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 horizontal optical fiber 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 Fiber Cabling

2.1.1 Single-mode Fiber Optic Outlet Cable - Provide horizontal fiber optic cable from outlet through conduits to skeletal or cable tray then through skeletal or cable tray to IDF or BDF.

2.1.1.1 Each single-mode fiber optic cable shall be plenum-rated MIC type tight buffered fiber. Typical fiber outlets consist of a two-strand fiber, Corning part #002E81-31131-24 for non-plenum installations and Corning part #002E88-31131-29 for plenum installations. Number of strands may vary depending on project.

2.1.1.2 Fiber-optic glass must be manufactured by Corning Cable Systems

2.1.2 Multimode Fiber Optic Outlet Cable - Provide horizontal fiber optic cable from outlet through conduits to skeletal or cable tray then through skeletal or cable tray to IDF or BDF.

2.1.2.1 Each multimode fiber optic cable shall be plenum-rated OM3, MIC type tight buffered fiber. Typical fiber outlets consist of a two-strand fiber, Corning part #002T81-31180-24 for non-plenum installations and Corning part #002T88-31180-29 for plenum installations. Number of strands may vary depending on project.

2.1.2.1 Fiber-optic glass shall be manufactured by Corning Cable Systems.

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

3.1.1.3 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.

3.1.1.4 The Contractor shall verify space requirements and locations with the Purdue IT Infrastructure Services Department before starting cable installations and terminations.
3.1.1.5 The Contractor shall verify the cable type and jacket rating required with the Purdue IT Infrastructure Services Department before starting fiber installation.

3.1.1.6 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 attachment, 3.01 Attachment #1.

3.2 Skeletal and Empty Station Conduits

3.2.1 Provide a nylon pull cord in each empty conduit to facilitate future installation of cables.

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

3.3 Horizontal Fiber Cabling

3.3.1 The horizontal fiber cabling will be terminated at the telecom room in either a wall mountable enclosure or frame mountable enclosure.

3.3.2 Contractor is responsible to obtain and follow installation instructions for Corning products for correct termination and fiber management of cables on respective products.

3.3.3 Owner to provide future cross terminations to network equipment.

3.4 Fiber Color Codes

<table>
<thead>
<tr>
<th>Fiber</th>
<th>Color Combination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Blue</td>
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<tr>
<td>2</td>
<td>Orange</td>
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<td>3</td>
<td>Green</td>
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<td>10</td>
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<tr>
<td>11</td>
<td>Rose</td>
</tr>
<tr>
<td>12</td>
<td>Aqua</td>
</tr>
</tbody>
</table>

3.5 General Fiber Installation

3.5.1 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”).

3.5.2 Cable bends shall not be greater than that recommended by the manufacturer of the cable.
3.5.3 Care shall be taken so as not to damage cable during the installation process and that manufacturer’s pull tension specification is not exceeded.

3.5.4 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.

3.5.5 Provide a minimum 8’-0” and maximum 10’-0” of slack on telecom room cable tray.

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

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

3.5.8 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 Cable Testing

3.6.1 A 100% verification by the Purdue IT Infrastructure Services Department of all horizontal fiber cable tests will be performed. Contractor shall notify the Purdue IT Infrastructure Services Department 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 Fluke DTX cable analyzer. If Purdue personnel accompany the Contractor on testing, verification shall not be performed.

3.6.2 The fiber optic cables shall be tested utilizing a power meter and stabilized light source capable of testing at 850 nm and 1300 nm for multimode and 1310nm and 1550nm for single-mode. Contractor shall complete a fiber optic post installation report at the time of testing containing meter readings at both 850 nm and 1300 nm for multimode and 1310nm and 1550nm for single-mode in one direction (TR to outlet) on each fiber, actual loss and other pertinent data regarding the cables tested, including model and serial number of test equipment, cable part #, installed fiber length, building span loss at 850 nm and 1300 nm for multimode and 1310nm and 1550nm for single-mode and date tested. The fiber optic post installation report shall be in Fluke Linkware (.flw) format. A CD with the electronic Fluke file is required at the end of the project. Span loss calculations may be verified for loss at 850 nm and 1300 nm for multimode and 1310nm and 1550nm for single-mode via the formula below.

\[
\text{Span Loss Benchmark Calculation} \\
(D \times L) + (C \times \# \text{ connectors})
\]

\[
D = \text{Length}; \ L = \text{Loss}; \ C = \text{Connector loss (Max 0.75 dB)}
\]

\[
1 \text{ ft.} = .0003048 \text{ km.}
\]

Owner will perform 100% verification testing as part of acceptance of all fiber optic cable testing.

3.7 Equipment Installation and Cable Terminations

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

3.7.2 All fiber cables shall be installed and terminated by technicians experienced in the installation and termination of fiber cables.
3.7.3 The Contractor shall employ certified system installation technicians and have at least 5 years of experience in the installation of similar and equivalent systems.

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

3.8 As Built Information

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

3.8.2 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.

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

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

3.8.5 Contractor shall submit cable records to reflect all moves, adds, and changes.

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

### Table 2

<table>
<thead>
<tr>
<th>Conduit size</th>
<th>% EMT</th>
<th>1” EMT</th>
<th>1 ¼ EMT</th>
<th>1 ½” EMT</th>
<th>2” EMT</th>
<th>3” EMT</th>
<th>4” EMT</th>
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<tr>
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<tr>
<td>40% area</td>
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<td>0.60</td>
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<td>19</td>
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<td>162</td>
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<tr>
<td>4-pr. cables**</td>
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<td>13</td>
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### Table 3

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<th>6000</th>
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<tbody>
<tr>
<td>4-pr. cables*</td>
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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.
** 23” = O.D. of 2-strand fiber