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 The work required under this section consists of providing conduits, boxes, raceways, etc., for telecommunications wiring included in this project. Telecommunications wiring includes cables for Data, Voice, Video, Audio and future signal requirements.

1.1.3 The location at which all new telecommunications wiring will terminate is called a PIC (Purdue Information Connection).

1.1.4 Furnish and install skeletal conduits and branch conduits as specified in the Drawings and as specified herein, and in accordance with electrical specifications.

1.1.5 Furnish and install raceway and outlet boxes as specified in the Drawings and as specified herein, and in accordance with electrical specifications.

1.1.6 Furnish and install conduits through walls and floors for cable routes.

1.1.7 Furnish and install raceways in hallways next to ceilings for distribution routes for telecommunications cabling.

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.

2 Products

2.1 Refer to electrical specifications (Division 26) for electrical product requirements. (Conduit, boxes, etc.)

2.2 Owner approved 4" Conduit Waterfall.

2.3 Nylon Cable Protectors for conduits 3" - 6".

2.4 Nylon Cable Protectors for conduits 2" and 2-1/2".

2.5 Nylon Cable Protectors for conduits 1-1/4" and 1-1/2".

2.6 All raceway products containing telecommunications cabling shall be fiber ready to allow for minimum bend radius requirements.

2.7 Manufacturer of insulating bushing on all telecommunication conduits shall be Arlington or Owner approved equal.

2.8 Owner approved Fire Rated Sleeves for wall penetrations.

2.9 Owner approved Fire Rated Sleeves for floor penetrations.

2.10 PIC locations shall utilize either a 4 11/16" H x 4 11/16" W x 3 ¼" D box for up to 4 cables, a 5" H x 5" W x 3 ¼" D box for 5-8 cables, and a 4 11/16" H x 7 ¾" W x 3 ¼" D box for more than 8 cables, or Owner-approved equivalent

3 Execution

3.1 General Requirements

3.1.1 The intention of the telecommunications pathways is to provide a route between BDF and IDF rooms, routes from the IDFs throughout building floors to hallways, and routes from hallway distribution systems into rooms to individual PICs for telecommunications cabling.

3.1.2 Installation of new pathways shall not interfere with existing pathways in such a way that installation of new cables within the existing pathway is made more difficult.

3.1.3 All conduit termination points shall be fitted with a plastic bushing. Conduits and fittings with threads shall have a threaded plastic bushing.

3.2 Service entrance conduits
3.2.1 A minimum of (2) 4" conduits shall be installed from the nearest utility tunnel or duct bank system as shown on the Drawings. Underground conduits shall either be PVC schedule 40 conduit or HDPE SDR 11 conduit until turning up into BDF room. Transition the material to GRC before entering the BDF room. EMT may not be used for building entrance conduits. Any deviations must be approved by Purdue ITIS prior to installation.

3.2.2 Terminate entrance conduits entering BDF rooms from below grade 4" above finished floor. Location of entrance conduits shall be within 12" of room corners.

3.2.3 Terminate entrance conduits entering BDF rooms from above ceiling height to extend 4" below finished ceiling or 12" above cable tray.

3.2.4 Entrance conduits shall be continuous into the building and to the BDF. Securely fasten all entrance conduits to the building to withstand movement from any cable placing operation. Do not include more than two 90 degree bends between pulling points when installing entrance conduits.

3.2.5 On exterior wall penetrations, seal both sides of the wall around outside of conduit with hydraulic cement to prevent water from entering the building. Seal the inside of the conduit on both sides with conduit plugs, water plugs, or duct sealer to prevent water, vapors, or gases from entering the building.

3.2.6 Provide grounding bushings on each metallic conduit and terminate to the technology busbar (PBB) with a minimum #6 AWG grounding conductor.

3.3 Pathway Requirements for Entrance Conduits

3.3.1 If the entrance conduits exceeds the 180 degree of total bends limitation, an appropriate sized junction box or manhole is required. Access to the junction box from below shall be maintained.

3.3.2 See attachment at end of this section for sizing of entrance conduit junction boxes.

3.3.3 As-built drawings of entrance conduit path required to be submitted to Purdue IT Infrastructure Services before covered with soil.

3.3.4 Install cable waterfalls on outside plant conduits entering the room from above where the incoming cable will transition to another raceway more than 6" vertically.

3.4 Riser Conduits

3.4.1 A minimum of (2) 3" conduits shall be installed between the BDF room and each IDF room as shown on the Drawings.

3.4.2 Conduits entering BDF and IDF rooms shall be reamed or bushed and terminated not more than 4" from entrance wall and within 12" of room corners.

3.4.3 Conduits entering BDF and IDF rooms from below floor shall be terminated not more than 4" above finished floor.

3.4.4 Conduits for riser cables shall be continuous and separate from all skeletal conduit or enclosed raceway systems. Do not include more than two 90 degree bends between pulling points when installing riser conduits. Where junction boxes are required, locate in accessible areas, such as above suspended ceilings in hallways. See attachment at the end of this section for sizing of entrance conduit junction boxes.

3.4.5 Conduits shall not be less than 3" trade size and be equipped with a nylon pull cord rated minimum 200 pound test.

3.4.6 Provide restorable fire stops inside and around conduits as recommended by UL1479 or ASTM E814 for all conduits penetrating fire-rated construction. Fire-rated construction to be verified with the Owner. All fire stopping penetrations must be labeled with the UL1479 or ASTM E814 reference number, dated, and signed by the technician who installed the fire stopping material.

3.4.7 Provide an insulating press fit bushing on all telecommunications riser conduits unless a cable waterfall is used (see below). Bushings must be rated to be used in an environmental air handling space (Plenum).

3.4.8 Install a cable waterfall on all 3" and 4" conduits containing cables that transition more than 6" vertically.

3.4.9 Riser conduits shall not be used for the distribution of horizontal cabling, departmental cabling, or other low voltage systems not related to telecommunications.

3.5 Riser Sleeves

3.5.1 Where telecommunications rooms are stacked, the installation of fire rated floor assemblies are required.

3.6 Horizontal Distribution Systems

Note: The following are approved distribution systems for telecommunications cabling. Refer to system as specified in the scope and/or as shown on the drawings.

3.6.1 Skeletal Conduit System (Renovations only, where skeletal exists)
3.6.1.1 Provide conduits secured to wall above corridor ceilings as shown on the Drawings or as specified herein for installation of telecommunications cables. Any exposed conduit shall be painted except conduit above suspended ceilings or in mechanical, electrical or telecommunication rooms. Color to match that of surface installed upon or as directed by Owner. Coordinate with Owner prior to painting.

3.6.1.2 Corridor conduits shall be 3” or 4” EMT, furnished in 10 foot lengths wherever possible, with no sharp edges, reamed as necessary, supported at 6'-0" spacing. Skeletal conduits shall be sized and quantified to account for handling cables in all PIC conduits at 40% fill back to the IDF and/or BDF rooms. Verify size with Purdue IT Infrastructure Services Representative prior to installation. Bushings and/or connectors on ends of EMT are not required.

3.6.1.3 Conduits shall be interrupted and separated 18”-24” at access points and at obstructions such as pipes, ducts, etc.

3.6.1.4 All skeletal system conduits shall be installed stacked and attached to walls unless conditions exist which prohibit this type of installation. When this condition exists, mount conduits side-by-side supported with 3/8” rod attached to building structure utilizing unistrut channel to form a trapeze. Double nut the top and bottom at the unistrut. Utilize conduit clamp to secure conduits to unistrut.

3.6.1.5 In straight sections of skeletal runs, provide nylon pull cords in each conduit.

3.6.1.6 Grounding of skeletal conduits is not required per NEC #250-33, Exception No. 2.

3.6.1.7 Provide restorable fire stops inside and around conduits as recommended by UL1479 or ASTM E814 for all conduits penetrating fire-rated construction. The use of restorable fire sleeves are an acceptable alternative to conduit sleeves with separate fire stopping material. Fire-rated construction to be verified with Owner. All fire stopping penetrations must be labeled with the UL1479 or ASTM E814 reference number, dated, and signed by the technician who installed the fire stopping material.

3.6.1.8 Install the cable waterfall on all conduits containing cables that transition more than 6” vertically from the conduit down to another raceway (conduit or cable tray). This includes conduit sleeves.

3.6.1.9 Install nylon cable protectors in conduits where cables enter/exit the conduit system creating pressure on the cables on the leading conduit edge. These protectors would not be used on conduits where the cable waterfalls are required (more than 6” of vertical drop).

3.6.1.10 Provide an insulating press fit bushing on all telecommunications riser conduits unless a cable waterfall is used (see below). Bushings must be rated to be used in an environmental air handling space (Plenum).

3.6.2 Corridor Cable Tray System

3.6.2.1 Complete wall mounted or suspended cable basket system and necessary accessories shall be provided as shown on plans. Install entire cable basket system in accordance with manufacturer’s minimum installation practices and all local governing codes.

3.6.2.2 Coordinate installation of cable tray with other trades to allow a minimum of 12” above, 6” in front, and 3” below of clearance from piping, conduits, ductwork, etc.

3.6.2.3 Submittal drawings, in the form of 8 1/2” x 11” catalog cut sheets, shall be provided for the following items: cable tray, fittings, accessories and load data.

3.6.2.4 Cable tray shall not be loaded beyond 60% of manufacturer’s recommended load capacity.

3.6.2.5 Install wall mounted cable basket on one side of the hallway to minimize conflicts with mechanical ductwork or
as shown on drawings and where applicable.

3.6.2.6 Where a new cable basket distribution system encounters a wall, install sufficient 4” EMT sleeves or restorable fire stopping sleeves through the wall so cabling does not exceed 20% fill.

3.6.2.7 Where cable basket is exposed below ceiling, install the appropriate solid bottom inserts to conceal cables.

3.6.2.8 Install cable basket dropouts where more than 10 cables exit the distribution system.

3.6.2.9 Manufacturer of cable basket in corridors shall be WBT, Cablofil, B-Line Systems, or Owner approved equal.

3.6.2.10 Provide factory manufactured tee fittings and 90 degree fittings to maintain the tray performance characteristics. Utilize factory splice connectors to maintain the tray ground integrity.

3.6.3 Sleeves

3.6.3.1 Install a cable waterfall on all 4” conduit sleeves containing cables that transition more than 6” vertically from the sleeve down to another raceway (conduit or cable tray).

3.6.3.2 Install nylon cable protectors at the leading conduit edge. These protectors would not be used on conduits where the cable waterfall is required (more than 6” of vertical drop).

3.6.3.3 Where cables must penetrate fire-rated walls between sections of skeletal conduit or cable tray sections, install sufficient 4” EMT sleeves or restorable fire stopping sleeves through the wall so cabling does not exceed 20% fill.

3.7 Station Conduits

3.7.1 Provide station conduits from PICs to between 12” - 18” of hallway distribution systems of 1 ¼” EMT minimum or appropriate size as shown on the Drawings or as specified herein for installation of telecommunications cables.

3.7.2 Provide an insulating press fit bushing on all telecommunications conduits including interconnecting nipples and stub to distribution system. To prevent conflicts with other cables, conduits to cable tray or skeletal system shall be stubbed not less than 6” above or below skeletal conduit/cable tray center line. Where space permits, every effort shall be made to bend station conduits down such that the flow of installed cables promote the minimum length back to the IDF and the least amount of bends in the cables. Bushings must be rated to be used in an environmental air handling space (Plenum).

3.7.3 Provide nylon pull cord in each conduit to hallway skeletal or distribution system.

3.7.4 Indelibly mark station conduit at hallway distribution end with Room # that conduit serves.

3.7.5 Indelibly mark station conduits that directly enter the telecommunications room.

3.7.6 The use of pulling LBs is prohibited.

3.7.7 Do not include more than two 90 degree bends between pulling points when installing station conduit runs. If the path of the station conduits requires more than 180 degrees of total bends, installation of an appropriate sized junction box or “C type” condulet is required. See attachment at end of this section for junction box requirements.

3.7.8 Place an appropriate sized junction box or “C type” condulet in each individual station conduit run that exceeds 100ft in length.

3.7.9 The use of a third bend in a conduit is only acceptable if:

3.7.9.1 The total conduit run does not exceed 33 ft.

3.7.9.2 The conduit size is increased to the next trade size.

3.7.9.3 One of the bends is located within 12” of the cable feed end.

3.7.10 Ceiling grid support wires shall not be used to support telecommunications raceways or cables.

3.7.11 Station conduits shall not be used for the distribution of departmental cabling or other low voltage systems not related to telecommunications.

3.7.12 Conduits shall be anchored so that they are RIGID to movement.

3.8 Junction Box Requirements for Station Conduits

3.8.1 A. If the station conduit route exceeds the 180 degree of total bends limitation, an appropriate sized junction box or “C type” condulet is required within a straight section of the conduit run.

3.8.2 Each station conduit run requires a
separate junction box or “C type” condulet. The sharing of a junction box by multiple conduits is prohibited.

3.8.3 A junction box shall not be used in place of a bend. All junction boxes or “C type” condulet in station conduit paths shall be installed within a straight section of the conduit run.

3.8.4 See attachment at end of this section for sizing of station conduit junction boxes.

3.9 Purdue Information Connections (PIC)

3.9.1 New construction standard PIC consists of a 4 11/16" H x 4 11/16" W x 3 ¼" D box for up to 4 cables, a 5" H x 5" W x 3 ¼" D box for 5-8 cables, and a 4 11/16" H x 7 ¾" W x 3 ¼" D box for more than 8 cables. Box is secured on both sides of the box to the building structure and located 18” center AFF as indicated on the drawings or as specified herein. The outlet box shall have at a minimum a 1 ¼” EMT conduit stubbed to within 12” of the hallway skeletal, cable basket, or raceway distribution system.

3.9.2 Existing construction PIC typically consists of (1) 10' section of vertical, surface-mounted Wiremold #V2400 series raceway including base, cover, end fitting, entrance end fitting, and (1) 1 ¼” EMT conduit stubbed out top of entrance end fitting to within 12” of the nearest hallway skeletal, cable basket, or raceway distribution system. Use “Fiber Ready” products where available.

3.9.3 The intent of the installation of the PICs which consist of the vertical Wiremold #V2400 series raceway is as follows:

3.9.3.1 Where ceilings are accessible, the raceway and entrance end fitting shall extend above the ceiling and the conduits installed above the ceiling in the room to the nearest hallway distribution system.

3.9.3.2 Where ceilings are partially accessible, or if the Drawings and/or Specifications indicate installation of access panels, the raceway shall extend above the ceiling and the conduits installed above the ceiling in the room to the nearest hallway distribution system.

3.9.3.3 Where ceilings are inaccessible or no ceilings exist, the raceway shall extend up as close to the ceiling as practical to allow installation of conduits as high as possible to the nearest hallway distribution system.

3.9.4 Data or VOIP-Only PIC:

3.9.4.1 New Construction outlet box shall be of a 4 11/16" H x 4 11/16" W x 3 ¼" D box for up to 4 cables, a 5" H x 5" W x 3 ¼" D box for 5-8 cables, and a 4 11/16" H x 7 ¾" W x 3 ¼" D box for more than 8 cables. Box to be located 18” center AFF. Outlet box shall have at a minimum a 1 ¼” EMT conduit to nearest distribution system or as indicated on the Drawings or as specified herein.

3.9.4.2 Flush wall mounted VOIP telephones shall be a standard (1) 4 11/16" H x 4 11/16" W x 3 ¼” D box. Box shall have a minimum of a 1 ¼” EMT to nearest distribution system with the box being centered at 46”

3.9.4.3 Surface mounted outlets for wall mounted VOIP telephones or single data device shall have a Wiremold #2448 single gang outlet box mounted at 48” to top of box with surface mounted Wiremold #2400 raceway, entrance end fitting and 1 ¼” EMT conduit to nearest hallway skeletal or raceway distribution system. (Note: Single gang Wiremold #2448 box requires raceway to enter from the side).

3.9.4.4 Surface mounted outlet boxes for single VOIP desk phone shall be Wiremold #2448 single-gang outlet box with Wiremold #2400 raceway and entrance end fitting and (1) 1 ¼” EMT conduit to hallway distribution system.

3.10 Fire Stops

3.10.1 In all buildings, floor/ceiling assemblies, stairs, and elevator penetrations must be sealed with a minimum 2-hour fire stop assembly, unless otherwise noted. Penetrations through non-fire rated walls do not require fire-stopping but will require sleeves.

3.10.2 Contact Owner to identify walls which are fire-rated construction if not shown on architectural drawings.

3.10.3 Communication pathways requiring fire stopping shall utilize removable/re-usable fire stopping putties for ease of Moves, Adds, and Changes.

3.10.4 All fire stopping penetrations shall conform to the recommended practices listed in UL1479 or ASTM E814 and must be labeled with the UL1479 or ASTM E814 reference number, dated,
and signed by the technician who installed the fire stopping material.

3.11 Table of Junction Box Requirements

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