ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER AND OFFICE OF INFORMATION TECHNOLOGY (OIT)

TELEPHONE AND NETWORK CLOSETS

DEFINITIONS

- **Backbone cable** – This is the primary cabling that provides data and telephone connectivity to the building. It is generally run through maintenance tunnels or in conduits between buildings.

- **Riser cable** - This type of cable is generally run vertically throughout the building to connect the TR’s with the MTR.

- **Station cable** - This type of cable is generally run horizontally throughout the building to connect the individual room jack with TR’s.

- **MTR (Main Telecommunications Room)** - This will be the room where the backbone and riser communication cables will terminate. The MTR may also be used as a TR on its designated floor.

- **TR (Telecommunications Rooms)** - These will be the rooms where all the station cables will terminate on each floor.

COMPONENTS

ROOM SIZE

- The MTR room size will be a minimum of 12’ x 12’ unless directed otherwise by project manager.

- The TR’s size will be a minimum of 8’ x 8’ unless directed otherwise by project manager.

- The MTR and TR will have a floor to minimum ceiling clearance height of 8’ 4” with no obstructions (e.g. piping, lights, drop ceiling, duct work, etc.).

ROOM LOCATION

- The MTR will be located as close as possible to the cable entering the building,

- The MTR and TR’s will not be located in close proximity to a high voltage transformer, elevator switch gear, large electric motor or any other type of high EMF producing devices.
• The MTR and TR will be placed in a manner in which the cabling connecting a room jack to the MTR or TR does not exceed 250 feet in length.

• The MTR and TR will have direct access to the main hallway.

COMMUNICATIONS EQUIPMENT CONFIGURATION

• There will be two equipment racks (4 posts) in each MTR and TR unless otherwise noted by the project manager.

• There will be a total of three vertical wire managers attached to the equipment racks. One wire manager will be shared between two racks and the other two wire managers will be placed on the remaining sides of each rack.

• There will be one horizontal wire manager installed above and below each cable patch panel.

• There will be an overhead ladder rack installed above the equipment racks in both MTR and TR rooms.

• The exact placement of the overhead ladder rack, wire managers, patch panels, and equipment racks will be determined by the project manager prior to installation.

CONDUIT

A. Two, reamed or bushed, 4” conduits will be installed from the MTR into the main utility tunnel or if there is not a tunnel present, to an area of the building where the backbone cable will enter the building. The conduit must extend into the tunnel or outside the building as approved by project manager.

B. There will be four, reamed or bushed, 2 1/2” conduits stubbed from the hallway into the MTR or if there is a cable tray installed in the hallway, it may extend into the MTR, to accommodate the room cabling on that floor. To accommodate any cabling leaving the MTR to a different floor, there will be two sleeved 4” core drilled holes drilled through the floor directly above and/or below and accessible to the cable pathways. These sleeves will protrude 1” above the floor.

C. There will be three, reamed or bushed, 2 1/2" conduits stubbed from the hallway into the TR or if there is a cable tray installed in the hallway, it may extend into the TR, to accommodate the room cabling on that floor. To accommodate any cabling leaving the TR to a different floor, there will be two sleeved 4” core drilled holes drilled through the floor directly above and/or below. These sleeves will protrude 1” above the floor.
ACCESS CONTROL

- The MTR and TR doors will be equipped with electronic door access controls that adhere to the Ohio University electronic access control standards.
- The MTR and TR door key designation will be identified by project manager.
- Only OHIO approved equipment and/or personnel will occupy the MTR and TR’s.

HVAC

- The MTR and TR’s air conditioning will be designed to maintain a consistent 70°F room temperature. For energy efficiency purposes, we would like the primary HVAC system to be the building AHU supply and for a back-up AC system to be the secondary system if the room does not meet a 70°F set point. The MTR and TR’s room temperature and unit should be monitored by the front end per division 23.
- The HVAC contractor will need to work with the mechanical engineer and project manager to properly size the HVAC system.

ELECTRIC

- The MTR and TR will have a minimum of four quad 120 Volt AC 20amp outlets. There will be a total of two circuits in the room. Each quad outlet will have a separate circuit on each side (e.g. circuit 1 would be on the duplex outlet on the left side and circuit 2 would be on the duplex outlet on the right side). All outlet covers will be marked with the circuit breaker and breaker box ID. These circuits shall be used only for communication circuits and will be connected to the emergency backup generator, if available.
- The MTR and TR will have a minimum of one 120 Volt AC 30amp (L5-30r) outlet installed in a location in the room to be identified by the project manager.

FIRE SUPPRESSION

- OU-OIT request that the MTR and TR’s be constructed in a manner in which fire suppression is not needed. If fire suppression is required, OIT would prefer either a dry fire suppression system or a thru-wall dry pipe sprinkler system with a high temperature head and a protective wire cover.
There will be a fire/smoke detector installed in the MTR and TR’s. The detector will be tied into the building fire alarm system.

LIGHTING

- The MTR and TR will be well illuminated with lighting fixtures. Minimum lighting conditions will be 540 lux (50 foot candles) when measured at 3’ above the floor level.

FLOORING

- Floors in the MTR and TR will be VCT tile or sealed concrete.

MISC.

- All walls will be painted in the MTR and TR’s.
- There will be no water pipes, drain pipes, high power electrical conduits, electrical panels, steam lines, hot pipes, etc. in or through the MTR or TR.
- Entrance door for the MTR and TR will swing out of room.

PROPER INSTALLATION OF OPTICAL FIBER AND COPPER TELCO BACKBONE CABLES IN UTILITY TUNNELS, CONDUITS, MAN HOLE AND HAND HOLE SYSTEMS

- This Section describes the installation for the products and materials, as well as methods and standards associated with backbone cable installation in utility tunnels, conduits, man hole and hand hole systems.
- These Specifications, along with the Drawings and other IT supplied specifications shall be provided during the course of the installation.
- The Contractor shall install all materials plumb, square and in a workman-like manner.
- The Contractor shall supply all necessary tools, equipment, accessories, safety equipment, protective clothing, etc., as customary for the craft and necessary for the installation.
- The Contractor shall verify space requirements and locations with the project team and IT before engaging cable installations.
• The Contractor shall verify existing cable fill in conduit, raceway or cable tray system prior to quote or bid and before cable installation. Contractor will be responsible for installation of additional conduit, raceway or cable trays if needed.

• The Contractor shall comply with all National, State and local codes and Ohio University’s Policies, Procedures, Standards AND Design Guidelines during the course of installation.

• Should any portion of these Specifications conflict with applicable Codes, the Contractor shall cease work on that particular aspect of the Project and notify owner immediately.

• All Backbone cabling shall be installed in a neat and professional manner.

• The Contractor shall employ certified system installation technicians and have experience in the installation of similar and equivalent systems.

• The Contractor shall supply verification of experience, for this type of work, to Design and Construction for approval before performing any work.

FIELD CONDITIONS

• The Contractor shall verify fixed facility locations shown on the Drawings.

• The Contractor shall conduct field inspections to coordinate, verify and/or determine the actual as-built locations of conduits, manholes, hand holes and all other special facility needs such as in existing utility tunnels that affect the installation, prior to commencing cable installation.

• All underground structures including utility tunnels, conduits, man holes, hand holes and related fixtures shall be kept as clean as possible during installation. Labor required for any cleaning work shall be included in the quote or bid and provided by the Contractor.

TELEPHONE AND NETWORK CABLE PATHWAYS

REQUIREMENTS:

• The consultant shall review all state, local and federal codes including the requirements of EIA/TIA-569, BICSI’s telecommunications distribution methods manual (TDMM) when applicable.
• Telephone and network cable conduits and boxes shall refer to all low voltage systems specified within the technology specifications.

• Pathways shall not have exposed sharp edges or other surfaces that could cause damage or otherwise cause substandard installation that may come into contact with the structured cabling system.

• Elevator shafts shall not be used as pathways.

• All pathways installed under the scope of this contract, whether for routing of cable, future use or spare, shall have an appropriately sized pull string installed. Each end of the string shall be fastened in such a fashion so as to assure its availability in the future, and shall be tagged with the location of the other end.

• Telephone and network cable trays, cable runways and other communications pathways are for the exclusive use for telephone and networking.

• All conduits will be Electrical Metallic Tubing (EMT) unless otherwise specified by the project manager.

• All outlet boxes will be metallic unless otherwise specified by the project manager.

• Unless otherwise noted, use the metal cable trays, splices, brackets, grounding straps, etc. as listed in the approved product section below.

• Surface mounted raceways for technology cabling shall be metallic. Products shall be UL Listed for their intended use and shall be provided complete with all fittings, barriers, covers and mounting accessories as recommended by the manufacturer. Preferred manufacturer: Wiremold.

• All raceways with built-in outlets will use cutouts that will accommodate the approved communications jack and faceplate.

• All communication outlets mounted in the floor will be duplex or quad receptacle type cutouts, unless specifically designed to accommodate the approved communications jack and faceplate.

• There will be two 4” conduits installed from the MTR into the main utility tunnel or if there is not a tunnel present, to an area of the building where the backbone cable will enter the building. The conduit must extend into the tunnel or outside the building as approved by project manager.
• There will be four 2 1/2" conduits stubbed from the hallway into the MTR or if there is a cable tray installed in the hallway, it may extend into the MTR, if allowed by code.

• There will be three 2 1/2" conduits stubbed from the hallway into the TR or if there is a cable tray installed in the hallway, it may extend into the TR, if allowed by code.

• Conduit runs shall not contain more than two 90 degree turns prior to termination unless conduit size is increased to the next trade size. Conduit shall not exceed three 90 degree turns regardless of size. All 90 degree turns shall be a long 90 degree sweep.

• All conduits, with the exception of telecommunication outlet conduits, shall not exceed 100 feet without utilizing a pullbox.

• All conduits shall be reamed smooth to prevent accidental damage to the cables, and have a non-metallic bushing installed.

• Conduits from each room will stub out into the hallway above the drop ceiling, if acceptable by code. Otherwise, conduit will be stubbed above the nearest drop ceiling.

• All conduits for telecommunications outlets shall be a minimum of ¾”

• All conduits stubbed into an open area shall extend 6” from the finished surface.

• Until cables are installed in the conduit, they will need temporarily capped to keep out various construction debris.

• Blank cover plates shall be provided for boxes that are not identified to have cabling installed.

• Outlet boxes shall be double gang with a single gang plaster ring.

• All CATV connections will have their own receptacle boxes.

• Telephone and data connections may be combined into one receptacle box, if they are in the same location and do not exceed a total of four connections per box.
### APPROVED PRODUCTS

<table>
<thead>
<tr>
<th>Item</th>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ladder rack (to be used in IT closets above equipment racks)</td>
<td>10250-712 *</td>
<td>CHATSWORTH Universal Cable Runway; 12&quot;W x 1.5&quot;H x 9.96'L</td>
</tr>
<tr>
<td>Ladder rack butt-splice kit</td>
<td>11301-701 *</td>
<td>Cable Runway Butt-Splice Kit, 0.38&quot; W x 1.5&quot; H x 5&quot; L</td>
</tr>
<tr>
<td>Ladder rack wall support bracket</td>
<td>11312-718 *</td>
<td>Triangular Support Bracket for cable runway, Aluminum, Width 12&quot; to 18&quot;, Maximum of 100 lbs</td>
</tr>
<tr>
<td>Ladder rack ground strap</td>
<td>40164-001 *</td>
<td>Cable Runway Ground Strap Kit; Green</td>
</tr>
<tr>
<td>Ladder rack T-splice</td>
<td>11298-701 *</td>
<td>Heavy-Duty Junction-Splice Kit; 0.38&quot;W x 1.5&quot;H x 2&quot;L</td>
</tr>
<tr>
<td>Ladder rack ceiling support bracket kit</td>
<td>11310-001 *</td>
<td>Threaded Ceiling Kit 3/8-16; 72&quot;L; Gold</td>
</tr>
<tr>
<td>Ladder rack center support bracket kit</td>
<td>12362-712 *</td>
<td>Cable Runway Center Support Kit; 12.56&quot;W; Black</td>
</tr>
<tr>
<td>Ladder rack 90 degree splice</td>
<td>SB2101ABZ *</td>
<td>Cable Runway/Ladder Rack, 90 Deg. Junction Splice Clamp for 1.5&quot;H Runway,</td>
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<tr>
<td>Ladder rack wall angle support</td>
<td>11421-112 *</td>
<td>CPI wall angle brackets</td>
</tr>
<tr>
<td>Ladder Rack J-bolt kit</td>
<td>11308-001 *</td>
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<td>J-hooks or rings</td>
<td>BRS-32A /BRS-64A/BCH32/BCH64 *</td>
<td>2&quot; B-line saddled rings / 4&quot; B-line saddled rings /2&quot; J-hook B-line /4&quot; J-hook B-line</td>
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<td>Cable trays (for primary building pathways)</td>
<td>CF105/300EZ *</td>
<td>CABLOFIL 10 ft. L x 12 in. W x 4 in. D, tray</td>
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<tr>
<td>Cable tray ceiling hanger support</td>
<td>FASP300PG *</td>
<td>FAS profile 12 in. L, finish: pre-galvanized</td>
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<tr>
<td>Cable tray spice kit (90 degree/T spice)</td>
<td>EZT90KITBL *</td>
<td>CABLOFIL</td>
</tr>
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| **Ohio University** | **Architecture, Design and Construction Standards** | **Division 27 – Communications** |
## Division 27 – Communications

### Cable tray spice kit
- **Part #**: FTEF100BL *
- **Description**: CABLOFIL | FiberTrough FAS Coupler, Black

### Conduit
- **Part #**: *
- **Description**: EMT

### Pullstring
- **Part #**: 430 *
- **Description**: Greenlee 430 polyline

### Non-metallic bushing
- **Part #**: ARTEMT75 *
- **Description**: Arlington ¾” plastic bushing

### Grounding
- **Part #**: 10622-010
- **Description**: CHATSWORTH Wall-Mount Busbar Kit; 4"W x 0.25"H x 10"L; Copper

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**CABLING**

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<thead>
<tr>
<th>Station cable (Twisted pair)</th>
<th>CMP-00424COM-7U-04</th>
<th>CommScope 7504 Uniprise UltraMedia cat 6E U/UTP Cable, plenum, green, 4 pair, 1000’ box</th>
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<tbody>
<tr>
<td>Station cable (Coaxial)</td>
<td>B633938-U1000</td>
<td>Belden RG6 plenum rated</td>
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<tr>
<td>Backbone cabling MTR to TR (Twisted pair)</td>
<td>10032113</td>
<td>in-house riser rated 100pr cat 3</td>
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<tr>
<td>Backbone cabling MTR to TR (Fiber)</td>
<td>012E88-33131-29</td>
<td>12 strand single mode Corning fiber yellow plenum rated tight buffer tube</td>
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<tr>
<td>Backbone cabling MTR to TR (Coaxial)</td>
<td>CSP3500JCASS</td>
<td>1/2 coax trunk cable</td>
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<tr>
<td>Backbone cabling between buildings (Twisted pair)</td>
<td>E-010024DFC</td>
<td>100 pr 24 gauge cat3 armored</td>
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<tr>
<td>Backbone cabling between buildings (Fiber)</td>
<td>012E8P-31131-A3</td>
<td>12 plenum rated outdoor armored coring fiber</td>
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<tr>
<td>Backbone cabling between buildings (Coaxial)</td>
<td>CSP3500JCASS</td>
<td>1/2 coax trunk cable</td>
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# PATCH PANELS AND WIRING BLOCKS

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<tr>
<th>Description</th>
<th>Model</th>
<th>Details</th>
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<tbody>
<tr>
<td>Fiber patch panel boxes 1U</td>
<td>CCH-01U</td>
<td>Corning LANscape Closet Connector Housing, Accepts 2 CCH Panels</td>
</tr>
<tr>
<td>Fiber patch panel boxes 4U</td>
<td>CCH-04U</td>
<td>Corning LANscape Closet Connector Housing, Accepts 4 CCH Panels</td>
</tr>
<tr>
<td>Fiber connectors</td>
<td>95-200-99-Z</td>
<td>Corning UniCam® Pretium™ Performance Single Mode Connectors LC Compatible 25 pack</td>
</tr>
<tr>
<td>12 port LC fiber modules</td>
<td>CCH-CP12-A9</td>
<td>CCH-CP12-A9 Corning (CCH) Panel, LC adapters, Duplex, UPC, 12 F, Single-mode (OS2)</td>
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<tr>
<td>Cat 6 patch panel</td>
<td>OR-PHD66U48</td>
<td>Ortronics Clarity 6 48-port Category 6 patch panel, six-port modules, 19&quot; x 3.5&quot;</td>
</tr>
<tr>
<td>Wiring blocks</td>
<td>S110DB1-200RFT</td>
<td>SIEMON 200-pair 19 inch panel</td>
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# COMMUNICATION JACKS

<table>
<thead>
<tr>
<th>Description</th>
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<tr>
<td>Faceplate</td>
<td>OR-403000664</td>
<td>Angled face plate Ortronics OR-403000664</td>
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<tr>
<td>Single rj-45 jack module</td>
<td>OR-S21600</td>
<td>Single port data OR-S21600</td>
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<tr>
<td>Dual rj-11 jack module</td>
<td>S21RJ25</td>
<td>Dual port phones S21RJ25</td>
</tr>
<tr>
<td>Dual rj-45 jack module</td>
<td>OR-S22600</td>
<td>Dual port data OR-S22600</td>
</tr>
<tr>
<td>CATV F connector jack</td>
<td>80781-W</td>
<td>Leviton Standard F-Connector Video Wall plate Jack, White</td>
</tr>
<tr>
<td>CATV coaxial end for RG6 quad shield</td>
<td>FS6PL2</td>
<td>Compression end plenum rated RG6 coax FS6PL2</td>
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EQUIPMENT RACKS AND WIRING MANAGERS

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Model</th>
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<tbody>
<tr>
<td>4 post equipment rack</td>
<td>AR204A</td>
<td>APC NetShelter 4 post open frame rack - 44U</td>
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<tr>
<td>2 post equipment racks</td>
<td>OR-19-84-T2SD</td>
<td>19&quot; Ortronics equipment rack</td>
</tr>
<tr>
<td>Equipment shelf</td>
<td>604044938</td>
<td>Ortronics vented equipment shelf, slide-out</td>
</tr>
<tr>
<td>Vertical wire manager</td>
<td>MM6VML706(V)</td>
<td>Mighty Mo vertical management</td>
</tr>
<tr>
<td>Horizontal wire manager</td>
<td>60400131(H)</td>
<td>Ortronics horizontal wire manager</td>
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</table>

BUILDING ENTRANCE TERMINAL AND PROTECTION MODULES

<table>
<thead>
<tr>
<th>Module Type</th>
<th>Model</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Lightning protection</td>
<td>1880ECA1-100</td>
<td>Circa Telecom 100pr lightning protection</td>
</tr>
<tr>
<td>5 pin module</td>
<td>3B1S-300</td>
<td>Circa Telecom 5 PIN - Solid State - Surge Protection Module</td>
</tr>
</tbody>
</table>

* or like products meeting specifications of products listed

Parts may be substituted upon written approval by the project manager.

CABLE TRAYS

- Provide straight sections, curved sections, hangers, support rods, clamps, related fittings and mounting accessories as recommended by the system supplier. Conflicts shall be brought to the attention of the project manager and the OU project manager.

- All fittings, supports, splices, etc. for the ladder tray system shall be installed to provide a complete assembly- including fasteners, hardware, and other items required to complete the installation as indicated on the drawings.

- Radius drops shall be used when transitioning cables from the cable runway to a rack, wall field or other cable management device. Radius drop shall securely fasten to the rung or stringer, and shall be the same width as the cable runway.

- Support systems for cable ladder trays and cable runways shall not be center hung.
• Provide a minimum of 12” clearance above and both sides of all cable tray sections from the finished structure of any device or equipment installed or routed above the cable tray.

• Cable tray and runway used as equipment grounding conductors shall be provided with bonding jumpers between sections, raceways, and equipment. Support of cable trays and runways shall meet NEMA Class 10A, at 6 foot support spans to support 50 pounds/foot (safety factor 1.5).

• Cabling pathways shall maintain clearance from line voltage cabling and devices at all times, and shall be spaced from these devices so as to comply with the TDMM, the NEC, and any other local codes or regulations.

SURFACE MOUNTED RACEWAYS

• If possible, transitions from conduit shall occur above ceilings. The raceways shall be large enough to support the required cable capacity for its intended use.

• Raceways shall be mechanically fastened to the walls or ceilings. Adhesive mounting is not permitted.

• Cabling shall be properly supported in the raceways. Sectional barriers shall be provided between power and communication wiring.

TELEPHONE AND NETWORK GROUNDING SYSTEM

• The electrical contractor shall provide the telephone and network grounding system.

• The telephone and network grounding system shall be bonded to the building grounding electrode system.

• The telephone and network grounding system shall comply with the latest revisions of ANSI-J-STD-607-A, Commercial building grounding (Earthing) and bonding requirements for telecommunications.

• Distribution of the telephone and network grounding system shall be in accordance with the specifications and drawings.

• Each MTR and TR shall be equipped with a telecommunications grounding busbar (TGB) that shall be bonded to the telecommunications main grounding busbar (TMGB).
• The telephone and network grounding system shall not be connected to avoid creating pathways for circulating currents.

EQUIPMENT GROUNDING

• All conductive equipment installed by the telephone and network cabling contractor shall be bonded to the local TGB.

• Where copper cabling is routed to an area, either in another building, or with a separate electrical service, the telephone and network cabling contractor shall provide primary protective equipment and ground the equipment to the local TGB.

CABLE

• The grounding cable used to bond the horizontal cable equipment to the TGB shall be stranded 6 AWG green jacketed (non-plenum) depending on the environment in which the cable is installed.

GROUNDING WASHERS

• All ground washers shall be paint piercing type, green in color, and constructed of electro zinc plated steel.

• The telecommunications bonding backbone (TBB) shall be installed in a continuous run (without splices) between the TMGB and every TGB. Where the TBB is installed in a riser, or multiple TGBs are connected to the same TBB cable, approved taps shall be used to connect the TBB to each TGB. Approved taps will be approved by the project manager after approval from OU-OIT.

• The bonding conductor used between the TBB and TGB shall be the same size as the TBB.

• The bonding conductor used to bond the TMGB to the main electrical service equipment (power) ground shall at a minimum be the same size as the TBB.

• Horizontal cable equipment shall be grounded in compliance with ANSI/NFPA 70 and local requirements. Horizontal equipment includes but is not limited to cross connect frames, patch panels and racks, cable runway, active telecommunications equipment, and test apparatus and equipment.

• The bonding conductor used to bond the horizontal cable equipment to the TGB shall be a minimum of 6 AWG, stranded, jacketed, copper wire.
• Paint piercing grounding washers and antioxidant shall be used when attaching ground lugs to equipment racks and enclosures.

• Sharp bends in the TBB and the bonding conductors shall be avoided. The maximum sweep radius shall be less than or equal to 90°. All 90° bends shall be sweeping. All bends in the bonding conductors shall flow towards the TGB or the source of the TBB.

• The TBB shall be supported by a separate and independent support system, and shall not share electrical or telecommunications pathway support systems. When non-insulated (non-jacketed) copper cable is used, the support system shall be insulated and non-conductive. Extreme care shall be taken to ensure the cable does not come into contact with structural steel, plumbing piping and fixtures, sprinkler system, electrical conduit, or other metallic device or apparatus. When contact is unavoidable, the grounding conductor shall be insulated with plenum rated innerduct or other approved method.

• The telephone and network grounding system shall be an independent system from the building grounding electrode system with the exception of the bond between the systems.

• Telecommunications bonding backbone shall not be routed in the same cable tray or runway as low voltage cabling.

LABELING

• All bonding conductors related to the technology equipment shall be labeled at both ends within 2” of the end of the outer sheaths. The label shall be pre-printed or machine generated, permanently self-adhering or adhered by means of clear shrink tubing, and shall be clearly legible. The label shall indicate the source and the destination of the bonding conductor, the source being the device or equipment closest to the TMGB. Labels shall be white with black letters.

• All busbars shall be identified with a permanent laminate placard, 2 ½” by 5”, with white letters on a green field stating:

   “WARNING - Telecommunications grounding busbar for data and communications equipment only - NOT to be used as an electrical systems ground. If connectors or cables show signs of becoming loose or require removal, contact the OU Office of Information Technology.”
The identification placard shall be permanently mounted directly above the busbar at a distance no greater than 6” above the top edge of the busbar.

CONNECTIONS

- All connections of bonding conductors routed between two busbars, between a busbar and the building grounding electrode system, shall be irreversible compression connections or exothermic connections.
- All connections between the horizontal cabling and equipment shall be irreversible compression connections.

RECORD DRAWINGS

- Contractor shall provide full size electronic drawings showing the TGMB, all TGBs, termination point to main electrical service ground, and route of TBB.
- All as-built information shall be submitted in AutoCAD readable format.

TELEPHONE AND NETWORK CABLELING SYSTEM

- Install a structured cabling system consisting of various types of cable and hardware required to support the new telephone and network system. This will include but is not limited to horizontal cabling, backbone cabling, workstation outlets, cross-connect hardware, etc.
- Third party sub-contractor must comply with all the same requirements as the contractor and must be approved by project manager prior to work start.
- All equipment and installation practices shall comply with the latest BICSI Telecommunications Distribution Methods Manual (TDMM).
- All equipment shall comply with the latest ANSI-J-STD-607 commercial building grounding and bonding requirements for telecommunications standard.
- All equipment shall comply with the latest ANSI TIA/EIA-568, 569, 606, 607, 862 standard.
- All equipment and installation practices shall comply with the latest ASNI/NFPA-70 National Electric Code.
Employees must meet the following qualifications.

- On Staff
  - RCDD (preferred)

- On Site
  - Foreman
    - BISCI Technician (TE350) with 3 years of experience related to the installation and supervision of network and telephone cabling (preferred).
    - Or 5 years of experience related to the installation and supervision of network and telephone cabling of similar sized projects.

  - Copper Installers
    - BICSI Installer Copper 2 (IN225) or 3 years of experience related to the installation of network and telephone cabling of similar sized projects. (minimum of 1 on work site)
    - BICSI Installer 1 (IN101) or 2 years of experience related to the installation of network and telephone cabling of similar sized projects. (no more than 3 per BICSI IN225 certified installer or equivalent)

  - Fiber Installers
    - BICSI Installer Fiber 2 (IN250) or 3 years of experience related to the installation of fiber optic network cable of similar sized projects. (minimum of 1 on work site, if project requires fiber optic cabling)
    - BICSI Installer 1 (IN101) or 2 years of experience related to the installation of fiber optic network cable of similar sized projects. (no more than 3 per BICSI IN250 certified installer or equivalent)

- There will be periodic meetings with the contractor and the project manager to review installation methods and progress for the following activities:

  - Equipment lay-out and cable routing in the communications closets: prior to start, 50%, and upon completion.
  - Cabling installation: prior to start, 10%, 30%, 50%, 70%, 90%, and upon completion.
  - Labeling in communications closets and room jacks: prior to start, 10%, 50%, and upon completion.
  - Review testing equipment and methods: prior to start, 10%, 50%, and upon completion.

Note: The project manager may initiate meetings at other intervals.
EXECUTION

INSTALLATION

CABLE ROUTING

- Where the contractor is required to install non-continuous pathways for the structured cabling system, the contractor shall keep hallway crossover to a minimum. Furthermore, non-continuous pathways shall be routed so as to follow logical paths parallel and perpendicular to the building structure.

- Cable support methods of binding cabling shall not be installed in such a fashion to as to bend, crimp or deform the cabling in any way so as to alter the electrical or transmission characteristics of the cabling.

- Velcro shall be used in all cable pathways in technology equipment rooms.

- All horizontal cables, regardless of media type, shall not exceed 250 feet from the telecommunications outlets in the work area to the MTR or TR.

- Horizontal pathways shall be installed such that the minimum bending radius of the horizontal cables is kept within manufacturer specifications both during and after installation.

- The contractor shall verify the proper installation technique and sizing of the raceway system prior to installation of the cabling.

- The number of horizontal cables placed in a cable support or pathway shall be limited to a number of cables that will not affect the geometric shape of the cables.

- Maximum conduit pathway capacity shall not exceed a 40% fill with the exception of perimeter and furniture fill, which is limited to 60% fill for moves, adds and changes, unless otherwise noted on drawings.

- Horizontal distribution cables shall not be exposed in the work area or other locations with public access, unless otherwise noted on drawings.

- Cables routed in a suspended ceiling shall not be draped across the ceiling tiles. Only approved pathway systems shall be used.
Each cable shall be run in a homerun configuration, and shall contain no bridges, taps, or splices.

Cabling shall maintain clearance from line voltage cabling and devices at all times, and shall be spaced from these devices so as to comply with the TDMM, the NEC, and any other local codes or regulations.

PULLING TENSION

The maximum pulling tension for all cables shall not exceed the respective manufacturer’s specifications, or the limits as published in current edition of the TDMM.

BENDING RADIUS

The contractor shall adhere to the manufacturer’s requirements and as indicated in the BICSI Telecommunications Distribution Methods Manual (TDMM) for bending radius of all data and voice cables. Where the manufacturer’s specifications differ from those cited in the TDMM, the Contractor shall abide by the greater bending radius.

SLACK

At the work area outlet, a minimum of 300 mm (12 inches) shall be left for UTP, while 1 m (3 ft) shall be left for fiber cables.

For wireless access point locations, a minimum of 20 feet shall be left for UTP horizontal cable. The slack will be coiled above the ceiling in the location of the access point.

In the MTR and TR, a minimum of 3 m (10 ft) of slack shall be left for all copper and fiber cable types. This slack shall be neatly managed on trays or other support types.

SPECIAL REQUIREMENTS FOR CABLE ROUTING AND INSTALLATION

All cabling used throughout this project shall comply with the requirements as outlined in the National Electrical Code Articles 725, 760, 770, and 800 and the applicable local codes. All copper cabling shall bear CMP (plenum rated) markings. All fiber optic cabling shall bear OFNP (plenum rated) markings.

Cables shall not be attached to or supported by fire sprinkler heads or delivery systems or any environmental sensor located in the ceiling space.
BUILDING ENTRANCE TERMINALS AND PROTECTION MODULES

- All copper circuits shall be provided with protection between each building or between areas with separate electrical service with entrance cable protector panels at each end. All building-to-building circuits shall be routed through this protector.

- Each protector shall be connected with a minimum 6 AWG, jacketed, copper bonding conductor between the protector ground lug and the local TGB unless otherwise noted on the drawings.

STRUCTURED CABELING SYSTEM TESTING

- The project manager retains the right to be present at any or all cable certification. The contractor shall provide written notice 48 hours prior to the beginning of the certification process.

- The contractor shall provide a copy of the unaltered certification test reports to the project manager in both hardcopy and electronic format.

- Independent system certified testing may be required, at the discretion of the project manager, provided at the expense of the contractor, in the event of non-performance of the specified testing procedures, submittals and/or installation procedures. The extent and logistics of the independent testing shall be arranged by the project manager.

- The project manager reserves the right to mandate re-termination or other reasonable rework to improve the performance of any cabling indicated as being a “marginal pass”.

COPPER CABELING

- Upon completion of the cable installation, the contractor shall perform complete copper cable certification tests on every cable, including but not limited to:
  - Wire Map
  - Length
  - Attenuation
  - Near End Cross Talk (NEXT)
  - Equal Level Far End Cross Talk (ELFEXT)
  - Propagation Delay and Delay Skew
  - Return Loss
  - Power Sum Cross Talk (PSNEXT and PSELFEXT)
  - Insertion Loss
Test shall be performed to published standards, including but not limited to, the latest revisions of EIA/TIA 568, ISO/IEC 11802 and other applicable standards at the time of installation for the appropriate cabling type.

All UTP field testers shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided to the project manager for review prior to the start of testing.

New test leads and/or calibration of testing instruments shall be provided at the beginning of each project.

Autotest settings provided in the field tester for testing the installed cabling shall be set to the default parameters.

FIBER OPTIC CABLING

Any fibers proving to be inoperable after installation shall be augmented by an additional fiber run or replaced at no additional cost to the owner.

Fiber cables shall be 100 percent tested for attenuation and length.

Attenuation shall not exceed 3db when tested at 1310nm or 1550nm.

Reflectance shall not exceed -40db when tested at 1310nm or 1550nm.

Length shall be tested using an OTDR, optical length test measurement device or sequential cable measurement markings.

TELEPHONE AND NETWORK CABLE SYSTEM LABELING

All work in this section will be performed by the telephone and network cabling contractor.

All work shall be in compliance to TIA/EIA 606.

The telephone and network cabling contractor shall compile all documentation required under this section, both hard copy and electronic.

All textual electronic documentation shall be recorded in MS Windows format.
• All files shall be in the native format of the software in which it was generated, as well as a plain text format. A copy of any viewing software shall be made available at no additional cost to the owner.

• Review and coordinate cabling and equipment labeling system with the project manager.

PRODUCTS

TAPE BASED LABELS

• All tape-based products shall be manufactured for the purpose of identifying flexible communications cabling.

PLACARDS

• All placards shall be constructed of a laminated polyvinyl process, and shall be engraved. All placards shall be white with black letters unless otherwise noted.

EXECUTION

LABELING

WORK AREA FLOOR PLANS

• Each MTR and TR shall contain a lexan covered copy of the floor plan(s) associated with the work area outlets serviced by the MRT and/or TR.

• The size of the plans shall be equal to the size of the contract drawings, unless contract drawings exceed 30” x 42”, in which case half size prints are to be utilized.

• The plans shall be affixed by means of compression between the lexan cover and the backboard to which it is mounted. The telephone and network cabling contractor shall make provisions to assure that the plans cannot accidentally fall from behind the lexan.

• For cross connect locations that are smaller than TIA standard locations, half size plans shall be permitted.

• The telephone and network cabling contractor shall utilize the final set of drawings when providing these plans.
RISER CABLE

- Each MTR and TR shall contain a lexan covered copy of the riser diagram(s) associated with the backbone cabling serviced by the MTR and TR.

- The size of the plans shall be equal to the size of the contract drawings, unless contract drawings exceed 30” x 42”, in which case half size prints are to be utilized.

- The plans shall be affixed by means of compression between the lexan cover and the backboard to which it is mounted. The telephone and network cabling contractor shall make provisions to assure that the plans cannot accidentally fall from behind the lexan.

- For cross-connect locations that are smaller than TIA standard locations, half-size plans shall be permitted.

- For locations that are serviced by wall mounted enclosures in shared spaces with other trades, the telephone and network cabling contractor shall provide a laminated 8 ½” x 11” plan of only the riser diagram and basic title block information. The laminated copy shall be attached in a semi-permanent fashion to the enclosure.

- The telephone and network cabling contractor shall utilize the final set of record drawings when providing these plans.

GENERAL LABELING REQUIREMENTS

- The telephone and network cabling contractor shall label all cables, faceplates, cabling enclosures, panels, termination blocks, equipment enclosures, racks and related hardware.

- The identification tag or placard shall be self-adhering or attached by means of a permanent adhesive listed for the application, or other permanent mechanical means.

- All means of identification shall be visible and clearly identifiable by personnel in charge of maintaining the cabling infrastructure.

- All labels shall be machine generated onto adhesive labels or tags.

- All laminated placards shall have a white field with black letters, unless otherwise indicated by the project manager.
• Contact the project manager for labeling methods regarding faceplates, 110 blocks, racks, and patch panels.

HORIZONTAL UTP CABLE LABELING

• All UTP cables shall be marked at both ends of the cable jacket, at approximately 2” from the end of the sheath, with a self-adhesive label.

• The label shall have the exact location of the point of service (the TR, rack or block ID and port) as well as the exact work area identification (faceplate ID and port number), at both the work area and cross-connect locations.

FIBER OPTIC CABLE LABELING

• All fiber optic cabling and innerduct that is exposed shall be identified with a pre-printed tag stating “WARNING FIBER OPTIC CABLE”. At least one label shall be utilized in all equipment rooms, cross-connect locations, closets, pull boxes, etc. All labels shall be readily visible by any personnel working in the area.

• All fiber optic cabling shall be labeled at both ends at approximately 2” from end of sheath, with a self-adhesive label.

• The label shall have the exact location of the point of service (the TR and fiber enclosure ID), for both the source and destination.

RISER UTP CABLE LABELING

• All riser UTP cabling shall be marked, at both ends, with the exact source and destination information (Telecommunications Space ID, rack, patch panel and ports, or punch down block ID and ports). Each label shall be approximately 2” from the end of the sheath.

CLOSE OUT PROCEDURES/DELIVERABLES

PERFORMANCE AND WARRANTY

• The contractor shall furnish and install all system cabling and components as required for a complete system as described elsewhere in these specifications and as shown on the drawings.
• The contractor shall guarantee all material and installation labor to be free from defects for a period of one (1) years from the date of formal written acceptance by the owner.

• After substantial completion by architect, final acceptance of the project will be approved by the project manager after review with the OHIO-OIT project manager

RECORD DRAWINGS

• The contractor shall submit to the owner as a condition of final acceptance a single reproducible set of record drawings exactly as the system was installed with all cable numbers designated on the drawings.

DOCUMENTATION

• As stated elsewhere in these specifications, it is the responsibility of the contractor to maintain a set of drawings and records. In addition, all electronic design documentation shall be corrected to reflect “as-built” conditions, including all spreadsheets and/or databases utilized for labeling and testing. Such documentation shall be turned over to the project manager in the original format without additional compensation to the contractor, including, but not limited to, all spreadsheets, databases, text files and proprietary file formats from the various testing instruments.

ALL ITEMS TO BE REVIEWED AND APPROVED BY PROJECT MANAGER AND OFFICE OF INFORMATION TECHNOLOGY (OIT)