 188OECA1-100G
b. Protector Modules: Gas Protector Unit - 3BIE

D. Copper Termination Hardware (Cat 3, legacy applications) – Main Cross Connect (MC)

1. Panduit

a. 5 Pair: P110KB1005
b. 4 Pair: P110KB1004

2. CommScope

a. 5 Pair: UNK-110-WB-5M-100PR
b. 4 Pair: UNK-110-WB-4M-100PR

E. Copper Termination Hardware (Cat 3, legacy applications) – Building Distribution Frame (BDF)

1. Panduit

   a. 5 Pair: P110KB1005
   b. 4 Pair: P110KB1004

2. CommScope

   a. 5 Pair: UNK-110-WB-5M-100PR
   b. 4 Pair: UNK-110-WB-4M-100PR

F. Angled Patch Panels (Cat 3, legacy applications) – Equipment and IDF – 48-port, filled and terminated with appropriate number of black RJ-45 jacks.

1. Panduit - UICMPPA48BL
2. CommScope - 760207308

G. Copper Termination Hardware (Cat 6) – Main Cross Connect (MC)

1. Panduit

   a. 5 Pair: P110KB1005
   b. 4 Pair: P110KB1004

2. CommScope

   a. 5 Pair: UNK-110-WB-5M-100PR
   b. 4 Pair: UNK-110-WB-4M-100PR

H. Copper Termination Hardware (Cat 6) – Building Distribution Frame (BDF)

1. Panduit

   a. 5 Pair: P110KB1005
   b. 4 Pair: P110KB1004

2. CommScope

   a. 5 Pair: UNK-110-WB-5M-100PR
   b. 4 Pair: UNK-110-WB-4M-100PR

I. Angled Patch Panels (Cat 6) – Equipment and IDF – 48-port, filled and terminated with appropriate number of black RJ-45 jacks.

1. Panduit - UICMPPA48BL
2. CommScope - 760207308

J. Fabric Inner-duct

1. MaxCell

K. Metallic Tone Tape

1. Arnco

a. DL WP12LC Tone Tape

L. Outside Plant Fiber Optic Cable

1. CommScope

a. 48-strand 9/125-micron single-mode outside plant rated fiber optic cable
b. 12-strand 62.5/125-micron multimode outside plant rated fiber optic cable (MM OSP cable shall be used only for fire alarm systems on the main campus; all other applications, including UH Technology Bridge fire alarm system, shall use SM OSP cable)

M. Inside Plant Fiber Optic Cable

1. CommScope

a. 12-strand Plenum-rated 9/125-micron single-mode fiber optic cable
b. 6-strand Plenum-rated 62.5/125-micron multi-mode fiber optic cable

N. Fiber Termination Hardware

1. Rack-mounted Fiber Distribution Units

a. CommScope

1) For ER: #RFE-FXD-EMT-BK/4U
2) For NFs: #RFE-SLG-EMT/2U

2. Use LC fiber connectors, except in the case of fire alarm systems using multimode fiber optic cable, which require ST fiber connectors.

O. Firestopping Materials

Designer: Coordinate with UIT Project Manager to include the specific EZ-Path model(s) required for the Project.

1. Basis of Design Product: Specified Technologies EZ-Path firestop pathways.
2. Comply with requirements of Section 07 8413 “Penetration Firestopping.”

PART 3 - EXECUTION

3.1 CABLE INSTALLATION – OUTSIDE PLANT

A. Communications conduits shall be the top tier utility within the duct bank with a minimum of 18-inch separation from high voltage cabling.

B. All fiber optic cable with loose tube construction installed underground shall be gel filled or constructed of appropriate waterproofing compounds.

C. Fiber optic cable installed in manholes between buildings shall have a minimum of two (2) complete loops of at least 50 feet in each manhole.

D. A copper tracer line shall be run with all fiber that is in a non-metallic conduit. In each conduit, install a pull cord having a metallic member (tone tape) with a minimum test rating of 200 pounds pulling strength. Secure all pull cords to prevent accidental removal.

E. Fiber optic cables shall have minimum 20-foot service loops at the terminating ends and all approved splice points. Place service loops with large bend radii neatly bundled on walls or attached to the bottom side of ladder trays in 'figure-8' configuration.

F. Install cable runs in one continuous length from bulkhead connector to bulkhead connector without splices, unless given a specific directive otherwise in the Drawings.

G. Place all newly installed fiber optic cable inside fiber optic inner duct with one-inch inside diameter when not in conduit or utility tunnel cable tray.

H. When splicing into the Metro fiber ring, all fiber cable installations shall be 100 percent terminated except as directed by the UIT Project Manager.

I. Install plastic dust caps on all unused fiber terminations.

J. Single-mode cable attenuation at 1310nm shall not exceed 1 dB plus 0.0008 dB per foot, end to end.

K. The average/maximum fiber splice loss shall be 0.05/0.3 dB for single-mode fusion splices and 0.10/0.3 dB for mechanical splices.

L. Include two fiber optic cables in each elevator umbilical.

M. Install shield bond connectors to the shields of all cables terminated at the Protector Panels.

N. Voice backbone cables installed in underground conduits or a tunnel shall be gel-filled PIC cable to a termination point within the ER. The backbone cable shall then be cross-connected to the protector blocks.

O. Apply an appropriate amount of damming compound over the end of filled copper cables in indoor or dry environments to prevent seepage of cable filling compounds where encapsulant cannot be used.

P. Prior to closure assembly in dry or indoor installations, all exposed cable pairs shall have the filling compound thoroughly cleaned off the cable insulation using appropriate cleaning solvents.

Q. All splice cases used in the multi-pair voice backbone shall be waterproof.

R. Test all spliced pairs and clear all splice-related faults prior to sealing the closure

S. Voice backbone cables shall have a minimum 10-foot service loop when terminated in the NF and at any splice points in telecommunications manholes.

T. Submit preliminary fiber test results to the UIT Project Manager after installation and before being put into service to provide for correction of any non-conformities or inconsistencies and to avoid disruptions to the active network.

3.2 BACKBONE CABLE TESTING

A. Provide end-to-end test results for all copper UTP and fiber optic lines.

B. All fiber optic cable shall be visually inspected and optically tested on the reel upon delivery to the installation site. Test all fibers for continuity and attenuation using Optical Loss Test Sets (OLTS) or an Optical Time Domain Reflectometer (OTDR), an access jumper with like fiber, a pigtail, and a mechanical splice.

C. After installation, provide end-to-end (bi-directional) test measurements for single-mode and multimode fibers (2 wavelengths per test are required). Test results shall be submitted for review as part of installation inspection requirements.

D. Test all fibers in the completed end-to-end system, following the technical criteria and formulae in the applicable section of ANSI/TIA-568-x-D. Note however, that all fiber shall be tested, rated and guaranteed for Ethernet GigaSPEED 1000B-X performance. Additionally, all fiber optic cable links shall pass all installation and performance tests both recommended and mandated by the cable manufacturer.

E. All multi-pair copper cable pairs installed shall be tested to ANSI/TIA-568-x-D, Category 3 or Category 6 equivalent performance specifications using level IIe or higher field testers. In addition, provide loop resistance measurements in ohms and dB loss at 1 KHz, 8 KHz, and 256 KHz.

1. Test each pair and shield of each cable for opens, shorts, grounds, and pair reversal. Correct any reversed or grounded pairs. Examine open and shorted pairs to determine if problem is caused by improper termination. If termination is proper, tag bad pairs at both ends and note on termination sheets.
2. If copper cables contain more than the number of bad pairs shown in the table below, or if outer sheath damage is the cause of bad pairs, remove and replace the entire cable.

MAXIMUM PERMISSIBLE BAD PAIRS IN CAT 3 CABLING

CABLE SIZE	MAXIMUM BAD PAIRS
<100	1
101 to 300	1 – 3
301 to 600	3 – 6
>601	6

F. Notify Owner’s Project Manager and UIT Project Manager at least 24 hours prior to testing to allow observation at Owner's discretion. If Owner confirms intention to observe, agree with UIT

Project Manager upon a reasonable starting time. Should UIT Project Manager not be present at the scheduled commencement time, Contractor may begin testing as scheduled.

G. Format: Submit test results in two (2) formats: first, original file(s) downloaded from tester; second, data in Excel format with the following fields: NF RM # / RM # of drop / Port # / all relevant test information in as many fields as necessary.

H. All test results shall be recorded and submitted to Owner for checking within 10 business days of cable installation.

3.3 CABLE AND TERMINATION PANEL LABELING

A. Label the installed cables in accordance with Section 27 0553 “Identification for Communications Systems.”

3.4 CABLE SUPPORT

A. Provide cable supports and clamps to attach cables to backboards and walls.

1. Attach horizontal and vertical backbone cables at 2-foot intervals using Owner-approved supports such as D-rings or jumper troughs utilized for wire management.

B. Attach cables to manhole racks using Owner-approved methods.

3.5 CLOSE-OUT DOCUMENTS

A. Red Line Drawings: Contractor shall keep one set of floor plans at the Project Site during working hours with installation progress marked and backbone cable labels noted. Red line drawings are required to be available for examination during construction meetings and field inspections.

B. As-Built Drawings:

1. Provide files in .dwg, .rvt and .pdf formats showing floor plans with room numbers and final backbone cabling and pathway locations and labeling.
2. Submit within 5 business days of final cable testing.
3. Include GPS coordinates of all manhole/pull boxes.

END OF SECTION 27 1300