

SECTION 27 13 14
COMMUNICATIONS BACKBONE OSP TWISTED PAIR CABLING
Construction Specification

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Backbone OSP (outside plant) twisted pair cabling.
- B. Related Sections
 - 1. Comply with the Related Sections requirements of Section 270000.
 - 2. Section 270811, "Communications Twisted Pair Testing"

1.2 REFERENCES

- A. Comply with References requirements of Section 270000.
- B. In addition to the codes and standards listed in Section 270000, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
 - 1. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
 - a. UL 497, "Protectors for Paired-Conductor Communication Circuits"
 - b. UL 497A, "Secondary Protectors for Communications Circuits"
 - c. UL 497B, "Protectors for Data Communications and Fire-Alarm Circuits"
 - d. UL 497C, "Protectors for Coaxial Communications Circuits"
 - e. UL 1863, "Communications-Circuit Accessories"
 - f. UL 1863, "Communications-Circuit Accessories"
 - 2. Insulated Cable Engineers Association (ICEA)
 - a. ANSI/ICEA S-84-608-2007, "Telecommunications Cable Filled, Polyolefin Insulated, Copper Conductor Technical Requirements"
 - b. ANSI/ICEA S-85-625-2011, "Telecommunications Cable Aircore, Polyolefin Insulated, Copper Conductor Technical Requirements"
 - c. ANSI/ICEA S-107-704-2012, "Broadband Buried Service Wire, Filled, Polyolefin Insulated, Copper Conductor Technical Requirements"
 - 3. Telcordia
 - a. GR-421-CORE Issue 2, "Generic Requirements for Metallic Telecommunications Cables"

1.3 DEFINITIONS

- A. Refer to Section 270000 for Definitions.
- B. In addition, define the following list of terms as used in this specification as follows:
 - 1. "BEP": Building Entrance Protection [systems]
 - 2. "CMP": Communications Media Plenum [NEC plenum rating]
 - 3. "CMR": Communications Media Riser [NEC riser/non-plenum rating]
 - 4. "HDPE": High Density Polyethylene

5. "ISP": Inside Plant [cabling]
6. "LDPE": Light Density Polyethylene
7. "OSP": Outside Plant [cabling]
8. "PE": Polyethylene
9. "PIC": Plastic Insulated Conductor
10. "PVC": Polyvinyl Chloride

1.4 SYSTEM DESCRIPTION

A. Work Provided Under Other Sections

1. Telecommunications Pathways

- a. Pathways (underground conduits, maintenance holes, pull boxes, pull ropes, etc.) will be provided under other Sections.
- b. Refer to the Drawings for size/capacity and route information.

2. Telecommunications Rooms

- a. Buildout (e.g., backboards, overhead and vertical cable runway, etc.) of the telecommunications rooms (MDF, BDFs, IDF) work will be covered under another Section.
- b. Refer to the Drawings for buildout information.

B. Base Bid Work

1. Provide engineering, labor, materials, apparatus, tools, equipment, and transportation required to make a complete working telecommunications backbone twisted pair cabling system installation described in these specifications and shown on related Drawings.
2. The Drawings are diagrammatic in nature, and require shop drawings to complete the detailed design of the communications infrastructure.
3. Consider Backbone cabling as shown on Drawings as base bid work, unless otherwise noted. This includes terminations at both ends.
4. In general, the base bid work includes:
 - a. Submittals
 - b. Backbone outside plant (interbuilding) twisted pair (copper) cables and terminations
 - c. Building entrance protection and terminal
 - d. Splicing apparatus
 - e. Cable management
 - f. Crossconnects
 - g. Cable identification tags and system labeling
 - h. Record Documents
 - i. Warranty

1.5 SUBMITTALS

- A. Comply with Submittal procedural, quantity, and format requirements of Section 270000.

B. Submittal Requirements Prior To Start Of Construction:

1. Product Data Submittal, indicating conformance with NEC, UL, TIA/EIA listings, certifications and specifications.

1.6 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 270000.

B. Contractor Qualifications

1. In addition to the Contractor Qualifications requirements of Section 270000, the Contractor shall be manufacturer certified to install the proposed and submitted cabling system and to provide an extended warranty. Provide satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the bid submission.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 270000.

1.8 WARRANTY

- A. The communications cabling system, as specified in this Section, shall carry a 15-year (minimum) extended system warranty. This extended warranty shall cover parts and labor for the duration of the extended warranty. This extended warranty shall also cover electrical performance of cabling system to the specific category per ANSI/TIA-568-C performance criteria for backbone cabling.

PART 2 PRODUCTS

2.1 UNDERGROUND CABLES – DUCT/CONDUIT

A. Application:

1. Cable shall be suitable for underground conduit installations.
2. Each and every cable run shall be a continuous single cable, homogenous in nature. Splices are not permitted anywhere (unless otherwise shown on project drawings).
3. Cable type shall be PIC twisted pair, filled core, with an “ALPETH” sheath and compatible with RDUP type “PE89-AL”.

B. Conductors:

1. Solid, annealed copper, 24 AWG
2. Fully insulated conductors consisting of an inner layer of expanded polyolefin, covered with an outer layer (skin) of solid polyolefin
3. Conductors twisted into pairs. Twisted pairs are stranded into 25-pair bundles and into units (and super units, if required by pair count)
4. Color Coding: Twisted pairs and units (supper units, if necessary) individually color-coded to industry standards (ANSI/ICEA Publication S-80-576, and EIA-230)

C. Core & Sheath:

1. Cable core shall have a tape applied longitudinally (wrapped around its entirety)
 - a. Tape Material: non-hydroscopic dielectric (polypropylene) film, or

equivalent

2. Cable core and sheath flooded (interstices between the pairs and under the core tape) with filling compound to protect against moisture penetration
 - a. Filling compound: 80°C ETPR compound, or equivalent
 3. Sheath Type: "ALPETH". Sheath consists of a shield and an outer jacket
 - a. Shield: Corrugated bare 8 mil aluminum tape applied longitudinally over the core wrap
 - b. Outer Jacket: PE, black, with UV inhibitors, bonded to shield
- D. Standards Compliance:
1. Telcordia GR-421-CORE Issue 2
 2. RoHS-compliant
- E. Manufacturers:
1. General Cable
 2. Superior Essex
 3. Belden

2.2 SPLICE CLOSURES AND ACCESSORIES

- A. Splice Closure – Building Entrance Type
1. Application: Splice closure system shall be suitable for indoor installation within an entrance facility for splicing between OSP and ISP cable.
 2. Closure:
 - a. Re-enterable
 - b. Through-splice or butt-splice configurations will be accepted.
 - c. Solid sleeve, or slip sleeve acceptable.
 - d. End caps shall accept eight single collared or having multiple holes.
 3. Manufacturer:
 - a. 3M Telecom Systems
 1. #5-26; solid closure, up to 600 pair,
 2. #5DS-26; split closure, up to 600 pair
 3. #C5-100-6; end caps (to be sized to cable entry and exits)
 4. #4460; shield bond connector for cables 100-pair or larger
 5. #4460-D; shield bond connector for cables 100-pair or smaller
 6. #25T ground braid or #25T ground braid with eyelets
- B. Splice Closure – Underground Vault Type
1. Application: Splice closure system shall be suitable for outdoor installation within underground vault and/or maintenance hole.
 2. Closure:
 - a. Re-enterable
 - b. Through-splice or butt-splice configurations will be accepted
 - c. End caps that accept one cable per end / one incoming cable and two outgoing cables
 3. Air and watertight closure system and RUS listed and UL approved

4. Manufacturer:
 - a. 3M Telecom Systems
 1. "Better Buried" series gravity filled closures
 2. #4460; shield bond connector for cables 100-pair or larger
 3. #4460-D; shield bond connector for cables 100-pair or smaller
 4. #25T Ground Braid or #25T Ground Braid with Eyelets

C. Encapsulant

1. Application: Encapsulant shall be suitable for outdoor installation within underground splice closures (vault and/or maintenance hole).
2. Re-enterable encapsulant
3. Manufacturer:
 - a. 3M Telcom Systems
 1. #4442; "High Gel" re-enterable encapsulant

2.3 SPLICE MODULES

A. Splice Module – 710 Dry Straight Type

1. Application: Cable transition (OSP to ISP) in telecom rooms.
2. Modules shall accept mixed solid wire gauges (26 AWG – 19 AWG) and mixed insulation types (PIC, PVC, pulp or paper) up to maximum insulation outside diameter of (.70).
3. Manufacturer:
 - a. 3M Telcom Systems
 1. #3M710-SD1-25; 25-pair 710 dry straight splicing module

B. Splice Module – 710 Filled Straight Type

1. Application: In-line or branch splicing of OSP cables in underground vaults or manholes.
2. Modules shall accept mixed solid wire gauges (26 AWG – 19 AWG) and mixed insulation types (PIC or PVC) up to maximum insulation outside diameter of (.70).
3. Modules shall be 'filled' with water resistant compound.
4. Manufacturer:
 - a. 3M Telcom Systems
 1. #3M710-SC1-25; 25-pair 710 filled straight splicing module

2.4 BUILDING ENTRANCE PROTECTION

A. BEP Terminal – Swivel Stub Input, 110 Output

1. Application: BEP terminal shall be suitable for indoor installation, within a telecom room (such as an Entrance Facility or 'MPOE'). BEP terminals shall provide termination of the backbone twisted pair cables specified within this Section, shall protect premises equipment against induced voltages and stray currents, and shall accept '5-pin' protector modules specified within this Section.
2. Configuration: BEP terminal shall be designed for a wall-mounted configuration, and shall have the capacity to accept 100-pair or 50-pair incoming and outgoing pairs.

3. Input: 100-pair or 50-pair 26 AWG UTP 'fusible' swivel stub. Output: 110 type punch down.
4. Manufacturer:
 - a. CommScope SYSTIMAX
 1. #489ACC1-100; 100-pair BEP terminal, swivel stub input, 110 output
 2. #489ACC1-050; 50-pair BEP terminal, swivel stub input, 110 output
 - b. Porta Systems
 1. #25100-ST-M110; 100-pair BEP terminal with swivel stub input, 110 output
 2. #25050-ST-M110; 50-pair BEP terminal with swivel stub input, 110 output
 - c. Or equal
- B. BEP Modules – With Sneak Current Protection
 1. Standard 5-pin type BEP, suitable for installation into BEP terminals.
 2. Overvoltage Device: solid state. DC Breakdown Voltage: 220 V. Response time: <100 nsec.
 3. Sneak Current Device: heat coil. Sneak Current: 1 A. Response Time: < 15 sec.
 4. Manufacturer:
 - a. Circa
 1. #4B1FS-240; solid-state module, 240V breakdown voltage, black
 - b. CommScope SYSTIMAX
 1. #4C1S; solid-state module, 220V – 300V breakdown voltage with sneak current protection, black
 - c. Porta Systems
 1. #115SCG-240V; solid-state module, 220V breakdown voltage, black
 - d. Or equal

2.5 LABELS

- A. Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer.
- B. Labels for Cables
 1. Labels shall be adhesive-backed and have a self-laminating feature
 2. Labels shall fit the backbone cables listed above (i.e., shall fully wrap around the cable's jacket).
 3. Printable area should be 1 inch wide x 0.5 inch high, or larger
 4. Printable area color shall be white
 5. Manufacturer:
 - a. Panduit
 1. #S200X400YAJ; labels for 25 to 100 pair cables [0.32" (8.09mm) - 0.95" (24.26mm) dia.]

2. #S200X650YAJ; labels for 100 to 400 pair cables [0.48" (12.13mm) – 1.59" (40.43mm) dia.]
- b. Or equal

2.6 DUCT PLUGS

- A. Plug shall create a watertight seal between interior of conduit and exterior of cable sheath.
- B. Manufacturer:
 1. Tyco
 2. Carlon
 3. Or equal

PART 3 EXECUTION

3.1 GENERAL

- A. Comply with the Execution requirements of Section 270000.

3.2 EXAMINATION AND PREPARATION

- A. Rooms: Prior to installation, verify equipment rooms are suitable to accept the backbone twisted pair cables and terminations.
- B. Pathways: Prior to installation verify that pathways and supporting devices, provided under other sections, are properly installed, and that temporary supports, devices, etc., have been removed. Verify dimensions of pathways, including length (for example, "True Tape" the conduits).
- C. Cable Integrity: Prior to installation, verify the twisted pair cable is fully operational – both cable sheath and twisted pair conductors. Documentation of pre-installation testing is not a close out requirement, and is the responsibility of the Contractor.

3.3 INSTALLATION

- A. OSP Interbuilding Backbone Cable
 1. Cable runs shall have continuous sheath continuity, homogenous in nature, between either termination points or designated splices points. Only splices as noted on the Construction Documents are permitted.
 2. Maximum cable length of 1,500 meters between termination points.
 3. Placement
 - a. Place cables within designated pathways.
 - b. Maintain a minimum bend radius of 6 times the cable diameter during installation.
 - c. Maintain pulling tension within manufacturer's limits. Only use UL approved cable-pulling compounds when necessary to reduce pulling tensions.
 - d. Protect cable during installation. Place and suspend cables in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cable if damaged during installation.

- e. Neatly dress and organize cables in the cable routing facilities, and fastened to support devices via tie wraps.
 - f. Place a pull rope along with cables where run in conduit and spare capacity still exists in the conduit. Tie off ends of the pull rope.
4. Routing:
- a. When routing horizontally within telecommunications rooms, utilize the overhead cable support; route backbone cables to avoid crossing over horizontal cabling or horizontal cabling crossing backbone cabling. When routing vertically within telecommunications rooms, utilize the vertical cable support and provide cable ties every 24 inches on center using.
 - b. Route cables a minimum of 6" away from power sources to reduce interference from EMI.
5. Duct Plugs
- a. Provide duct plugs into each duct port in maintenance holes/pullboxes and building entrances.
6. Termination
- a. Provide 15 feet cable slack loop at each end of the run. Store slack in overhead cable support or as noted on Drawings.
 - b. Properly strain relieve cables at designated points per manufacturer's instructions.
 - c. Terminate copper pairs at both ends on the specified BEP. Perform terminations in accordance with manufacturer's instructions and ANSI/TIA-568-C standard installation practices.
7. Labeling
- a. Provide labels on each end of the cable, no more than 4" from where the cable enters the specified splice closure.
 - b. Place labels such that they are visible by a technician from a normal stance.
- B. Underground Splicing Systems
- 1. Provide underground splice systems either as shown on the Drawings or as shown on approved shop drawing submittal, including closure, end caps, splice modules, grounding components, and accessories required for a complete installation. Install splice closure and splice modules per manufacturer's instructions using tools intended for the purpose. Provide re-enterable encapsulant within enclosure.
 - 2. Size enclosure based on splice bundle diameter, and size ends caps based on largest cable.
 - 3. Include required accessories, such as collars, grommets, bushings, bonding connectors, etc. for a complete installation.
 - 4. Thoroughly clean and separate binder groups prior to installing splice modules.
 - 5. Apply sealant (such as B-sealant) to the end of the cable where the pairs exit the cable sheath – this to prevent water-blocking gel from leaking out the cable's sheath.
 - 6. Provide labels on each splice module and binder group in splice closure.
 - 7. Grounding and Bonding
 - a. Bond cable shield to splice closure bond assembly. Provide bonding conductor from splice closure bond terminal to ground terminal within maintenance hole, if available.

2. Provide accessories required for a complete installation.
 3. Mount blocks plumb and square.
- F. Crossconnects
1. In the MPOE, provide one 1-pair crossconnect to length from the equipment field to the backbone field based on the records.
 2. In the MPOE utilize the horizontal and vertical management components to properly route the crossconnect wire to the 66-block on the Hamaco Frame
 3. In the MDF/IDF, twisted pair cable will terminate in 24 pair 1U patch panel in rack.
 4. Splices in crossconnect wire are prohibited.

3.4 LABELING

A. General Requirements

1. Labeling and identifier assignment and the label colors shall conform to the TIA/EIA-606-A Administration Standard and as approved by Owner or Owner's Representative before installation.
2. Provide permanent and machine-generated labels; hand written labels will not be accepted.

B. Cable Labels

1. Label Format:
 - a. Label type shall be wrap-around self-laminating.
 - b. Label color shall be white background with clear laminating window.
 - c. Text color shall be black; text height shall be 1/8" high, minimum, or #12 font size.
2. Provide labels on both ends of cables. Fully wrap label around the cable jacket. Install labels no more than 4 inches from the edge of the cable jacket. Install labels such that they are visible by a technician from a normal stance.

C. Protection and Termination Apparatus Labels

- a. Use labels included in the product packaging. Request approval by the Engineer for substitutions.
- b. Label color shall be brown for respective field type, per TIA/EIA-606-A.
- c. Text color shall be black, 3/32" high, minimum, or #10 font size.

D. Identifier Assignment

1. General: Separate label fields of the identifier with a hyphen.
2. Cables
 - a. The first field shall identify the beginning and ending pair counts.
 - b. The second field shall identify the originating termination room identifier and the destination termination room as shown on the plans.
 - c. Identifier Example: "0001-0200 B01-TDA-B02-TDA"
3. Termination Positions on the BEP Terminal Cover
 - a. The first field of the identifier shall be the pair count; e.g., "0001-0200".
 - b. The second field of the identifier shall be cable's other end room; e.g., "FROM B01-TDA".

3.5 FINAL INSPECTION AND CERTIFICATION

- A. Punch the Work of this Section compliant to the requirements of Section 270000.
- B. Remove and replace with new, at no cost to the Owner, cables or conductors failing to meet the indicated standards and not passing the testing requirements of Section 270811. The Owner, or Owner's Representative, will not accept the installation until testing has indicated a 100% availability of all cables and conductors or the Owner or Owner's Representative has approved any deviation from this requirement.
- C. Comply with system acceptance and certification requirements of Section 270000.

END OF SECTION