PART 1  GENERAL

1.1  Scope of work

1.1.1  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 horizontal cabling infrastructure as described on the Drawings and/or required by these specifications.

PART 2:  PRODUCTS

Note:  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. All questions, deviations, comments concerning guideline(s) interpretation, content, and/or use must be submitted in writing to the Project Manager for approval. No deviations from these guidelines shall be incorporated into the project without written approval from the Project Manager and Purdue Telecommunications representative.

2.1  General

2.1.2  The materials and products specified herein reflect the minimum acceptable standards of fabrication and manufacture. All materials and products supplied by the Contractor and specified herein are to be new, unused, of first quality and in original packaging or shipping containers or as shown on drawings and described in Item 3.01.

2.1.2  New buildings and major renovations will be treated differently than existing buildings. Existing buildings will utilize category 5E cabling and termination hardware for voice and data. New building construction and Owner approved large-scale renovations will utilize category 5E cabling and termination hardware for voice and category 6 cabling and termination hardware for data. Contact Purdue Information Technology Telecommunications Department Representative for approval of cabling systems before installation.

2.2  Data Cabling

2.2.1  Buildings requiring Category 6 cabling:

2.2.1.1  Owner-approved single 4-pair, category 6, unshielded twisted pairs, 24 gauge, bare copper, polyethylene insulated conductors, with overall green PVC flame retardant jacket, plenum rated.

2.2.1.1.1  Approved manufacturer part numbers include:

- Belden 3613 Enhanced Cat 6 cable item numbers: 3613 00510000 (1,000 feet) or 3613 0052500 (2,500 feet)
- Berk-Tek LANmark-1000 Plenum Enhanced Cat 6 cable item number: 10032096
- CommScope UltraMedia 7504 item number: 4766984/30
- General Cable 6000e item number: 7131966
- Mohawk Cat 6 LAN Plus item number: M58915 (reel required)
- Panduit TX6000 Enhanced Cat 6 item number: PUP6004GR-UY
- Superior Essex DataGain Category 6+ item number: 66-272-5B

2.2.2  Buildings requiring Category 5e cabling:

2.2.2.1  Owner-approved single 4-pair, category 5E, unshielded twisted pairs, 24 gauge, bare copper, polyethylene insulated conductors, with overall blue PVC jacket, plenum rated.

2.2.2.1.1  Approved manufacturers include:

- Belden 1585A Cat 5e cable item numbers: 1585A D151000 (1,000 feet) or 1585A D153000 (3,000 feet)
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- Berk-Tek HyperPlus 5e item number: 10032226
- CommScope Datapipe 5E55 item number: 4759004/10
- General Cable GenSpeed 5000 item number: 5131282E
- Mohawk Cat 5e LAN item number: M57546 (reel required)
- Panduit TX5500 Premium Cat 5e item number: PUP5504BU-UY
- Superior Essex Marathon LAN Category 5e item number: 51-220-28 (1,000 feet) or 51-273-28 (2,500 feet)

2.3 Voice Cabling

2.3.1 Owner-approved single 4-pair, category 5E, unshielded twisted pairs, 24 gauge, bare copper, polyethylene insulated conductors, with overall gray PVC jacket, plenum rated.

2.3.1.1 Approved manufacturers include:
- Belden 1585A Cat 5e cable item number: 1585A 0081000
- Berk-Tek HyperPlus 5e item number: 10032206
- CommScope Datapipe 5E55 item number: 4759204/10
- General Cable GenSPEED item number: 5131475E
- Mohawk Cat 5e LAN item number: M57545 (reel required)
- Panduit TX5500 Cat 5e item number: PUP5504IG-UY
- Superior Essex Marathon LAN Category 5e item number: 51-220-38 (1,000 feet) or 51-273-38 (2,500 feet)

PART 3: EXECUTION

3.1 Telecommunications Installation

3.1.1 General:

3.1.1.1 This Section describes the installation locations for the products and materials, as well as methods and Owner's Standards associated with the Telecommunications Installation portions of the Project. These Specifications, along with the drawings and other Owner supplied specifications shall be followed during the course of the installation.

3.1.1.2 The Contractor is required to be currently listed as either a BICSI Certified Installer or a registered Panduit Certified Installer and provide personnel for telecommunications installations who are verifiably certified.

3.1.1.3 The Contractor is instructed to coordinate his efforts with the other tradesmen who may be working within the same vicinity to avoid conflict and lost time.

3.1.1.4 The Contractor is required to supply all necessary tools, equipment, accessories, safety equipment, protective clothing, etc., as customary for the craft and necessary for the installation.

3.1.1.5 The Contractor shall verify space requirements and locations with Owner before starting cable installations and terminations.

3.1.1.6 The Contractor shall verify the category and jacket rating required with the Purdue IT Infrastructure Services Department before starting cable installation.

3.1.1.7 The Contractor shall verify existing cable fill in skeletal conduit, raceway or cable tray system before installation of additional cables so as not to exceed 40% cable fill. Contractor will be responsible for installation of additional skeletal conduit, raceway or cable tray where additional cables to be added will exceed the 40% cable fill. See cable fill attachments on Tables 1 and 2 at the end of this section.

3.2 Skeletal, Cable Tray, And Station Conduits
3.2.1 Provide a nylon pull cord in each conduit to facilitate future installation of cables.

3.2.2 Provide a nylon pull cord in each conduit and extended in raceway to openings for PIC faceplates to facilitate future installation of cables.

3.2.3 Provide a nylon pull cord in each straight section of cable tray. Pull cord shall be continuous from each end of the straight section of tray.

3.3 Horizontal Copper Cabling

3.3.1 The copper telephone horizontal cabling will be terminated at the IDF or BDF on S110 type wiring blocks.

3.3.2 The copper data horizontal cabling will be terminated at the IDF or BDF on patch panels as described herein. Where patch panels are mounted in equipment frames, equally distribute cables on each side, down the vertical wire management, and into the horizontal wire management so as not to exceed wire management fill.

3.3.3 Horizontal cabling shall be terminated such that wire pair twists are maintained as closely as possible to the point of mechanical termination. (No greater than 0.5” for category 5E or 6 cables.)

3.3.4 Maximum strip length shall be 1.0” or less. Maintain cable sheath to leading edge of connector block.

3.3.5 Contractor is responsible to obtain and follow installation instructions from the manufacturer for correct termination and wire management of cables on respective products.

3.3.6 Owner to provide future cross terminations to Campus switch.

3.3.7 Horizontal cables shall be terminated in the telecom room serving that floor unless otherwise noted. Exceptions would include telecom rooms serving multiple floors.

3.4 Relocation And Removal Of Existing Telecommunication Outlets

3.4.1 Where the relocation of existing PICs is required and the new location will allow the existing cables to reach, the cables may be disconnected and removed back to the hallway skeletal or raceway system for installation into the new PIC. Where existing cables will not reach, new cables shall be installed to the TR. The new PIC location shall be relabeled. This installation requires a retest of the voice and data cables.

3.4.2 Where the removal of existing PICs is required, the contractor shall remove the PIC raceway, conduits, and cables back to the exterior of the TR. Contractor shall notify Owner’s Representative at the time of removal. Owner will remove all items within the TRs. Removal of existing PICs requires as-built information from the contractor prior to removal. Contractors are to supply a copy of the construction floor plan indicating where the PIC was removed and the labeling information on the PIC to the Purdue IT Infrastructure Services Department.

3.4.3 PICs scheduled to be relocated shall be tested by the contractor prior to moving. This is to ensure the permanent link meets the category performance set forth by ANSI/TIA. The contractor is responsible for bringing failed tests to the attention of Purdue IT Infrastructure Services Department before proceeding. After reviewing and verifying the failed results, Purdue IT Infrastructure Services Department will discuss options for repair.

3.4.4 Per the NEC, cabling for legacy voice and data systems that will not be used within renovated areas shall be removed as part of the project. The Contractor is responsible to bring legacy systems within the proposed renovated areas not identified on the construction documents to the attention of the Purdue IT Infrastructure Services Department who will verify its usage. Note: Some legacy cabling still contains active circuits which must be verified and relocated in such a manner as to minimize customer disruption.

3.5 Wiring Configuration
3.5.1 Wire all jacks according to ANSI/TIA/EIA T568-B configuration.

3.6 General Cable Installation

3.6.1 Cable lengths within boxes shall be adequate to permit installation and removal of device for inspection without damage to cable or connections (minimum of 12”).

3.6.2 Cable bends shall not be greater than that recommended by the manufacturer of the cable.

3.6.3 Care shall be taken so as not to damage cable during the installation process and that manufacturer’s pull tension specification is not exceeded.

3.6.4 Route cables so that no horizontal cable exceeds 90 meters between TR termination and device jack termination. Contact the Purdue IT Infrastructure Services Department if this is not probable with TR location.

3.6.5 Provide a minimum 8’-0” and maximum 10’-0” of slack. Slack in the TRs to be contained on the cable tray so that the cables lay flat and do not cross over themselves (no coils). Smaller slack loops may be required in TR cabinets.

3.6.6 Within TRs, cables shall be snugly wrapped using Velcro reusable cable ties, a minimum of every 3’-0” for cable organization. Velcro ties shall be tightened so as not to deform cable jackets and thus affect cable performance. Plastic cable tie wraps shall not be used.

3.6.7 Velcro cable ties and tie wraps shall not be used in cable trays and skeletal systems outside of the TR.

3.6.8 Cable fill in station conduits, skeletal conduits, raceway, and cable tray shall not exceed 40% cable fill.

3.6.9 All telecom rooms must be free from dust, dirt, and other foreign materials before the installation of any termination hardware or the termination of copper or fiber optic cables. The door to the telecommunication rooms must be installed and closed during termination.

3.6.10 Contractor is responsible for the protection of all telecommunications equipment in existing telecom rooms. Contractor shall contact the Purdue IT Infrastructure Services Department before starting any work in an existing telecom room that might cause dust and debris from harming network equipment.

3.7 Cable Testing

3.7.1 A 20% verification by the Purdue IT Infrastructure Services Department of all horizontal voice and data cable tests will be performed. A 100% verification by the Purdue IT Infrastructure Services Department of all wireless access point installations will be performed. The contractor performing the telecommunications testing shall schedule a meeting with a Purdue IT Infrastructure Services Representative before the start of testing. Contractor may request Purdue personnel to accompany them in the testing of cables to ensure proper information entry into the Tester. If Purdue personnel accompany the Contractor on testing, verification testing shall not be required.

3.7.2 The horizontal cabling consisting of single 4-pair cable runs for voice shall be tested for Category 5E compliance utilizing a Fluke DTX or Fluke DSX series tester. Test unit shall be set up using: 1) cat. 5E permanent link test, 2) actual cable # installed (e.g. CommScope #5EN5 or 5E55), 3) Project field containing building acronym, “VOICE”, BDF or IDF, and telecom room number (e.g. MATH VOICE IDF 619). Cable Test Results shall be submitted in Fluke Linkware (.flw) format on a CD at the end of the project. Purdue IT Infrastructure Services Department will expedite activation of service before substantial completion if test results are submitted electronically via email. Testing required is 100%. The Purdue IT Infrastructure Services Department will perform random verification testing as part of acceptance of all copper voice cable testing.
3.7.3 The horizontal cabling consisting of single 4-pair cable runs for data shall be tested for Category 5E compliance using CommScope #5EN5, #5E55 or Category 6 compliance using CommScope #75N4, #7504 utilizing a Fluke DTX or Fluke DSX. Test unit shall be set up using: 1) cat. 5E or 6 permanent link (draft 10 for Category 6) test depending on cable used, 2) actual cable # installed (e.g., CommScope #5EN5, #5E55, #75N4, or 7504) 3) Project field containing building acronym, “DATA”, BDF or IDF, and telecom room number (e.g. MATH DATA IDF 619). Cable Test Results shall be submitted in Fluke Linkware (.flw) format on a CD at the end of the project. Purdue IT Infrastructure Services Department will expedite activation of service before substantial completion if test results are submitted electronically via email. Testing required is 100%. The Purdue IT Infrastructure Services Department will perform random verification testing as part of acceptance of all copper data cable testing.

3.8 Equipment Installation And Cable Terminations

3.8.1 All equipment shall be installed in a neat and workmanlike manner, arranged for convenient operation, testing and future maintenance.

3.8.2 All paired cables shall be installed and terminated by technicians experienced in the termination of cables on connector blocks.

3.8.3 The Contractor shall employ certified system installation technicians and have at least 5 years of experience in the installation of similar and equivalent systems.

3.8.4 The Contractor shall supply verification of experience, for this type of work, to the Architect for approval before performing any work.

3.9 As Built Information

3.9.1 Contractor shall provide as-built information along with all test result information to the Purdue IT Infrastructure Services Department.

3.9.2 As-built information shall be in red-lined format on a copy of construction drawings. Indicate location of all PICs, skeletal and riser conduit routes, distribution cable trays, junction boxes, and all additions and deletions pertaining to telecommunications. Include correct PIC labeling next to all telecom symbols.

3.9.3 If construction drawings are not utilized, Contractor shall provide all telecommunications location information on an accurate scaled floor plan.

3.9.4 Contractor shall perform all labeling requirements and provide testing documentation for verification as described herein.

3.9.5 Contractor shall submit cable records to reflect all moves, additions, and changes.

3.9.6 Contractor shall provide floor plans showing locations of all telecommunication outlets and spaces.

<table>
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<tr>
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<th>¾ EMT</th>
<th>1&quot; EMT</th>
<th>1 ¼ EMT</th>
<th>1 ½&quot; EMT</th>
<th>2&quot; EMT</th>
<th>3&quot; EMT</th>
<th>4&quot; EMT</th>
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### 1513 COPPER HORIZONTAL CABLING

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</thead>
<tbody>
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<td>18</td>
<td>37</td>
<td>80</td>
</tr>
<tr>
<td>4-pr. cables**</td>
<td>4</td>
<td>18</td>
<td>37</td>
<td>80</td>
</tr>
</tbody>
</table>

Please note 20% fill for Wiremold.

*4-pr.cable = CommScope #5EN5, Cat 5E or equivalent  
** 4-pr cable = CommScope #75N4, Cat 6 or equivalent

Contact Owner’s Representative for riser cable or entrance cable fill information

* Count fiber optic cables in fill as an equivalent to category 6 cables.  
.200” = O.D. of Cat 5E cable  
.240” = O.D. of Cat 6 cable  
.23” = O.D. of 2-strand fiber