**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.

**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.

1.2 General

1.2.1 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.

1.2.2 New buildings and major renovations will be treated differently than existing buildings due to advances in cable transport technologies. Contact Purdue Information Technology Telecommunications Department Representative for approval of cabling systems before installation.

1.3 Data and VOIP Cabling

All new buildings and major renovations on the Purdue West Lafayette Campus require Category 6a cabling:

1.3.1 Owner-approved single 4-pair, category 6A, unshielded twisted pairs, 23 gauge, bare copper, polyethylene insulated conductors, with overall violet/purple PVC flame retardant jacket, plenum rated.

1.3.1.1 Cables shall be terminated on patch panels in equipment frames with violet/purple jacks on both ends of the permanent link termination. Approved manufacturer part numbers include:

- Belden 10GXS13 Cat 6A cable item numbers: 10GXS13- 0071000 (1,000 feet)
- Berk-Tek LANmark-10G2 Plenum Cat 6a cable item number: 11085661
- CommScope Uniprise® Cat 6A item number: UN874041604/10 | CS44P VLT C6A 4/23 U/UTP RL 1KFT
- General Cable GenSPEED 10 Cat 6A item number: 7141825
- Mohawk GigaLAN10 Cat 6a item number: M59154
- Superior Essex 10Gain Cat 6A item number: 6A-246-7B or 6A-272-7B

1.4 Special Circuit Cabling

All new buildings and major renovations on the Purdue West Lafayette Campus require Category 6a cabling:

1.4.1 Owner-approved single 4-pair, category 6A, unshielded twisted pairs, 23 gauge, bare copper, polyethylene insulated conductors, with overall violet/purple PVC flame retardant jacket, plenum rated.

1.4.1.1 Cables shall be terminated on S110 blocks in Telecom Rooms.

1.4.1.2 Approved manufacturer part numbers include:

- Belden 10GXS13 Cat 6A cable item numbers: 10GXS13- 0071000 (1,000 feet)
- Berk-Tek LANmark-10G2 Plenum Cat 6a cable item number: 11085661
- CommScope Uniprise® Cat 6A item number: UN874041604/10 | CS44P VLT C6A 4/23 U/UTP RL 1KFT
- General Cable GenSPEED 10 MTP Cat 6A item number: 7141825
- Mohawk GigaLAN10 Cat 6a item number: M59154
- Superior Essex 10Gain Cat 6A item number: 6A-246-7B or 6A-272-7B
Execution

1.5 Telecommunications Installation

1.5.1 General:
1.5.1.1 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.
1.5.1.2 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.
1.5.1.3 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.
1.5.1.4 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.
1.5.1.5 The Contractor shall verify space requirements and locations with Owner before starting cable installations and terminations.
1.5.1.6 The Contractor shall verify the category and jacket rating required with the Purdue IT Infrastructure Services Department before starting cable installation.
1.5.1.7 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.

1.6 Skeletal, Cable Tray, And Station Conduits

1.6.1 Provide a nylon pull cord in each conduit to facilitate future installation of cables.
1.6.2 Provide a nylon pull cord in each conduit and extended into raceway to openings for PIC faceplates to facilitate future installation of cables.
1.6.3 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.

1.7 Horizontal Copper Cabling

1.7.1 The copper voice horizontal cabling will be terminated at the IDF or BDF on S110 type wiring blocks.
1.7.2 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.
1.7.3 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")
1.7.4 Maximum strip length shall be 1.0" or less. Maintain cable sheath to leading edge of connector block.
1.7.5 Contractor is responsible to obtain and follow installation instructions from the manufacturer for correct termination and wire management of cables on respective products.
1.7.6 Owner to provide future cross-connect terminations to Campus switch.
1.7.7 Horizontal cables shall be terminated in the telecom room serving that floor unless otherwise noted. Exceptions would include telecom rooms serving multiple floors.

1.8 Relocation and Removal of Existing Telecommunication Outlets

1.8.1 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.

1.8.2 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.

1.8.3 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.

1.8.4 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.

1.9 Wiring Configuration

1.9.1 Wire all jacks according to ANSI/TIA/EIA T568-B configuration.

1.10 General Cable Installation

1.10.1 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”).

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

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

1.10.4 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.

1.10.5 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.

1.10.6 Within TRs, cables shall be snugly wrapped using hook and loop (Velcro® or owner-approved equal) reusable cable ties, a minimum of every 3’-0” for cable organization. Hook and loop ties shall be tightened so as not to deform cable jackets and thus affect cable performance. Plastic cable tie wraps shall not be used.

1.10.7 Hook and loop cable ties and tie wraps shall not be used in cable trays and skeletal systems outside of the TR.

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

1.10.9 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.

1.10.10 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 to harm network equipment.

1.11 Cable Testing

1.11.1 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.

1.11.2 The horizontal cabling consisting of single 4-pair cable runs for data and VOIP shall be tested for Category 6a compliance utilizing Fluke DSX series tester. Test unit shall be set up using: 1) cat. 6a permanent link test, 2) actual cable # installed (e.g. CommScope #874010104). 3) Cable Test Results shall be submitted to Purdue IT Infrastructure Services in electronic Fluke Linkware (.flw) format 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.

1.11.3 The horizontal cabling consisting of single 4-pair cable runs for special circuits shall be tested for Category 5e compliance utilizing a Fluke DSX series tester. Test unit shall be set up using: 1) cat. 5e permanent link test, 2) actual cable # installed (e.g. CommScope #874010104). 3) Cable Test Results shall be submitted to Purdue IT Infrastructure Services in electronic Fluke Linkware (.flw) format 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.

1.12 Equipment Installation and Cable Terminations

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

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

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

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

1.13 As Built Information

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

1.13.2 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.

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

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

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

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