1 General

1.1 Scope of work

1.1.1 The Contractor is held responsible to be familiar with the provisions contained herein and with other Sections of this Specification as applicable to the completion of the installation.

1.1.2 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.

1.2 Intent of the drawings and specifications

1.2.1 These Specifications, together with the Drawings accompanying them, are intended to depict the installation requirements necessary to support this Project.

1.2.2 Contractor shall furnish materials shown and/or called for on the Drawings but not mentioned in the Specifications, or vice versa, that are necessary for the installation and support of the described work, whether or not specifically called for in both.

1.2.3 Contractor shall provide incidental equipment and materials required for the completion of systems included in this contract whether or not specified or shown on the Drawings.

1.3 Communication

1.3.1 It is Purdue’s expectation that the A/E of Record will work jointly with Purdue’s Telecommunication representatives to address specific technical issues and Owner requirements.

1.3.2 All questions, deviations, comments concerning guideline(s) interpretation, content, and/or use must be submitted in writing to the Project Manager for approval.

1.3.3 No deviations from these guidelines shall be incorporated into the project without written approval from the Project Manager and Purdue Telecommunications representative.

1.4 Submittals

1.4.1 All telecommunication submittals for substitutions shall be made to Purdue’s IT Infrastructure Services Department.

1.4.2 The Contractor shall submit a 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:

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

1.5 Substitutions

1.5.1 Where an item is specified only by reference standards, select any product meeting standards by any manufacturer.

1.5.2 Where an item is 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.

1.5.3 Where an item is 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.

1.5.4 Where an item is specified by naming only one product and manufacturer there is no option and no substitution will be allowed.

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

1.5.6 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.

1.5.7 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.

1.5.8 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.

1.6 Quality Assurance

1.6.1 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.

1.6.2 Equipment Qualifications: The Contractor is to use equipment and rigs designed for pulling, placement and termination of multi-pair 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.

2 Products

2.1 Copper Cable

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

2.1.2 Cable construction shall be as follows:

2.1.2.1 Conductor - Solid annealed copper in 24 AWG.

2.1.2.2 Insulation - Dual expanded high density polyethylene (foam skin) with outer skin color coded in accordance with telephone industry standards.

2.1.2.3 Twisted Pairs – Individual conductors twisted into pairs with varying twists and lay to minimize crosstalk, and specified color combinations to provide pair identification.

2.1.2.4 Core Assembly – Assembled in units, each individually identified by color coded unit binders.

2.1.2.5 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.

2.1.2.6 Jacket – Black, linear low density, high molecular weight polyethylene.

2.1.2.7 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.

2.1.2.8 Cable shall be REA PE-89 compliant.

2.1.3 Cable Pulling Tension Limitations

2.1.3.1 Refer to manufacturer’s recommendations for pulling tension

2.2 Labeling – Labels must be machine generated; handwritten labels are unacceptable

2.2.1 Owner-approved 1/2” wide, Orange, thermal label

2.2.2 Owner-approved 1/2” wide, Clear, thermal label

2.2.3 Owner-approved 1” wide, Orange, thermal label

2.2.4 Owner-approved 2” wide, Orange, thermal label

2.3 Owner-approved 1/2” wide, White, thermal label

2.3.1 Owner approved 4” J-type pipe hangers for multi-pair copper cables.

2.3.2 Owner approved 6” J-type pipe hangers for multi-pair copper cables.

3 Execution

3.1 Cable Installation

3.1.1 The Contractor shall submit the cable pulling plan to the Purdue’s IT Infrastructure Services Department prior to commencement of the operation.
3.1.2 The route of multi-pair copper cable installation is as described herein or as shown on the drawings.

3.1.3 When breaking out any multi-pair copper cable of 50 pairs or greater for splicing or termination, the binder groups shall have Panduit PIC color coded cable ties attached to the cable at the point of fan-out from super groups for splicing, and at the point of fan-out for termination on termination blocks.

3.1.4 The Contractor shall ensure the cables are pulled into the ducts in a manner observing the bend radii and tension restrictions of the cable.

3.1.5 The Contractor shall use appropriate shoes, guides, wheels and lubricants to prevent damage to the cable jacket and sheath during installation.

3.1.6 Install shield bond connectors to the shields of all cables terminated at the protector panels.

3.1.7 All pairs spliced shall be tested and all splice-related faults cleared prior to sealing the closure assembly.

3.1.8 Install J-hooks in tunnel as shown on drawings.

3.1.9 Contractor shall utilize cable-pulling lubricant for all pulls in conduit ducts or innerducts. No less than three (3) gallons per kilometer shall be used.

3.2 Cable Testing

3.2.1 Individually test from both ends of the cable for continuity, power faults, and ground faults. Correct all shorts, opens, crosses, bad terminations, foreign voltages, grounding problems, sheath continuity problems, etc.

3.2.2 In addition, provide loop resistance measurements in ohms and dB loss at 1KHz and calculated dB loss at 8KHz and 256KHz on the first pair of each binder group.

3.2.3 Purdue IT Infrastructure Services Representative is to be notified at least 24 hours prior to testing to allow observation at the Owner’s discretion. If the Purdue IT Infrastructure Services Representative confirms their intention to observe, a reasonable starting time will be agreed upon. Should the Purdue IT Infrastructure Services Representative not be present at the scheduled commencement time, the Contractor may begin testing as scheduled.

3.2.4 All test results are to be recorded and turned over to Purdue’s IT Infrastructure Services Department for checking. Test results shall be turned in to Purdue IT Infrastructure Services in electronic format.

3.2.5 Purdue’s IT Infrastructure Services Representative to approve all test equipment prior to the start of testing. Proof of calibration is required.

3.3 Cable and Termination Panel Labeling

3.3.1 Label the installed cables in accordance with the Purdue’s IT Infrastructure Services instructions.

3.3.2 Contractor shall submit label samples for approval to Purdue’s IT Infrastructure Services Department to verify label type and font size prior to commencing labeling work on the project

3.3.3 Use 1/2” white thermal labels with Black lettering on Circa protectors.

3.3.4 Use 1/2” orange thermal labels with Black lettering on cables ranging from 25pr-100pr

3.3.5 Use 1” orange thermal labels with Black lettering on cables ranging from 100pr-600pr.

3.3.6 Use 2” orange thermal labels with Black lettering on cables above 600-pair.

3.3.7 Use 1/2” clear thermal labels with Black lettering on Node protectors.

3.3.8 Use self-laminating cable marker holders on direct buried copper cables within pedestals. Each label shall be printed using a machine generated adhesive label affixed to the cable jacket

3.3.9 Each label shall contain the following information as it pertains to the project:

A. Cable type
   1. Node ID
B. Cable number
   1. Assigned by owner
C. Copper count
   1. Copper count going to building
D. Copper length
   1. Segment length of copper between splices
E. Date placed
   1. MM/YY (month/year)
Indicating the month and year when copper cable was installed
F. Destination building ID/splice case number
   1. Purdue-assigned building ID and/or splice number as shown on print
3.3.10 Labels to be placed respectively in the following locations and distances as they pertain to the project:

A. In Tunnels
   1. Labels to be placed approximately every 200 feet from beginning to end of cable run
   2. Labels to be placed approximately (12) inches from every corner or turn
   3. Labels to be placed in appendages and approximately (12) inches from entrance and exit conduits

B. In Manholes
   1. Labels to be placed approximately (12) inches from entrance and exit conduits

C. In BDF
   1. Labels to be placed approximately (12) inches from entrance and exit conduits
   2. Labels to be placed approximately (12) inches from termination point of Circa Protector
   3. Labels to be placed on protectors identifying cable and count

D. Splices
   1. Labels to be placed approximately (12) inches from each splice enclosure indicating copper count for the entry and exit cables
   2. All splice cases must be labeled as well, identifying the cable and the splice
   3. On occasion, some pairs will remain unspliced in the splice case. The number of pairs left unspliced to be designated as + (#)XD on the label where (#) is the number of pairs dark.

Any questions about labeling standards should be directed to Purdue IT Infrastructure Services personnel for clarification prior to labeling.