

## **27 1313 BACKBONE CABLING**

### **PART 1: GENERAL**

#### **1.01 SCOPE OF WORK**

A. Work covered by this Section shall consist of furnishing labor, equipment, supplies, materials, and testing unless otherwise specified, and in performing the following operations recognized as necessary for the installation, termination, and labeling of copper backbone infrastructure as described on the Drawings and/or required by these specifications.

#### **1.02 RELATED SECTIONS**

- A. Division 27, Section 270528 Pathways for Communication Systems.
- B. Division 27, Section 270543 Underground Ducts and Raceways for Communication Systems.
- C. Division 27, Section 270553 Identification for Communication Systems.
- D. Division 27, Section 271116 Communications Cabinets, Racks, Frames, and Enclosures.
- E. Division 27, Section 271119 Communications Termination Blocks and Patch Panels.
- F. Division 27, Section 271123 Communications Cable Management and Ladder Rack.
- G. Division 27, Section 271323 Communications Optical Fiber Backbone Cabling.
- H. Division 27, Section 271333 Communications Coaxial Backbone Cabling.

#### **1.03 COORDINATION**

A. Contractor shall coordinate the work specified in this Section with the work in other parts of the Contract document.

B. Plans 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 the multipair copper cable installation and the work of other trades.

C. All questions and issues with regard to coordination shall be directed to the Owner.

#### **1.04 SUBMITTALS**

- A. All submittals for substitutions or modifications shall be made to the Owner for approval prior to start of work. (See Section 27 0000)
- B. The Contractor shall submit a copper cable pulling plan for all multipair 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.

## **1.05 SUBSTITUTIONS**

A. Intent of Specifications:

1. Where specified only by reference standards, select any product meeting standards by any manufacturer.
2. Where specified by naming several products or manufacturers, select any product and manufacturer named that meets the specified requirements. Other products and manufacturers will not be considered.
3. Where specified by naming one or more products or manufacturers, but indicating "or equivalent" after specified listing, the specified product is the preferred quality standard. The Contractor may submit a request for another product for acceptance.
4. Where specified by naming only one product and manufacturer: There is no option and no substitution will be allowed.

B. Submit requests for substitutions within 10 days of contract award, or sooner if required to maintain the construction schedule.

C. The Contractor must submit sufficient information to show that a proposed substitute is equivalent to the item specified. Acceptance of substitutions is at Owner's discretion: the Owner reserves the right to determine suitability of the substitute product and reject any and all materials submitted for substitution. All substitute products and materials must be approved for substitution by the Owner in writing prior to installation. Products rejected or otherwise judged unsatisfactory by the Owner will not be authorized for use in completing the Work. Any unapproved products discovered as part of the installation will be removed and replaced with Owner-specified and approved products at the Contractor's expense.

D. Project Drawings may be based on equipment configuration of a particular manufacturer. If a substitution is approved, the Contractor shall make changes needed to accommodate the substitution at no expense to Purdue University, including work under other divisions.

## **1.06 QUALITY ASSURANCE**

A. Verification: The Owner will maintain inspection personnel on the job site. It is incumbent upon the Contractor to verify that the installation and material used has been inspected before it is enclosed within building features, or otherwise hidden from

view. The Contractor shall bear costs associated with uncovering or exposing installations or features that have not been inspected.

B. Equipment Qualifications: The Contractor is to use equipment and rigs designed for pulling, placement and termination of multipair copper cable; 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**

### **2.01 COPPER CABLE**

A. The cable shall be Bell Specification Filled Aluminum Polyethylene (ALPETH) Sheath cable with Dual Expanded Polyethylene (DEPIC) Insulated Conductors. or REI Equivalent.

B. Cable construction shall be as follows:

1. Conductor - Solid annealed copper in 24 AWG.
2. Insulation - Dual expanded high density polyethylene (foam skin) with outer skin color coded in accordance with telephone industry standards.
3. Twisted Pairs – Individual conductors twisted into pairs with varying twists and lay to minimize crosstalk, and specified color combinations to provide pair identification.
4. Core Assembly – Assembled in units, each individually identified by color coded unit binders. Prior to the application of the outer sheath, and jacket, the core is completely filled with filling compound that resists moisture penetration.
5. Filling compound – 80 degrees C. expanded thermal plastic rubber, compatible with most commercially available encapsulants. Cleaning of conductors is not required (CSI Flexgel or equivalent).
6. Shielding System – Corrugated 8 mil electrically contiguous aluminum tape applied longitudinally with overlapped edges over the core wrap. A polyolefin based flooding compound is applied over the aluminum tape.
7. Jacket – Black, linear low density, high molecular weight polyethylene.
8. Identification and Length Marking – Manufacturer's cable code pair size, manufacturing plant location, month and year of manufacture, sequential length markings and telephone handset symbol are imprinted onto jacket every two feet.
9. Provide special use cables where required i.e. aerial, armored, tunnels, air core, rated, etc. It is incumbent on the contractor to identify, design for and provide special use cables where required.

C. Cable Electrical Performance Specifications

1. Average Mutual Capacitance @ 23 +/- 2 degrees C (nF/mile) – 83 +/- 4.
2. Capacitance Unbalance @ 23 +/- 2 degrees C.  
Maximum pair to pair (pf/kft) – 80; RMS – 25.

05/27/06

3. Pair to Ground Maximum Capacitance, individual pair – 800; Cable average > 13 pair 175.
4. DC Conductor Resistance @ 20 degrees C, individual maximum, (Ohms/kft):  
27.3.
5. Resistance Unbalance Maximum average:- 1.5 %, Maximum individual - 5.0 %.
6. Minimum Dielectric Strength (kV); conductor to conductor, 1 second – 3.0, 3 seconds to sheath – 10.
7. Insulation Resistance (Mega Ohm per mile) 100-550 VDC for 1 minute. – 1000
8. Attenuation (dB/kft) 20 degrees C, @ 772 kHz, Maximum average - 7.0.
9. Equal Level Far End Crosstalk (ELFEXT) (dB/kft) @ 772 kHz, Minimum – Mean Power Sum – 47; Worst Pair Power Sum – 43.
10. Near End Crosstalk – (NEXT) (dB/kft) @ 772 kHz; Minimum; Mean Power Sum – 47; Worst Pair Power Sum – 42.

#### D. Cable Pulling Tension Limitations

1. Refer to ANMA Pulling Tension Specification Sheet.

E. The Cable shall be Cable Systems International, 24 AWG Filled Alplath or approved Equivalent, Cable Code ANMA.

## **2.02**

### **PROTECTOR PANELS**

- A. See Section 27 1313 Copper Splicing and OSP Protection

## **2.03 – Termination Blocks**

- A. See Section 27 1119 Termination Blocks and Patch Panels

## **2.04**

### **PIC COLOR CODED CABLE TIES**

- A. Panduit PIC Color Coded Cable Ties - Panduit Part Number PAN-TY PPC25X50F.

## **2.05**

### **SHIELD BOND CONNECTORS**

- A. 3M Scotchlok 4460 Series Shield Bond Connectors, or equivalent.

## **2.06**

### **ENCAPSULANT**

- A. 3M High Gel Reenterable Encapsulant 3M Part Number 4442, or equivalent

## **2.07**

### **BLOCKING COMPOUND**

- A. 3M Haplec Blocking Compound 3M Part Number 4408 or equivalent.

## **PART 3: EXECUTION**

### **3.01 CABLE INSTALLATION**

05/27/06

- A. The Contractor shall submit the cable pulling plan to the Owner prior to commencement of the operation.
- B. The route of multipair copper cable installation is as described herein or as shown on the Drawings.
- C. When breaking out any multipair copper cable of 50 pairs or greater for splicing or termination, the binder groups shall have PIC color coded cable ties attached to the cable at the point of fanout from super groups for splicing, and at the point of fanout for termination on termination blocks. (Panduit Part Number PAN-TY PPC25X50F).
- D. The Contractor shall ensure the cables are pulled into the ducts in a manner observing the bend radii and tension restrictions of the cable.
- E. The Contractor shall use appropriate shoes, guides, wheels and lubricants to prevent damage to the cable jacket and sheath during installation.
- F. Install shield bond connectors to the shields of all cables terminated at the Protector Panels.
- G. The Contractor shall 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 will not be used.
- H. 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.
- I. All pairs spliced shall be tested and all splice-related faults cleared prior to sealing the closure assembly.
- J. All multipair copper cable pairs installed shall be tested to TIA/EIA 568A, Category 3 equivalent performance specifications. In addition, provide loop resistance measurements in ohms and dB loss at 1KHz, 8KHz, and 256KHz.
- K. The Owner is to be notified at least 24 hours prior to testing to allow observation at the Owner's discretion. If the Owner confirms his intention to observe, a reasonable starting time will be agreed upon. Should the Owner not be present at the scheduled commencement time, the Contractor may begin testing as scheduled.
- L. All test results are to be recorded and turned over to the Owner for checking.

### **3.02 CABLE AND TERMINATION PANEL LABELING**

- A. Label the installed cables in accordance with the Owner's instructions

### **3.03 Cable Support**

- A. Provide cable supports and clamps to attach cables to backboards and walls.
  - a. Attach horizontal and vertical backbone cables at 2 foot intervals using Owner approved supports.
- B. Attach cables to manhole racks using Owner approved methods

**End of Section**

