

## **PART 1      GENERAL**

### **1.1          SCOPE**

Provide a complete copper and fiber communications cable plant distribution system as specified herein and as shown in the Contract Documents.

**1.1.1**      The Contractor shall provide all necessary project management, labor, materials, equipment, services, and other items required, whether specified or not, to furnish a complete and functional distribution facility. Among the items required are:

- Outside Plant: 110 cross-connect block in MDF for incoming copper service (incoming cable by the Owner)
- Single-mode fiber optic ribbon and Category 3 copper riser cables
- 4-strand fiber for FA Fiber Optic Loop
- Fiber optic enclosures for fiber optic cable
- 110 cross-connect blocks for copper riser tie cables
- Patch panels in the MDF/IDF Rooms for copper station cables
- Patch panels for voice transition cross-connect cables
- JP-36 termination blocks in MDF/IDF Room(s) for copper station cables
- JP-36 cross-connect blocks for voice transition in universal voice format
- 25-pr voice transition cross-connect cables
- Category 5e unshielded twisted-pair station cables
- Category 5e RJ45 568B inserts
- Outlet devices and faceplates
- Labeling in MDF/IDF Room(s) and at station outlets
- Terminations of riser backbone cables and station cables
- Installation testing and reports
- Connection to ground bar, grounding components
- Equipment racks and vertical wire management
- Telco ladder tray
- Pull strings, firestopping, and associated products

***[A&E: Modify the list above per specific Project scope.]***

***[A&E: Account for any departmental IT provisioning in a separately identified section.]***

### **1.1.2      Related Sections**

If not addressed in this section or the Contract Documents, the Contractor shall comply with the requirements and specifications contained in Division 00, Division 01, and Division 26. Refer to Division 01 for meeting attendance and submittal requirements. The Contractor performing this work is required to work with Section 26 XX XX contractor to assure infrastructure is installed to meet project scope requirements.

***[A&E: Match to specific specification format.]***

## 1.2 QUALITY ASSURANCE

### 1.2.1 Contractor Qualifications

#### 1.2.1.1 Copper Cable Installation Requirements

- 1.2.1.1.1 Section 27 17 52 Contractor and **[WIFI/CATV subcontractors]** shall have successfully completed no less than five (5) similar projects (in terms of size and construction cost) with same equipment under the Contractor's current business name within the past three (3) years.
- 1.2.1.1.2 Work in this section shall be performed by a low-voltage Contractor with demonstrated experience in the installation of structured cabling.
- 1.2.1.1.3 The Contractor shall have demonstrated experience in the installation and testing of all cable plant components specified herein.
- 1.2.1.1.4 Contractor shall be trained by the equipment manufacturers in the installation and testing of the proposed system. The technicians in the field shall demonstrate knowledge of material and installation on the product line. Only full-time permanent employees/staff of the company are approved to provide site supervision and testing.
- 1.2.1.1.5 Contractor's employees directly involved with the supervision, installation, testing, and certification of the system shall be trained on the system. Training by employee type is required as shown below:
- 1.2.1.1.5.1 Project Managers/Supervisors/Project Foremen: All (100%) shall provide proof of industry training for installation and testing.
- 1.2.1.1.5.2 Test Technicians: All (100%) shall provide proof of industry training for installation and testing of equipment.
- 1.2.1.1.5.3 Installation Technicians: All (100%) shall provide proof of industry training for installation.
- 1.2.1.1.5.4 Other Personnel: Personnel not directly responsible for installation supervision, installation, and testing of the system (i.e., clean up crew, etc.) are not required to provide proof of industry training. Otherwise, personnel not industry-trained shall not be allowed on the job site.
- 1.2.1.1.6 Contractor shall employ a minimum of one staff Registered Communications Distribution Designer (RCDD), certified by and in current good standing with BICSI. The RCDD shall be a direct, full-time employee of the Contractor (i.e., an RCDD consultant/subcontractor to the Contractor is not acceptable) and be available to visit site throughout the project when work is ongoing. Contractor shall continue to employ this RCDD throughout the duration of the project and submit documentation or a formal request for acceptance by the Owner if a

different RCDD is proposed. Provide current copy of RCDD certificate at acceptance of bid.

- 1.2.1.1.7 Staff RCDD shall be available for site pre-installation walk-through and four (4) further reviews prior to completion of drywall during construction of infrastructure. RCDD shall coordinate with 27 17 51 Contractor to assure infrastructure installation is complete and coordinated for cable plant installation prior to drywall cover.

### **1.2.1.2 Fiber Optic Ribbon Cable Installation Requirements**

- 1.2.1.2.1 Work in this section shall be performed by a full-time employee of the Section 27 17 52 contractor with demonstrated experience in the installation of single-mode fiber optic cabling and fiber optic ribbon cabling and all components including fiber optic ribbon testing specified herein.

- 1.2.1.2.2 The Fiber Optic ribbon cable Installation full-time employee shall have successfully completed no fewer than five (5) similar projects (in terms of size and construction cost) with the same equipment under the low-voltage contractor's current business name within the past three (3) years.

- 1.2.1.2.3 The Fiber Optic ribbon cable Installation full-time employee shall be industry trained in the installation and testing of the proposed system. The technicians in the field shall demonstrate their experience and knowledge of the specifications specific fiber type for terminations, installation and testing. Only a fiber optic ribbon cable installation full-time employee of the low voltage contractor shall be approved to provide site supervision and testing. See 1.2.1.1.1 for additional qualifications for supervisor/testor.

- 1.2.1.2.4 The 27 17 52 contractor shall submit (but not be limited to) the following:

- A list of recently completed projects of similar type and size with contact names and telephone numbers for each.
- A list of the test equipment by name and serial number proposed for use and evidence of recent calibration for each proposed device.
- A technical resume of optic fiber experience and optic fiber ribbon certifications for the low-voltage Contractor's Project Manager, on-site installation supervisor, and technicians who will be assigned to this project.
- A list of technical product training, specific to this project, attended by the low-voltage contractor's full-time fiber optic ribbon cable personnel who will install, terminate, pigtail splice, and test the fiber optic ribbon cabling system.

- 1.2.1.2.5 The Fiber Optic Cable Installation full-time employee shall submit current industry-recognized certification from major fiber optic manufacturers and organizations such as BICSI, Electronics Technician Association (ETA), Fiber Optic Association (FOA), etc., in particular associated with fiber optic ribbon cable systems.

1.2.1.2.6 Submit copies of installer(s) current certificates as described above at time of low-voltage contractor's bid acceptance. If on-site full-time employee assignment changes occur, appropriate certification paperwork shall be provided to reflect new personnel qualifications. See 1.2.1.1.1 for additional qualification for supervisor/testor which shall apply.

1.2.1.2.7 The Fiber Optic ribbon cable installation full-time employee/field technician shall schedule and attend a qualifying interview with the Owner (UW ITechnology) to demonstrate their experience and knowledge of fiber optic ribbon cabling installation, termination, and testing. This interview shall be required prior to commencement of cable installation. If on-site full-time employee assignment changes occur, this replacement person shall have his/her own interview prior to any ribbon cable system work is begun.

### **1.2.1.3 Firestopping Installation Requirements**

1.2.1.3.1 Contractor's employees whose duties include the application of firestopping material shall be trained by the firestopping manufacturer. Training by employee type is as shown below:

1.2.1.3.1.1 Project Managers/Supervisors/Project Foremen/Technicians: All (100%) shall be trained for installation by manufacturer.

### **1.2.2 Warranty**

Refer to Division 1.

### **1.2.3 Regulatory Requirements**

1.2.3.1 All work shall be performed in accordance with the latest revisions of all national, state, and local governing codes and standards, including:

- ANSI American National Standards Institute
- ASTM American Society for Testing and Materials
- BICSI Building Industry Consulting Services International
- EIA Electronic Industries Association
- FCC Federal Communications Commission
- ICEA Insulated Cable Engineers Association
- IEEE Institute of Electrical & Electronics Engineers
- NEC National Electrical Code
- NECA National Electrical Contractors Association
- NEMA National Electrical Manufacturers Association
- NESC National Electrical Safety Code
- NETA National Electrical Testing Association
- NFPA National Fire Protection Association
- NIST National Institute of Standards & Technology
- OSHA Occupational Safety and Health Administration

- TIA Telecommunications Industries Association
- UL Underwriters Laboratories, Inc.

#### **1.2.4 Conflicts Among Governing Codes and Documents**

Refer to Division 1.

#### **1.2.5 Materials, Equipment, and Product Substitutions**

**1.2.5.1** Refer to Division 1; Materials, Equipment, and Product Substitutions.

**1.2.5.2** The materials, equipment, and products specified herein have been extensively tested and vetted by UW ITechnology. In many cases, multiple manufacturers or products are listed for common solutions.

#### **1.2.6 Submittals**

**1.2.6.1** Refer to Section 01 30 00 Submittals.

***[A&E: Edit to meet project specifications. Include certification requirements and test forms as required]***

**1.2.6.2** Project Initiation: The Contractor shall furnish the following in a single consolidated submittal:

**1.2.6.2.1** List of all foremen, all lead installers, and all copper cable testing technicians who will work on this project. Include a summary of experience and training class certificates for each technician.

**1.2.6.2.2** Shop Drawings: The Contractor shall submit shop drawings to show his intent during installation. Shop drawings shall be submitted at least forty-five (45) days before any cable installation and shall include at least the following:

**1.2.6.2.3** Sample labels for all cable label and termination label types including station outlet tapes (with printed sample).

**1.2.6.2.4** Details of all IDF and MDF cable management wherever the Contractor may suggest an alternate method from that shown in the drawings.

**1.2.6.2.5** Shop drawings shall indicate expected cable types and routing.

**1.2.6.3** Provide complete manufacturer's product literature (not distributor's catalog sheets) for all products specified herein, referenced to the applicable paragraph in the Product Section.

**1.2.6.4** Provide manufacturer's recommended installation methods including maximum cable pull tension and minimum bend radius of all cable.

**1.2.6.5** Equipment Calibration and Certification: 27 17 52 Contractor shall provide this documentation a minimum of two weeks prior to performing any work to ensure that equipment meets the manufacturer's specifications. Dates provided shall be current through the construction schedule within a 12-month window.

Provide manufacturer's name and model number for each piece of equipment used on this project cross-referenced to serial number.

Provide manufacturer's certificate of compliance for fusion splicing equipment.

Provide certificates of calibration for all optic testing equipment including Optical Time Domain Reflectometer (OTDR) and Optical Loss Test Set – Light Source and Power Meter.

## **1.2.7 Product Substitutions**

**1.2.7.1** Refer to Section 01 60 00

***[A&E: Edit to meet project specifications.]***

**1.2.7.2** If substitutions to the recommended products are proposed, the Contractor shall submit complete manufacturer's product literature (not distributor's catalog sheets) demonstrating compatibility with other related products and provide samples for evaluation per 01 25 00 requirements. No "custom" items (e.g., to meet unusual physical requirements of the installation site) shall be used except as specified in the Construction Documents or as reviewed and approved by OWNER.

## **1.3 CONSTRUCTION SCHEDULE**

Refer to Division 1.

***[A&E: Edit to meet project specifications.]***

***[A&E: Coordinate the schedule milestones outlined below with UW ITechnology.]***

**1.3.1** Prior to drywall cover, the General Contractor shall coordinate a pre-installation walk-through with UW ITechnology, Section 27 17 52 Contractor, and **\*all\*** trades having work within or connected to the IDFs and/or MDF.

**1.3.2** Prior to commencing installation of the copper and fiber optic cable, the Contractors shall coordinate a pre-installation walkthrough with UW ITechnology, Section 27 17 51 Contractor and Section 27 17 52 Contractor installation lead to address buildout within the IDFs and/or MDF including location of racks and wall fields.

**1.3.3** In addition to the requirements in the above-referenced section, the following milestones shall be referenced in the project construction schedule. (At a minimum, include line items as place holders.)

- Start/completion of continuity-of-service work
  - Elevator inspection and other early building service commissioning dates
  - Walkthrough for inspection of early building service pathway
  - Walkthrough for inspection of overall building pathway (continuity/bushings/pull strings/etc.) prior to drywall cover and drop ceiling install
  - Start of cable tray in MDF/IDF's
  - Pre-install walkthrough for MDF/IDF's wall and rack build out
  - Start of racks and ladder rack
  - Pre-install walkthrough for routing of electrical outlets on racks
  - Mounting OSP punch down block for use by others
  - Start and completion of early building service cable plant install and testing
  - Completion of MDF and IDF Rooms including completion of cable installation, rack installation, cable tray installation, cable runway installation, all plywood, painting, sanding, etc., complete
- In addition, all other trades shall be complete with work in the MDF and IDF Rooms. This includes plumbing, sprinkler, electrical, HVAC, etc., work.
- Start of overall building cable plant
  - Start of termination
  - Start of testing with target testing completion dates by MDF/IDF
  - MDF and IDF's re-keyed and turned over to Owner personnel

***[A&E: Customize the construction phasing approach described above.]***

**1.3.4** UW ITechnology requires turnover of the MDF and IDF's one (1) month prior to early building service activation date. Contractor schedule and work shall be directed to provide MDF and IDF's finished, including early building service termination, testing, and labeling with a dust-free environment maintained to allow installation of Owner equipment for early building services. The Contractor shall coordinate this requirement with 27 17 51 Contractor **[GC, GC/CM]** and all related trades. The Contractor shall notify the Owner of this date for coordination with the service provider.

***[A&E: During the normal construction process, the need often arises for communications service prior to substantial completion of cable plant installation. Typical situations include elevator inspection, building services (DDC, CAAMS, etc.), temporary occupancy, etc. These needs shall be provided with design with cable plant to ensure these services are included. Early discovery and timely notification are critical.]***

## **1.4 PRE-CONSTRUCTION CONFERENCE**

Early in the construction time line, and before any shop drawings are produced, the 27 17 52 low-voltage Contractor shall attend a pre-construction meeting

where installation issues including wire management, labeling, and other items will be discussed.

Prior to commencing buildout within the MDF and IDFs the General Contractor shall coordinate a pre-installation conference with UW Technology and Section 27 17 52 Contractor to discuss issues including location of racks and wall fields, etc

## **1.5 PRE-INSTALLATION WALK-THROUGH**

**1.5.1** Pathway review walkthrough with UW ITechnology prior to OSP infrastructure installation.

### **1.5.2 Pathway review walkthrough with UW ITechnology prior to drywall cover.**

This Section Contractor shall attend communication pathway pre-installation walk-through with UW ITechnology representative and 27 17 51 Contractor. Refer to Section 27 17 51 for requirements. This walk-through shall occur prior to commencement of the cable tray and dry wall installation.

**1.5.3** Prior to commencement of installation work in the MDF/IDF's, the Contractor shall arrange a site walk-through with Owner to "mark layout" of actual location of cable routing and termination equipment in the MDF Room and IDF rooms. Owner has the authority to make modifications to the layout of these Rooms with no additional cost to the Owner. The Contractor's Foreman, who will be managing the cable installation, shall be present at the pre-installation walk-through.

**1.5.4 Pre-installation walkthrough with UW ITechnology prior to commencement of cable plant installation.**

### **1.5.5 Early Service Completion Notice**

**1.5.5.1** The overall building cable installation schedule shall be established such that the riser cables are installed first, starting with the MDF, then IDF's, followed by the building service locations and then the termination, testing, and labeling of cables. **(Coordinate with UW ITechnology.)**

**1.5.5.2** Pathway and cable plant for Early Building Service and a hard copy summary of the test results shall be complete one (1) month prior to the first inspection date.

### **1.5.6 Substantial Completion Notice**

**1.5.6.1** The overall building cable installation schedule shall be established and followed such that the MDF Room is completed first, the IDF Room(s) next, with all pathways complete. All rooms must be complete prior to Substantial Completion Notices.

**1.5.6.2** The cable plant Contractor shall complete work early enough that Owner has adequate time to install equipment and related functions prior to substantial



completion. (UW ITechnology requires a minimum of one month or approximately one week per MDF and IDF for projects with more than four riser rooms.) **Note to Contractor: This time is in addition to the one month required prior to the early building service inspection date.**

**1.5.6.3** Hard copy test results will be provided as each MDF Room and IDF Room is completed for the service area it supports.

**1.5.7 Construction Facilities and Trailer Farm**

Refer to Division 1.

**1.5.8 Inspection and Substantial Completion**

Refer to Division 1; Contract Closeout.

**1.5.9 Contract Closeout**

Refer to Division 1; Contract Closeout.

**END OF PART 1**

## **PART 2 PRODUCTS**

### **2.1 CABLE PLANT AND TERMINATION DESIGN CRITERIA**

#### **2.1.1 Introduction**

All materials constituting the voice and data transmission facility shall conform to the specifications herein.

The products included in this specification have been extensively evaluated by the University of Washington and constitute items of demonstrated functionality and compatibility.

The installation standards for the cable plant system are described below.

**2.1.2** All products shall be new and shall be brought to the job site in original manufacturer's packaging. Electrical components shall bear the Underwriter's Laboratories label. All communications cable shall bear the manufacturer's label in accordance with NEC 800 based on flammability testing as follows:

- CM General Purpose Communications Cable
- CMR Riser-rated Communications Cable
- CMP Plenum-rated Communications Cable

### **2.2 OUTSIDE PLANT**

#### **2.2.1 Provide 110 cross-connect block and C-5 clips. All other components N.I.C.**

Required Products:

110 block: Siemons – 110AW2-300

C-5 clips: Systimax – C-5 Clips 110C-5

#### **2.2.2 Tunnel fiber**

Required Product:

Outside Plant Fiber: 024EC4-14101D53

#### **2.2.3 Indoor/Outdoor Fiber for inter-building tie**

Required Product:

Indoor/Outdoor Fiber: 024ECF-14101-20

#### **2.2.4 Tunnel copper**

Required Products:

[XXX]

#### **2.2.5 Gel-filled cable for inter-building tie**

100 pr SealPic-FSF 24-gauge cable

Required Product:  
Superior Essex – 09-104-02

## **2.2.6 Copper Cable Protection Blocks and Protector Modules**

**2.2.6.1** Protection Blocks  
Required Products:  
100 pr Circa - 1880ECA1-100G  
200 pr Circa -1880ECA1/NCS-200

**2.2.6.2** Protector Modules

Required Product:  
Circa – 4B1S-300

***[Note to Specifier: Remove cable, protector blocks, and protectors. These items are by UW ITechnology.]***

## **2.3 MDF/IDF BUILD OUT**

### **2.3.1 Equipment Mounting Hardware**

**2.3.1.1** Equipment racks shall:

- Be floor mountable.
- Be constructed of painted or anodized aluminum.
- Be manufactured to support standard 19-inch mounting.
- Be 84 inches high.
- Be supplied with all mounting and assembly hardware.
- Be double-sided drilled and tapped to accept 12-24 screws.
- Have EIA/TIA hole pattern (5/8-5/8-1/2-inch).

Required Product:  
B-Line – SB-556-084-XU.

**2.3.1.2** Top-of-Rack Horizontal Wire Management Brackets (Water Fall) shall:

- Be 3.5 inches deep x 3.5 inches high.
- Be constructed of painted or anodized aluminum.
- Be provided one per rack.

Required Product:  
CPI – 12183-719.

**2.3.1.3 Vertical Wire-Management Brackets shall:**

- Provide for cable routing on front and back of rack
- Be 84 inches high x 6 inches wide x 12 inches deep
- Be provided with four mountable spools per bracket

Required Products:

Corning – CDF-IBU-7-6; CDF-HUB-05.

**2.3.1.4 Copper Horizontal Wire Management Brackets shall:**

- Be **[1.75] [3.5]** inches high
- Be constructed of painted or anodized aluminum
- Have six distribution rings

Required Products:

For 1RU – Ortronics – OR-60400131-1U

For 2RU – Hubbell – HC219 ME6N-2U.

**2.3.1.5 Fiber Optic Horizontal Wire Management Brackets**

Required Products:

For 1RU – Corning - CJP-01U

For 2RU – Corning - CJP-02U

**2.3.1.6 Ladder Rack Cable Runway shall:**

- Black
- Be constructed of 0.065" thick steel
- Utilize tubular stringers to support rungs
- Have rungs welded to stringers at 9-inch spacing on center.

Required Products:

CPI – 10250-718

***[A&E: Size to project requirements].***

**2.3.1.7 Ladder Rack Cable Runway Connecting Hardware shall be:**

- Black
- Constructed of steel
- UL listed
- Provided with all connecting hardware (screws, bolts, washers, etc.)

Required Products: CPI

Mounting plate – 10595-718

Elevation kit – 10506-706

J-bolt kit – 11303-000

Triangle bracket – 11746-718 *[A&E: Size to project requirements]*  
Wall angle kit – 11421-718 *[A&E: Size to project requirements]*  
Junction splice kit – 16302-701  
Butt splice kit – 11301-701  
Protective end caps – 10642-001  
Ground terminal blocks – 08009-001  
Rack anchor kits-concrete – 40604-003  
Rack anchor kits-wood – 40604-001

*[A&E: All products where possible are BLACK and to fit size of ladder-rack required.]*

### 2.3.1.8 Ladder Rack Cable Runway Radius Drop Plates shall be:

- Black
- Constructed of painted or anodized aluminum
- Provided with three mountable guides

*[A&E: Match product to size of tray.]*

Recommended Products:

CPI – 12100-718  
CPI – 12101-702.

## 2.3.2 MDF/IDF TERMINATION HARDWARE

### 2.3.2.1 Patch Panels/Patch Blocks

#### 2.3.2.1.1 Patch panels shall:

- Be rack-mountable in standard EIA 19” equipment racks
- Have cable support and strain relief
- Ensure minimum bend radius requirements are satisfied
- Include integral labeling means
- Labels shall be white with black lettering and backed with adhesive.
- Be 24 and 48 port Category 5e
- Be IDC to RJ45 568B termination style
- Have integral wire-management rings on front

Required Products:

Systimax – 24 port PM2150PSE-24  
Systimax – 48 port PM2150PSE-48

*[A&E: Cat6A - limited application for H&FS to be coordinated with UW ITech.]*

Patch Panel: Systimax – M2000-24  
Systimax – M2000-48

Support Bracket: Systimax 1100C1-35-19

Cat6A jacks: Systimax MGS600-123 (yellow)

#### 2.3.2.1.2 Patch blocks shall:

- Be mounted on standoff can
- Be provided with wire management rings
- Include integral labeling means
- Labels shall be white with black lettering and backed with adhesive.
- Be 36 port Category 5e
- Be IDC to RJ45 568B termination style

##### Required Products:

Cat5E Patch Blocks - Siemons – S110AB5-300JP (36 port)

Stand-off Cans – Rhino Mfg. Inc. -- RMNT-0010 (300 pr)

Rhino Mfg. Inc. -- RMNT-0009 (100 pr)

Wire Management Rings – Siemons – S146 (6”) & S145 (3”)

***[A&E: Cat6A - Limited application for H&FS to be coordinated with UW ITech.]***

Wall Adapter = Systimax 1100C1-35-19

Patch Panel = Systimax M2000-24 (1U)

#### 2.3.2.2 Fiber Optic Station Cabling Patch Panels

***[A&E: Limited application to be coordinated with UW ITechnology.]***

Match the requirements listed in fiber optic section.

## 2.4 RISERS

### 2.4.1 Copper and Fiber Cables

The following paragraphs describe the products used for intra-building riser cabling between the MDF Room(s) and the IDF Rooms.

#### 2.4.1.1 Copper Cable

##### 2.4.1.1.1 Category 3 cable criteria:

- Rating listed for installed space
- Shielded twisted pair, ARMM
- Color coded
- Pair count per sheath of 100, 200, or 300 as shown on drawings

##### Required Products:

Superior Essex – 100PR 02-104-03

Superior Essex -- 200PR 02-108-03

Superior Essex -- 300PR 02-110-03

Superior Essex -- 400PR 02-112-03

Superior Essex -- 600PR 02-116-03

2.4.1.1.2 **Category 3 horizontal tie cable** criteria:

***[A&E: confirm with UW ITechnology whether part of this project.]***

- Listed CMP
- Provided with parallel ground conductor
  
- Color coded
- Pair count per sheath of 100, 200, or 300 as shown on drawings

Required Products:

Superior Essex – 100PR 02-104-03  
Superior Essex – 200PR 02-108-03  
Superior Essex – 300PR 02-110-03  
Systimax -- 2010-100PR

2.4.1.1.3 **Copper riser voice transition tie cables** (wall to rack)

- To extend copper riser or tie cables from 110 cross-connect blocks on wall to patch panel in rack.
- Minimum of 50 feet (actual length of cable determined during installation).
- 25 pairs, Category 3.

Recommended Product:

Systimax – 1010A GY 25/24 R1000

2.4.1.2 **Fiber Optic Cable**

***[A&E: Coordinate with UW ITechnology during early design for fiber backbone approach.]***

- Field terminated ribbon fiber – Corning 0XXEC8-14101-20 (Where XX = 24 strand SM plenum for standard installation; XX = 12 or 48 where required by UW ITechnology) with LC terminations
- Pre-terminated ribbon fiber – Alternate Method #1 – Corning N909024 RD8AA4 XXXF with LC terminations
- Field terminated – Alternate Method #2 – Corning 024E88-33131-29 with SC terminations

2.4.1.2.1 Single-mode fiber optic cable criteria:

- Sufficiently free of surface imperfections and occlusions to meet optical, mechanical, and environmental requirements of this specification
- Have been subjected to minimum tensile proof test by fiber manufacturer equivalent to 100-kpsi
- Have transmission windows of 1310 nm and 1550 nm

- Suitable for installation in free air, in building risers, in conduit in cable tray and in innerduct
- Dielectric materials (no conductive materials)
- Have jacket material of FEP or equivalent as required for cable rating
- Have a cable rating of OFNP.
- Have ARAMID Yarn strength member.

Required Products:

Ribbon Fiber Termination Kit [ribbon cable tubing kit] – Corning – 15-211-14  
Fiber Optic Cable Tags – LEM Products, Inc. – LFO-100; PANDUIT PST-FO

## 2.4.2 **Connectors/Termination Hardware (for riser and voice transition cabling)**

**For Riser Cabling:** The following paragraphs describe the products used to terminate the copper riser cabling within the building. Products shall be located in MDF/IDF Rooms as directed by Owner during pre-installation walk-through.

### 2.4.2.1 **110 cross connect blocks** shall be supplied for/as cross-connects from building riser backbone cables from the MDF to the IDF.

The blocks used in the MDF and IDF Rooms for copper riser cable terminations shall be 300- pair 110-type wiring blocks.

#### **110 cross-connect block criteria:**

- 110-style high-density cross-connect blocks.
- 300-pair blocks with legs.
- Be capable of terminating one 25-pair binder group of Backbone Copper Cable on each horizontal row of the block
- Be able to terminate 24-26 AWG plastic-insulated, solid and stranded copper conductors
- Provide direct connection between riser voice transition and/or backbone cable and jumper wires
- Be designed to maintain cable pair twists as closely as possible to point of mechanical termination
- Be mountable on stand-off cans

Required Product:

Systemax – 110AW2-300

#### 2.4.2.1.1 **Stand-off cans**

Required Product:

Rhino Mfg. Inc. -- RMNT-0010 (300 pr)

Rhino Mfg. Inc. -- RMNT-0009 (100 pr)

#### 2.4.2.1.2 **110 cross-connect block wire management shall be**



Required Product:  
Systimax – 110A3

#### 2.4.2.1.3 **Connector clips**

Copper riser backbone cable blocks shall be provided with 4-pair and 5-pair connector clips, IDC style displacement. Each 25-pair row on 110 block shall be provided with (5) 4-pair clips and (1) 5-pair clip.

Required Product:  
Systimax – C-4 clips 110C-4  
Systimax – C-5 Clips 110C-5

#### 2.4.2.1.4 **110 block labels shall be:**

- Provided with each 110 block.
- Provided with clear plastic protective cover for attachment to 110 block.
- Affixed to each row on the 110 block.
- White with dark black lettering.

Required Products:  
Systimax – Clear cover 1884T1-50  
Systimax -- White labels 110WA2-4500L

**2.4.2.2 For Voice Transition Cabling:** The following paragraphs describe the products used to terminate the copper voice transition cabling within the building MDF or IDF's where patch panels are provided. Products shall be located in the MDF Room as directed by Owner during pre-installation walk-through.

In the MDF the 110 riser cross connect blocks shall also be used for/as a voice transition cross-connect from the rack-mounted patch panel to the MDF wall field riser block. The voice transition cable shall overlay the riser cables utilizing connector clips. Contractor shall be responsible for the cross-connect voice transition cable termination at voice transition patch panel and 110 riser block in MDF.

Copper voice transition patch panel criteria:

- 48-port
- Include RJ-45 to IDC connectors
- Terminated 4-pair per port
- Rack-mountable
- 4 RU's high
- Integral wire-management bracket
- Include white adhesive labels with dark black lettering

Required Products:  
Systimax – PM2150PSE-48

**2.4.2.3 For Voice Transition Cabling – JP36 Blocks:** The following paragraphs describe the products used to terminate the copper voice transition cabling within the building IDF's where racks are not installed. Products shall be located in the IDF Rooms as directed by Owner during pre-installation walk-through.

In the IDF JP36 blocks shall be used for/as a voice transition cross-connect from the wall-mounted station cable JP36 patch block on the IDF wall field. No cable shall be supplied to cross-connect between the station patch blocks and the voice transition block. No cable shall be supplied to cross-connect between the voice transition block and the IDF riser 110 block.

***[A&E: Pre-approval by UW ITechnology for cases where wall fields must used instead of racks.]***

Copper voice transition patch block criteria:

- 36-port
- Include RJ-45 to IDC connectors
- Terminate 4-pair per port
- Wall-mountable
- Include white adhesive labels with dark black lettering
- Be mounted on stand-off cans
- Be provided with wire-management rings

Required Products:

Siemons – S110AB5-300JP 36-port, T568A/B with permanent legs  
Siemons – S145 [3" wire management rings]

**2.4.2.3.1 Stand-off cans**

Required Product:

Rhino Mfg. Inc. -- RMNT-0010 (300 pr)  
Rhino Mfg. Inc. -- RMNT-0009 (100 pr)

**2.4.2.4 Fiber Optic Termination Hardware**

**2.4.2.4.1 Rack-Mounted fiber optic distribution cabinet** criteria:

- An enclosed assembly
- Incorporate hinged or retractable cover
- Rack-mountable
- Provide-strain relief for incoming cables
- Incorporate radius control mechanisms
- Include provisions for permanent labeling
- Incorporate splice shelf for fusion-spliced pigtail assemblies
- Incorporate splice organizer to manage pigtail assemblies and incoming fiber
- Incorporate LC coupler panels for single-mode couplers

Required Products: Pretium Connector Housing

144 strand Corning PCH-04U\*  
72 strand Corning PCH-01U  
(\*288 strand configuration requires (2) 144 strand units).

2.4.2.4.2 **Wall-field mounted fiber optic distribution cabinet** criteria:

- An enclosed assembly
- Incorporate hinged or retractable cover
- Wall-mountable
- Provide strain relief for incoming cables
- Incorporate radius control mechanisms
- Include provisions for permanent labeling
- Incorporate splice shelf for fusion-spliced pigtail assemblies
- Incorporate splice organizer to manage pigtail assemblies and incoming fiber
- Incorporate LC coupler panels for single-mode couplers

Required Product:  
Corning – 24 strand WIC-02P  
Corning – WIC-2-DOOR

***[A&E: Prior approval for selected design approach required from UW ITechnology.]***

2.4.2.4.3 **Fiber optic splice trays** shall be incorporated with each distribution cabinet.

Required Products:  
Corning – M67-110 (with PCH-04U and WIC-02P)  
Corning – PC1-SPLC-04R (with PCH-01U).

2.4.2.4.4 **Fiber optic coupler panels** with integrated pigtail assembly shall be provided with each distribution cabinet.

Required Product:  
Corning – CCH-CP24-A9-P03RJ

2.4.2.4.5 **Fusion Splice Protection** (heat shrink tubing) for Ribbon fiber and distribution shall be provided.

Required Product:  
Corning – 2806031-012

2.4.2.4.6 **Brackets** for fiber optic distribution cabinet shall be provided.

Required Products:  
Corning PCH-GOV-SPLC for distribution cabinet  
Corning CDF-RJ12-BKT for rack at distribution cabinet

## 2.5 STATIONS

### 2.5.1 Copper Cables

The following paragraphs describe the cabling for copper station outlets.

#### 2.5.1.1 Copper Cable

The twisted-pair cable for standard outlets criteria:

- Suitable for installation in environment defined
- Twisted 4-pair
- Have insulated solid annealed copper pairs, 24 AWG
- Category 5e **[(standard outlets), Category 6a (wireless outlets)]**
- Have jacket type **[PVC] [FEP or equivalent]** as required for cable rating
- Have an NEC Article 800 cable rating type **[CMP] [CMR]**, UL listed
- Jacket Color: White or gray

Required Products:

	Mohawk	Systimax	CommScope	ADC	Belden	General
<b>CMR(5e)</b>	M55989	1061	55N4	TN5ESR-XXRB	1212	6133XXXE
<b>CMP (5e)</b>	M55988	2061	5504M	TN5ESP-XXRB	1213	6131XXXE
<b>CMR (6a)</b>		1091B				
<b>CMP (6a)</b>		2091B				

***[A&E: Limited Cat6a application - requires prior approval by UW ITechnology.]***

#### 2.5.1.2 Copper Cable for Exterior Blue Light Phone

Required Product:

CommScope 5NF4 Cat 5e, 24 AWG, 4-pair UTP gel-filled, PE jacket or equivalent by Systimax, Uniprise, or ADC

#### 2.5.1.3 Copper Cable in Semi-Protected Pathway (gravel under slab)

***[A&E: This is a specific condition that requires prior product approval by UW Technology.]***

Required Product:

Provide Mohawk M58926 Cat 5E, 24 AWG, 4 pair UTP cable with CMX and CMR outdoor ratings or equivalent by Systimax, Uniprise, or ADC

### 2.5.2 Connectors and Termination Hardware for Station Outlet Cabling

The following paragraphs specify the standard modular copper, fiber, and multimedia outlet devices that shall be used in all new construction and

remodeled installations. Typical configurations combine a modular information insert with or without a mounting frame and a faceplate.

***[A&E: Modify this section as required by project, edit product numbers, and coordinate with UW ITechnology.]***

### 2.5.2.1 Station Outlets

Contractor bidding this section is required to provide faceplates, bezels, adapters, inserts, and mounting brackets to support station outlet installation including floor boxes, podium boxes, surface-mounted raceway and modular furniture outlets **[when specified]**.

#### 2.5.2.1.1 Station Copper Inserts criteria:

- Meet or exceed performance requirements for Category 5e
- Orange
- RJ45 568B
- Non-keyed
- Insulation displacement type contact
- Maintain cable's pair twist as close as possible to point of mechanical termination

Required Product:

Systemax – MPS100E-112 (5e)

**[Systemax – MGS600-123 (6a) yellow]**

***[A&E: Limited Cat6a application - requires prior approval by UW ITechnology.]***

#### 2.5.2.1.2 Standard Faceplate criteria:

- Double-gang
- Accommodate a minimum of **[8] [XXX]** modular inserts and connectors
- **[Constructed of high-impact plastic] [Stainless steel]**
- Incorporate recessed designation strips at top and bottom of frame secured with clear plastic cover
- Color: **[electric ivory -246] [white] [gray] [match other trades]**

Required Products:

Plastic - Systemax – M28L-246

Stainless Steel – Uniprise – UNF-MFM-DG8P-L-ST

Stainless Steel – Semtron – 2FM-(8)0E-LUC

#### 2.5.2.1.3 Wall Mount Phone Faceplate and Adapters criteria:

- Provide standard insert MPS100E-112
- Stainless steel faceplate

Required Product:  
CommScope – M10LW-148.

2.5.2.1.4 **Station Poke Through** Faceplates and Adapters

Required Products:  
WireMold  
Hubbell (shared)  
Hubbell (dedicated)

2.5.2.1.5 **Station Flush Floor Box** Faceplates and Adapters

Required Products:  
Walker  
Hubbell HBLLT309SGY

2.5.2.1.6 **Station Podium Box** Faceplate and Adapters; Co-located Medium Box for Power and Communications with a Large Box for Audiovisual

Required Product:  
Hubbell HBLLT309SGY

2.5.2.1.7 **Wireless Access Point** Faceplate and Adapters

2.5.2.1.7.1 Wireless access point outlets located in **ceiling** at a maximum of 12 feet shall be provided with standard box and faceplate – install flush with and below ceiling.

Required Products:  
Faceplate – Systimax M28L-246

2.5.2.1.7.2 Wireless access point outlets located in **wall** at a maximum of 10 feet but not lower than 8 feet shall be provided with standard box and faceplate.

Required Product:  
Systimax M28L-246

2.5.2.1.7.3 Wireless outlets in an **auditorium seating step riser** shall be provided with standard box, faceplates, and clear plastic cover (plastic cover provided and installed by UW ITechnology).

Required Products:  
Systimax – M28L-246;  
Clear Plastic Cover - Taymax – MM2440C-B

2.5.2.1.8 **Station Surface-mounted Raceway** Faceplates and Adapters

RJ45 inserts shall match requirements above for station outlets.

Faceplates, activation plates, device plates, and couplers shall be furnished and installed to match the specifications of the surface-mount raceway.

2.5.2.1.8.1 **Wiremold Faceplates and Adapters**

Required Products:  
Raceway adapter – Wiremold CM-ARA  
2-port bezel – Wiremold CM2-U2ATT  
Blank insert – Wiremold 5507B.

2.5.2.1.8.2 **Isoduct outlets Faceplate and Adapters**

Required Products:  
Insert Coupler – CM2-U2ATT-WH  
Device Bracket – AL3356-ACTLPB

2.5.2.1.8.3 **Panduit Faceplates and Adapters**

Required Products:  
Single-gang faceplate – Panduit – CPGIW  
Device bracket – Panduit – T70DB-X

2.5.2.1.9 **CAAMS Communications Outlets** (see **[SEC XXX, Detail X]** backboard elevation for locations)

Required Products:  
ENET: 6" x 6" x 4" box/16-gauge steel/screw cover (by 27 17 51 contractor)  
2-port biscuit jack-system M102SMB-A-246  
VOICE: CommScope – M10LW-148

2.5.2.1.10 **Irrigation Control Box Outlet**

Required Products:  
6" x 6" x 4" box/16-gauge steel/screw cover (by 27 17 51 contractor)  
2-port biscuit jack-system M102SMB-A-246

2.5.2.1.11 **Two-way Communications Annunciator Control Panel Box Outlet**

Required Products:  
6" x 6" x 4" box/16-gauge steel/screw cover (by 27 17 51 contractor)  
2-port biscuit jack-system M102SMB-A-246

2.5.2.1.12 **Laundry Room Controller (H&FS) Box Outlet**

Required Products:  
6" x 6" x 4" box/16-gauge steel/screw cover (by 27 17 51 contractor)  
2-port biscuit jack-system M102SMB-A-246

2.5.2.1.13 **Fire Alarm FIBER Loop**

Required Products:

4-strand SM Indoor Plenum Fiber – OCC #DX004SSLX9YP-SPCLBL

Mounted inside MILBANK Box:

4-port Wall Panel – Leviton 41089-4WP

Coupler – Leviton 41084-SWZ

ST Fast Cure Connector Leviton SM-49990-SST

Between MILBANK Box and Main Fire Control Panel location:

ST-ST Jumper (SM) 3 meter length: Leviton UPDST-S03

Mounted in MDF Rack 1 [label as Panel 3]

***[A&E: where MDF has no racks – use Leviton Wall Panel and parts listed above and coord with UW ITechnology for location in wall field]***

Pretium Connector Housing – Corning PCH-01U

ST Coupler Panel – Corning CCH-CP12-19T

#### 2.5.2.1.14 Other BAS Milbank Box Locations

DDC Master Control, Power Metering Main Unit, Lighting Relay Control are typical locations requiring the faceplate to be within the Milbank box.

***[A&E: Coordinate with UW ITechnology for specifics on actual wording above, details required in documents, and outlet schedule information.]***

#### 2.5.2.1.15 Modular Furniture Faceplate and Adapters

***[A&E: Specify UW ITechnology-approved furniture-specific adapter at these locations (for Systimax – M28L-246 jack).]***

#### 2.5.2.1.16 Power Poles [text]

### 2.6 TELEPHONE UNITS

The Contractor bidding this portion of work is responsible to provide the following phones.

***[A&E: Verify with UW ITechnology: “To be provided by Contractor.”]***

#### 2.6.1.1 Elevator Phone Units

Contractor to provide elevator phone unit to elevator contractor for installation.

Required Product:

RamTel – RR733-924M



(when phone unit is housed inside cabinet with door accessed from elevator cab)  
RamTel – RR833-924M  
(when phone unit has lip flush-mounted over hole in cabin wall)

#### **2.6.1.2 Direct-connect 911 Phone Units**

Emergency wall telephone unit shall have a bright yellow, weatherproof casing with a pushbutton (no dial) “ring down” function.

Required Product:  
Gai-Tronics – Emergency Telephone 393AL-001

#### **2.6.1.3 Courtesy Phone Units (H&FS outside front entry)**

Wall telephone unit shall have a stainless steel, weatherproof casing with a pushbutton dialing keypad.

Requires wall-mount enclosure with hood to provide recessed surface mounting with flush mount telephones and added weather protection.

Required Products:  
Gai-Tronics – Emergency Telephone 392-001 (stainless steel)  
Gai-Tronics – Wall-Mount Enclosures with Hood 236-001BK (black)

#### **2.6.1.4 Two-Way Communications Unit (H&FS elevator lobby)**

Flush mount unit with capability to record a message identifying location of call.

Required Product:  
Talk-a-Phone ETP-100EBV [color: Chilean Red 1074-07SFA]

#### **2.6.1.5 Weatherproof Touch-tone Phone Unit with Handset and Keypad**

Required Products:  
Gai-Tronics – 256-001AC outdoor industrial phone (high-impact plastic)  
Gai-Tronics – 226-001 outdoor industrial phone (metal).

#### **2.6.1.6 Explosion-proof (Class 1, Division 2) Phone Unit with Handset and Keypad**

Required Products:  
Gai-Tronics – 262-001 (indoor IS phone) – with 263-000 isolation barrier unit

#### **2.6.1.7 Wide Area Emergency Broadcast Phone Units (Blue Light)**

Required Products:

- Stanchion – Talk-A-Phone WEBS-MT/R, nine-bolt configuration (color = SAFETY BLUE).

- Phone Unit – Talk-A-Phone ETP-400; emergency telephone, flush mounted, indoor/outdoor, ADA compliant.
- Controller – Talk-A-Phone WEBS-ZPS; zone paging systems head end for WEBS, 9 paging zones. **[A&E: Consult with UW ITechnology for situation-appropriate unit]**
- Paging Module – Talk-A-Phone WEBS-ZPM-9; zone paging module for WEBS System – adds 9 zone

**[A&E: Develop electrical specification section addressing the following power requirements:**

**ETP-MT/R (Tower without broadcast function)**

Power is needed for the blue light and the faceplate light.  
120 VAC (Volts Alternating Current), maximum total 283 watts.  
There are two hardwired connections, one to the blue light and one to the faceplate light.

**WEBS MT/R (Tower with broadcast function)**

Power is needed for the blue light, faceplate light and amplifier.  
120 VAC (Volts Alternating Current), maximum total 283 watts.  
There are three hardwired connections, one to the blue light, one to the faceplate light, and one to the amplifier.]

**[A&E: Develop specification section addressing the following mounting requirements: [A&E: Develop electrical specification section addressing the following power requirements:**

**Mounting**

The tower shall include 24 inch J-bolts for mounting into a 24" x 24" concrete foundation, depth to vary according to local regulations and other site-specific considerations. J-bolts shall protrude approximately 5 inches from surface of foundation.

An optional mounting kit shall be available for mounting into above ground locations such as parking decks, where access to concrete base is available from both above and below.]

**2.6.1.8 UWT Wall-Mounted Station w/ (Blue Light) Emergency Phone**

Required Products:  
Station: Talk-A-Phone ETP-WM  
Phone Unit: Talk-A-Phone ETP-400

**2.7 SATELLITES**

***[A&E: Develop this specification section per the requirements of UW ITechnology.]***

## **2.8 ASSOCIATED PRODUCTS**

### **2.8.1 Innerduct shall be:**

- Flexible nonmetallic
- Corrugated
- Suitable to the environment installed in
- Flame-retardant plenum rated
- Orange

Recommended Products:

ENDOT – CMR -- IRI 100 24 17 02-7500

ENDOT -- CMP – IPR 100 24 17 07-7500

ENDOT -- CM – ICE 100 32 21 02-7500

***[Specifier: Consult with UW ITechnology for alternate products.]***

### **2.8.2 Cable Lubricants shall:**

- Be non-injurious to cable jacket and other materials used
- Not harden or become adhesive with age

Recommended Products:

Dyna-Blue American Polywater (copper cable)

Ideal Optic Lube (fiber cable)

### **2.8.3 Firestopping shall be:**

- Coordinated with Division 1 requirements to assure a system approach
- A combination of **[manufactured sleeves] [muffins] [caulk/putty] [foam]**

Recommended Manufacturers:

STI, T&B, 3M.

### **2.8.4 Pull Strings shall be:**

- A minimum of 3/32-inch diameter
- A minimum of 200-pound strength
- Polyethylene line

Recommended Product:

Greenlee - 430

**END OF PART 2**

## **PART 3 EXECUTION**

### **3.1 PRODUCT INSPECTIONS**

#### **3.1.1 Pre-installation Walk-through**

Prior to commencement of cable installation, the Contractor shall arrange a site walk-through with Owner to “mark layout” for actual location of termination equipment in the MDF and IDF Rooms. Owner has the authority to make modifications to the layout of these Rooms with no additional cost to the Owner. The Contractor’s Foreman, who will be managing the cable installation, shall be present at the pre-installation walk-through.

#### **3.1.2 Owner Review**

**3.1.2.1** All products shall be inspected prior to installation to verify that they are of proper gauge, contain the correct number of pairs, and otherwise meet the specifications. Any physical damage to products is unacceptable. Uniform jacket thickness, tightness, or buckling should be checked. All outlet devices, cross-connect blocks, and other components shall also be inspected prior to installation.

**3.1.2.2** Within one (1) week of inspection, the Contractor shall submit a statement certifying that all cable and components met specifications or were replaced.

### **3.2 SERVICE INTERRUPTIONS**

*[A&E: Include paragraphs below as necessary.]*

#### **3.2.1 General Requirements**

**3.2.1.1** The Contractor shall be responsible for identifying any possible service interruptions. Coordination with Owner shall be required to develop a plan.

**3.2.1.2** Contractor shall schedule a pre-demolition walkthrough with UW ITechnology prior to commencing any work.

**3.2.1.3** The Contractor shall maintain continuity of existing service in the construction area and for building occupants not otherwise affected by the Project throughout the demolition and construction phases, unless prior arrangements have been negotiated.

**3.2.1.4** The Contractor shall notify the Architect in writing of all copper, fiber optic, and coaxial communications cables (which are serving occupied areas) that must be relocated. The Contractor shall be responsible for relocating existing cables that are to remain in service after consultation with Owner.

**3.2.1.5** The Contractor shall prevent interruption of service by identifying and providing temporary supports and protection of all existing communications cables, cross-connect blocks, and equipment throughout demolition and construction. Coordinate requirements for continuity with UW ITechnology. In both cases, UW ITechnology approval is required prior to final solution.

**3.2.1.6** Upon disruption of service, the Contractor shall notify the University Construction Coordinator immediately so that a repair crew can be assigned to correct the problem.

### **3.2.2 Construction Services**

#### **3.2.2.1 Decommissioning of Construction Trailers and Temporary Offices**

The Contractor shall remove communication cable and termination equipment serving construction trailers and temporary offices installed for the purpose of supporting this project. Contractor shall coordinate decommissioning with Owner prior to performing this work. Two (2) weeks notice is required. This time is designated for the Owner to remove equipment and termination blocks prior to any demobilization work performed by Contractor.

#### **3.2.2.2 Building Systems Activation Interface**

***[A&E: Revise paragraph below as necessary. The following paragraph describes the Contractor's responsibilities to provide timely installation of services for the numerous building systems. These services are often needed for commissioning and AHJ inspections prior to substantial completion of the cable plant.]***

**3.2.2.2.1** The Contractor shall coordinate timely installation of communication cable and termination equipment with the Subcontractors providing Elevator Service, Fire Alarm System, Card Access System (CAAMS), Building Automation System, etc. Termination outlets shall be mounted adjacent to respective system panel per the communication outlet schedule and as shown in details. Out-of-sequence construction may be required to support testing and Authority Having Jurisdiction (AHJ) witnessing of building systems. The Contractor shall provide timely installation of outlets serving the building systems to accommodate commissioning and testing.

**3.2.2.2.2** Refer to requirements in Part One for construction schedule and partial completion notification.

### **3.3 CABLE INSTALLATION**

#### **3.3.1 General Installation Requirements**

**3.3.1.1** The Contractor shall ensure that communications cable is installed with care, using techniques that prevent kinking, sharp bends, scraping, cutting, or

deforming the jacket, or other damage. Installation shall be subject to periodic inspections by the Owner. The Contractor shall replace unacceptable cable at no additional expense to the University.

**3.3.1.2** Furnish all required installation tools to facilitate cable pulling without damage to cable jacket.

**3.3.1.3** Pull all cable by hand unless installation conditions require mechanical assistance.

**3.3.1.4** Install cable in conduit or metal raceway system (cable tray or equivalent) in public areas and as designated on plans.

**3.3.1.5** Station cable in MDF/IDF shall be routed and supported utilizing "D-type" mounting rings and overhead cable tray.

**3.3.1.6** Backbone in the MDF/IDF shall be routed and supported utilizing overhead cable tray and D-rings.

**3.3.1.7** Cabling shall be neatly laced, dressed, and supported.

**3.3.1.8** Repair damage to interior spaces caused by installation of cable, raceway, or other hardware. Repairs or replacements must match preexisting color and finish of walls, floors, and ceilings.

### **3.3.2 Splices**

**3.3.2.1** Copper cables shall be installed splice-free.

**3.3.2.2** Optical fiber cable shall not be spliced except when specified. Fiber terminations shall utilize fusion-spliced pigtails.

### **3.3.3 Routing**

**3.3.3.1** All cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance purpose (e.g., access boxes, ventilation mixing boxes, access hatches to air filters, switch or electrical outlets, electrical panels, fire alarm equipment, clock systems, and lighting fixtures).

**3.3.3.2** The installation of cable around movable devices, instruments, sub-panels, etc., shall be provided with a fixed standard outlet adjacent to device. Final connectivity shall only be provided through patch cable.

### **3.3.4 Pull Lines**

**3.3.4.1** A 3/32-inch diameter, 200-pound (minimum) strength polyethylene pull line shall be installed in all communication system conduit, both empty and with cable. This provides a pull line available for the next cable installation. Each end of the pull line shall be secured. Secure pull line to conduit end and box end.

### **3.3.5 Cable Bend Radius and Pull Tension**

**3.3.5.1** During pulling operation, adequate number of workers shall be present to allow cable observation at all points of raceway entry and exit, as well as to feed cable and operate pulling machinery.

**3.3.5.2** Pull cables in accordance with cable manufacturer's recommendations and ANSI/IEEE C2 Standards.

**3.3.5.3** Recommended pulling tensions and bending radii shall not be exceeded.

**3.3.5.4** Where mechanical assistance is used, ensure that maximum tensile load for cable is not exceeded. This may be in the form of continuous monitoring of pulling tension, use of "break-away" or other approved method.

### **3.3.6 Cable Support**

**3.3.6.1** All cable shall be supported every 4 feet vertically and horizontally within MDF and IDF Rooms.

**3.3.6.2** Separately supported "D-rings" shall be used to support cable vertically and horizontally by means of D-rings screwed to the backboard. Installation of these supports shall be done with care, so as not to cause crushing or distortion of the cable or result in tighter radius bends than the minimum radius permitted for each type of cable. Cable not dressed in a neat fashion or installed with excessive slack shall be rejected.

**3.3.6.3** Station cables shall be organized neatly by system (copper/fiber). Zip ties are not acceptable. Provide temporary Velcro hook-and-loop straps during installation. Remove straps when installation is complete.

### **3.3.7 Cable Removal**

***[A&E: Provide drawings, notes, and specification for demolition as required.]***

**3.3.7.1** All communications cable that has been decommissioned, slated for demolition, or otherwise found abandoned shall be removed from ceiling spaces, conduit, cable tray, and other raceway within the construction area.

**3.3.7.2** Provide demolition of cable complete from point of origin (MDF, IDFs) to outlet.

### **3.3.8 Custom Installation Requirements**

***[A&E: Include custom installation instructions at this location. Prior approval from UW ITechnology is required to use this section.]***

### **3.3.9 Conduit/Sleeve Usage/Fill**

**3.3.9.1** All communications conduits and sleeves shall be grounded, dedicated, meet NEC fill requirements, meet bend radius, supplied with pull lines, and labeled.

3.3.9.1.1 Contractors shall not attach any devices, raceway, or other building systems to communications conduits.

3.3.9.1.2 If raceway has been installed in 3 x 3 cluster patterns or greater, do not install cable. Any cable pulled in the conduits located on the perimeter ring blocks access to the interiorly located conduit. Identify and report locations to Engineer/UW ITechnology prior to installation.

3.3.9.1.3 Innerduct is to be installed only where fiber optic cable is exposed and shall not be installed through conduits.

3.3.9.1.4 Innerduct must be installed with UL listing visible to Authority Having Jurisdiction.

### **3.3.9.2 Grounding**

3.3.9.2.1 All communications cable shall be installed in grounded metal conduit.

3.3.9.2.2 A grounding riser shall be established for all communications cabling devices and supports. Refer to Section 27 17 51 for grounding requirements and coordination with trades.

3.3.9.2.3 Riser cable shields in MDF and in each IDF shall be connected to telecommunications ground bus bar.

### **3.3.9.3 Dedicated Use**

Communications cable shall not share conduit sleeves with electrical power wiring, department system wiring, or any other building system.

### **3.3.9.4 Fill**

Communications conduit shall not be filled beyond 40% capacity. Refer to NEC for conduit capacity for various trade sizes of conduit.

### **3.3.9.5 Cable Lubricants**

Lubricants specifically designed for installing communications cable may be used to reduce pulling tension as necessary when pulling cable into conduit. After installation, exposed cable and other surfaces shall be cleaned free of lubricant residue.



### **3.3.10 Cable Tray Usage/Fill**

**3.3.10.1** All communications cable tray shall be grounded, dedicated, meet NEC fill requirements, and meet bend radius.

**3.3.10.2** Contractor shall not attach any devices, raceway, or other building systems to sides or bottom of cable tray.

#### **3.3.10.3 Fill**

Communications cable shall be installed in cable tray as indicated in the Contract Documents. Cable tray fill shall not exceed 50% of total tray cross-sectional area per NEC.

#### **3.3.10.4 Transitions**

Install cable so that entry to and exit from tray is supported by drop-out plates or other listed devices installed to ensure cable is not stressed at the point at which it enters or exits the tray.

#### **3.3.10.5 Cable-Dressing**

**3.3.10.5.1** Wherever cable tray is exposed in hallways, whether completely visible or partially concealed, extra care shall be taken to neatly dress all cable between the conduit and the tray. Do not secure cable in bundles while inside the tray. Cable shall remain loose, not bound, but neatly managed in tray.

**3.3.10.5.2** Zip ties shall not be used to secure cable, even temporarily.

**3.3.10.5.3** Provide velcro straps to secure cables in vertical cable management adjacent to racks only.

### **3.3.11 Fire-stopping**

**3.3.11.1** During the final review and inspection period, following the Owner inspection of cable installed and tested acceptable, but prior to substantial completion, all sleeves passing through floors, roofs, and exterior walls shall be filled with approved fire-stop material in accordance with NEC. All firewall penetrations shall likewise be filled with suitable fire-stop material. Unused sleeves shall be capped or grouted.

**3.3.11.2** Fire-stopping shall be coordinated with all trades to assure a common fire-stopping system is deployed.

**3.3.11.3** In situations where cable tray, conduit, or sleeves extend outside the construction area into occupied portions of the building or through fire-rated construction, they shall be capped or fire-stopped throughout the course of construction.

- 3.3.11.4 The ancillary space around all sleeves passing through fire-rated construction shall be sealed with approved fire-stop material in accordance with NEC 300-21. Unused sleeves shall be sealed with approved fire-stop material. UL-listed, fire-rated conduit caps may be used to seal unused sleeves and conduit except where conduits have grounding bushings.
- 3.3.11.5 Where conduits extend through walls to the exterior of buildings, conduits shall be sealed with weatherproof material or capped. Unused conduits in outside cable plant pull vaults or duct banks shall be capped.
- 3.3.11.6 Regardless of building code requirements, all sleeves and conduit entering or exiting an MDF or IDF shall be fire-stopped or be a manufactured fire-rated assembly for both horizontal and vertical interconnections.

## 3.4 MDF/IDF CABLE PLANT INSTALLATION

### 3.4.1 Cable Sleeve Usage and Cable Routing

- 3.4.1.1 Exact conduit/sleeve usage, cable routing and backboard layout shall be coordinated with Owner during pre-installation walk-through.
- 3.4.1.2 Coordinate Construction Schedule to assure outside plant cable (by Owner) is installed in MDF prior to any riser or station cable routing in MDF.
- 3.4.1.3 Copper riser cable, optical fiber riser cable, and coaxial riser cable shall be routed inside the MDF and IDF Rooms as three distinct and separate cable bundles.
- 3.4.1.4 Install cable in the MDF and the IDF per the Contract Documents. Allocation of riser sleeves shall be as indicated on the riser diagram. Unless otherwise noted in the contract drawings, each sleeve shall be filled to maximum fill allowed by the NEC before adjacent sleeve is used. For existing conditions, use partially filled sleeves before using adjacent unused sleeves.
- 3.4.1.5 Station cables shall be installed in conduits and sleeves as directed by UW ITechnology during pre-installation walk-through.
- 3.4.1.6 Cable shall be routed as close as possible to the ceiling, floor, or corners to ensure that adequate wall or backboard space is available for future equipment and for cable termination.
- 3.4.1.7 Cable shall be routed over a path that will offer no obstruction to future installation of equipment on backboards, or other cables. Avoid crossing areas horizontally just above or below riser sleeve or cable tray penetrations.

### 3.4.2 Cable Terminations

The exact position of copper, fiber, and coaxial riser termination locations shall be based on the pre-installation walk-through with the Owner prior to rough-in of the cable plant. Refer to Section 3.1 pre-installation walk-through for requirements.

**3.4.2.1 Copper Riser Cables** shall be installed from the riser field termination block(s) in the MDF to the termination block(s) in each IDF. Refer to the riser diagram for pair counts and cable counts

3.4.2.1.1 Copper riser pairs shall terminate to 300-pair 110 blocks mounted to stand-off cans. All pairs shall be terminated with a combination of 4-pair and 5-pair 110 connectors.

3.4.2.1.2 110 blocks shall be organized into fields designated as riser and riser voice transition cross-connect. Additionally, fields shall be further subdivided by floor where multiple floors are served by the same riser room.

3.4.2.1.3 **For rack-mounted universal design format**, copper riser pairs shall be cross-connected to rack-mounted Telco patch panels utilizing separate riser-tie wall-mounted 110 blocks, with 5-pair 110 connectors, and 25-pair cables. Cables shall be terminated 4 pair (8 conductor) per outlet on patch panel. **[Refer to Detail XXX.]**

3.4.2.1.4 **For wall-field universal design format**, a JP-36 voice transition block is provided by the 27 17 52 contractor, but the copper riser pairs are cross-connected by others.

**3.4.2.2 Individual Optical Fiber Riser Cables** shall be installed from the termination point in the MDF to the patch panel in each IDF. Refer to the contract drawings for strand counts and cable type. Cable shall be protected by innerduct whenever cable is not in conduit (more typically in cable tray or routing in communication rooms). Provide service loop consisting of 15 feet of slack (coiled to manufacturer's recommendation) in the MDF and at each IDF termination point (exact location to be determined on pre-installation site walkthrough). At all points, innerduct rating shall be visible for Authority Having Jurisdiction inspection.

3.4.2.2.1 Fiber optic cables shall be terminated in rack-mounted optical fiber patch panels using pigtail terminations. The patch panels shall be organized in the MDF by floor and by IDF as specifically shown in the Contract Documents on the rack elevation detail and as discussed during the pre-installation walkthrough.

## **3.5 STATION CABLE PLANT INSTALLATION**

### **3.5.1 Cable Routing**

**3.5.1.1** Cabling shall be run in raceways as designated on floor plans and outlet schedule.

- 3.5.1.2** All cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance purpose (e.g., access boxes, ventilation mixing boxes, access hatches to air filters, switch or electrical outlets, electrical panels, fire alarm equipment, clock systems, and lighting fixtures).
- 3.5.1.3** To reduce effects of EMI, the following minimum separation distances shall be adhered to:
- 5" from power lines of 2 kVA.
  - 18" from high-voltage lighting (including fluorescent).
  - 39" from power lines of 5 kVA or greater.
  - 39" from transformers and motors.
- 3.5.1.4** Station copper **[and station fiber]** cables shall be home run to IDF or MDF from station outlet.
- 3.5.1.5** Station fiber for the Seattle campus Fire Alarm Loop shall homerun in **continuous** conduit from the outlet device adjacent to the main Fire Alarm panel to the MDF. No pull boxes or cable tray shall be part of this routing.
- 3.5.1.6** Maximum station cable length shall not exceed 295 ft (90 meters) measured from termination in IDF or MDF to station outlet, including slack required for installation and termination. Contractor is responsible for installing station cable to avoid unnecessarily long runs. Coordinate with Division 26 Contractor to assure pathways are adequately installed.
- 3.5.1.7** Any area that cannot be reached within the above constraints shall be identified and reported to Engineer/UW ITechnology prior to installation.
- 3.5.2 Cable Terminations at MDF/IDFs**
- 3.5.2.1** The exact position of copper station termination hardware shall be based on a pre-installation walk-through with the Owner prior to rough-in. Refer to Section 3.1 for pre-installation walk-through requirements.
- 3.5.2.2** Station copper cable shall terminate to rack-mounted patch panels **[and/or wall-mounted JP36 blocks]**. Additionally, furnish and install dedicated patch panel(s) **[and/or patch blocks]** for wireless access point copper cables.
- 3.5.2.3** Cables shall have pair twists preserved to point of termination.
- 3.5.2.4** Cable jacket shall be continuous to within 1/2" of termination.
- 3.5.2.5** Terminate cables using 568B wiring standard.
- 3.5.3 Cable Termination Sequence – Copper Patch Panel/Patch Block**

- 3.5.3.1** For **rack-mounted** patch panels, **station copper cables** shall terminate in sequential order from top left port to bottom right port.
- 3.5.3.2** For **rack-mounted** patch panels, **wireless access point copper cables** shall terminate in sequential order on dedicated patch panel from top left port to bottom right port.
- 3.5.3.3** For **wall-field** patch blocks, **station copper cables** shall terminate in sequential order on JP36 blocks from top left to bottom right port, alternating top/bottom across each 12-port termination row.
- 3.5.3.4** For **wall-field** patch blocks, **wireless access point** copper cables shall terminate in sequential order on dedicated JP36 blocks from top left to bottom right port, alternating top/bottom across each 12-port termination
- 3.5.4 Cable Termination at Outlet Device**
- 3.5.4.1.1** The standard communications outlet consists of 3 cables of unsheathed twisted 4-pair Category 5e. Unless noted otherwise, this cable bundle shall be installed from each outlet location to the MDF and/or IDF designated in the Outlet Schedule.
- 3.5.4.1.2** At the outlet location, approximately 6-9 inches of slack cable shall remain to facilitate servicing after the installation.
- 3.5.4.1.3** Cables shall have pair twists preserved to point of termination.
- 3.5.4.1.4** Cable jacket shall be continuous to within 1/2" of termination.
- 3.5.4.1.5** Terminate cables using 568B wiring standard.
- 3.5.4.1.6** All cable installed to floor boxes shall be terminated at floor box in specified faceplate. It is not acceptable to extend station cable out of a floor box. Refer to Outlet Schedule.
- 3.5.4.1.7** Refer to Detail [XXX] for specific configurations for outlet types.
- 3.5.4.2 Surface Mounted Raceway**
- 3.5.4.2.1** Applications in SMR require a device plate and jack insert frame. In installations within divided SMR, the communication system outlet shall be offset from the power receptacle faceplate by 2 inches. Refer to additional assembly details in the Contract Documents for SMR mounting configurations.
- 3.5.4.2.2** Cable shall be placed into open SMR, not pulled. Care shall be exercised when installing the SMR cover so as not to pinch or otherwise damage cable.
- 3.5.4.2.3** Communications cable shall be routed in the top half of divided SMR. Manufacturer's listed divider shall be used to separate power wiring from communications cabling.

3.5.4.2.4 Do not install Category 5e cable around corners of surface-mounted raceway. Coordinate with Electrical Contractor to install SMR entrance outlets to each wall supported by SMR.

3.5.4.2.5 Contractor shall furnish and install all required faceplates, device plates, and activation components required for complete and secured installation.

### **3.5.4.3 Furniture Outlets**

The Contractor shall terminate system furniture outlets after the completion of the furniture installation. Refer to the Contract Documents for details of this activation.

***[A&E: Device termination instructions for special situations (e.g., landscape furniture) shall be obtained from UW ITechnology and incorporated here.]***

### **3.5.4.4 Specific Service Location Requirements**

#### **3.5.4.4.1 Stacked/Through Box Installation (twin)**

Provide and install per outlet schedule and detail.

#### **3.5.4.4.2 Elevator Phone**

Provide and install phone unit per manufacturer's instructions and detail.

#### **3.5.4.4.3 Direct Connect 911 Telephone without Light**

Telephone units are 8-1/2 inches wide by 11 inches high. Conduit enters through either the top or the bottom edge of the unit. The unit shall be permanently secured to the wall surface.

#### **3.5.4.4.4 Direct Connect 911 Telephone with Light**

Install phone unit per manufacturer's instructions.

#### **3.5.4.4.5 Outdoor Weatherproof Phone**

Install phone unit per manufacturer's instructions.

### **3.5.4.5 Building Automation Systems Outlets**

#### **3.5.4.5.1 Fire Alarm System**

***[A&E: Ask UW ITechnology about latest technology developments.]***

Provide cables (and terminations) per outlet schedule and detail.

- 3.5.4.5.2     **Voice Rescue Assistance vs. Area of Refuge Panel**  
Provide cables (and termination) per outlet schedule and detail.
- 3.5.4.5.3     **Elevator**  
(See previous section under “Specific Service Location Requirements”.)
- 3.5.4.5.4     **Monitoring [ADT/Sonitrol]**  
***[A&E: Coordinate requirements with UW ITechnology.]***  
Provide cables (and termination) per outlet schedule.
- 3.5.4.5.5     **DDC Control for HVAC**  
Provide cables (and terminations) per outlet schedule.
- 3.5.4.5.6     **Lighting Relay Control Panel**  
Provide cables (and terminations) per outlet schedule.
- 3.5.4.5.7     **Power Panel Meter**  
Provide cables (and terminations) per outlet schedule.
- 3.5.4.5.8     **Utility Meter**  
Provide cables (and terminations) per outlet schedule.
- 3.5.4.5.9     **Irrigation Control**  
Provide cables (and termination) per outlet schedule and detail.
- 3.5.4.5.10    **CAAMS**  
Provide cables (and termination) per outlet schedule and install per CAAMS wall layout detail on Security detail sheet.
- 3.5.4.5.11    **Car Charging Vehicle Locations**
- 3.5.4.5.12    **UCAR Locations**
- 3.5.4.6        Payment Systems *[A&E: Coordinate requirements with UW ITechnology]***
- 3.5.4.6.1     **Husky Card System**
- 3.5.4.6.2     **Point of Sales Locations**
- 3.5.4.6.3     **ATM’s**

### 3.6 LABELING REQUIREMENTS

#### 3.6.1 General

- All cable and terminating devices shall be labeled.
- Label with adhesive tags.
- Insert white adhesive labels behind a clear protective cover.
- Fiber cable labels shall be attached to cable via loose tie wraps.
- All labels shall be white (except for fiber optic cable label).
- Labeling shall be by mechanical means in black ink.
- Fiber cable labels shall be handwritten in black ink, using capital lettering, best penmanship.
- Hand-lettered designations are not allowed (except on fiber cable).

#### 3.6.2 Vertical Riser Cable Labels

Labels shall be placed at the following locations:

- Riser blocks, fiber enclosures, and patch panels in the MDF and each IDF.
- Six inches above the floor penetration (sleeve or conduit) in each MDF and IDF.
- For optical fiber, labels shall be placed 6 inches before the service loops, 6 inches after the service loops, and 6 inches below the sleeve opening at the ceiling or from the wall.

##### 3.6.2.1 Fiber Optic Riser Cable Label Format (MDF/IDF)

3.6.2.1.1 Fiber optic cables shall have the following labeling format:

Building Code – Building Code – SM – 24  
Room – Room [MDF room number if first; IDF room number is second]  
Ribbon

3.6.2.1.1.1 Example: Building – Molecular Engineering  
***[A&E: verify UW building code with UW ITechnology]***

MOL-MOL-SM-24  
G37-132  
Ribbon

3.6.2.1.2 Fiber optic **rack-mounted enclosures** shall have the following labeling format:

A	Building Code
X-Y	Room Number

where “A” is the rack row (typically only one);  
where “X” is the rack number (rack for riser cable abuts wall is #1);  
where “Y” is the fiber enclosure number (#2 in MDF; #1 in IDF).



3.6.2.1.2.1 Example: Building – Molecular Engineering

**At MDF G37**

A 1-2		MOL G37
MOL-MOL-SM-24 G37-132	MOL-MOL-SM-24 G37-232	etc. etc

**At IDF 132**

At IDF:

A 1-1	MOL 132
MOL-MOL-SM-24 G37-132	

3.6.2.1.3 Fiber optic **wall-mounted enclosures** shall meet all standards as listed for IDF's excluding rack and row number BUT including the following:

TOP CENTERED

Building Code-Building Code-SM-24

Room-Room (MDF room number is first; IDF room number is second)

LOWER RIGHTHAND CORNER

Building Code-Room Number

Wall Panel Number

3.6.2.1.3.1 Example:

MOL-MOL-SM-24  
G37-132

MOL 132  
WP1

3.6.2.1.3.2 See Details [XXX, YYY, ZZZ] on T-dwgs sheets for labeling information.

***[A&E: Customize SD-CM-XX, XX, XX dwgs to reflect project information and include on with details in T-dwgs.]***

**3.6.2.2 Copper Riser Cable Label Format (MDF/IDF)**

**3.6.2.2.1 Voice riser 300 pair 110 block label format**

3.6.2.2.1.1 Example:

VP1V1 VP1V2 VP1V3 VP1V4 VP1V5 VP1V6  
VP1V7 VP1V8 VP1V9 VP1V10 VP1V11 VP1V12

Etc

where VP1 stands for the first Voice Transition Panel  
and VP2 stands for the second Voice Transition Panel;  
where V1 is the first 4-pr on the 110 block, etc..

3.6.2.2.1.2 Refer to Detail [XXX] on T-dwg sheets for labeling information.

***[A&E: Customize SD-CM-XX, XX, XX dwgs to reflect project information  
and include on with details in T-dwgs.]***

3.6.2.2.2 **Voice transition patch panel label format**

3.6.2.2.2.1 Example:

VP1V1 VP1V2 VP1V3 etc. VP1V24

where VP1 is Voice Transition Panel #1 and V1 is port 1.

3.6.2.2.2.2 Refer to Details [XXX, YYY, ZZZ] on T-dwgs sheets for labeling information.

***[A&E: Customize SD-CM-XX, XX, XX dwgs to reflect project information  
and include on with details in T-dwgs.]***

3.6.2.3 **Copper Station Cable Labels**

All station cables shall be labeled per the Contract Documents. Cable shall be labeled on both ends at the Faceplate Outlet Device and in the MDF/IDF Rooms.

3.6.2.3.1 **Patch panel port label format** : Ports are numbered in sequential order from left to right starting on the top row 1-24 and the bottom row 25-48.

3.6.2.3.1.1 Example:

Using sample Room 242 with outlet device faceplate .03 having three jacks – the top row of the patch port panel would look as follows at ports number 1, 2, 3:

242.03-01 242.03-03  
242.03-02

289.01-46 289.01-48  
289.01-47

Using sample Room 289 with outlet device faceplate .01 also having three jacks – the bottom row of the same patch port panel would look as above at ports 46, 47, 48.

- 3.6.2.3.1.2 Refer to Details [XXX, YYY, ZZZ] on T-dwgs sheets for labeling information.

*[A&E: Customize SD-CM-XX, XX, XX dwgs to reflect project information and include on with details in T-dwgs.]*

### 3.6.2.4 Station Cable Termination Labels at Outlet Device

- 3.6.2.4.1 All faceplate identification shall be consistent with the numbers on the Outlet Schedule included in the Contract Documents. Document grid numbers are unacceptable. Owner-assigned room numbers shall be used. Verify that floor plans show Owner-assigned room numbers; no conversion outlet schedules will be accepted.
- 3.6.2.4.1.1 **Standard wall-mounted outlets** shall be labeled sequentially clockwise around the room from the door (skipping wireless outlets). Floor-mounted outlets shall be labeled after wall outlets, and ceiling-mounted outlets will be labeled last.
- 3.6.2.4.1.2 **Wireless outlets** shall be labeled sequentially, clockwise around the room from the door, beginning with outlet ID of Room #.80.
- 3.6.2.4.1.3 **CATV outlets** shall be labeled sequentially, clockwise around the room from the door, beginning with outlet ID of Room#.90. Where the CATV device has been combined in the same box as the Cat5E device, then the standard box numbering takes precedence over “.90” series” numbering. See Outlet Schedule
- 3.6.2.4.2 All faceplates shall be labeled. The mechanical labels shall be legible, permanent, and securely attached to the respective faceplate. Position the room and outlet identifier at the top center of the faceplate.
- 3.6.2.4.3 As specified in the Construction Documents, all plastic faceplates shall be provided with a mechanical label in black ink securely attached to the faceplate indicating that location’s ID number. The Contractor shall provide blank faceplates on all device boxes and SMR sections that do not get served with station cable. This includes replacing pre-punched section of SMR (Isoduct) with new blank section. Blank faceplates shall be labeled “comm.” with same material as other outlet labels.
- 3.6.2.4.4 **Faceplate outlet device label format**
- 3.6.2.4.4.1 **Faceplate outlet devices** are numbered in sequential order using the Room # and a faceplate number. The example below uses room number 267 and faceplate number .01.

3.6.2.4.4.2 **Patch panels** in riser room rack are numbered in sequential order by patch panel slot (see details [XXX] and pre-installation walkthrough). The **patch panel ports** are numbered 1-48. Outlet device jacks are terminated sequentially first on patch panel #1, ports 1-48, then on patch panel #2, ports 1-48, etc.

3.6.2.4.4.3 Example:

2/3-25 2/3-26 2/3-27 2/3-28  
267.01

IDF 132  
2/3-29 2/3-30 2/3-31 2/3-31

where center tag directly above jacks indicates Room #.Faceplate #;

where center tag directly below jacks indicates MDF or IDF room number when either a floor has more than one MDF/IDF or when more than one floor goes to the same MDF/IDF;

where label locations on topmost and bottom most row on faceplate indicate Rack # (in this example Rack 2) / Patch Panel # (in this example Patch Panel 3) - Patch Panel Port # ( in this case #25 through #31).

3.6.2.4.4.4 Refer to Details [XXX, YYY, ZZZ] on T-dwgs sheets for formatting information.

***[A&E: Customize SD-CM-XX, XX, XX dwgs to reflect project information and include on with details in T-dwgs.]***

## 3.7 TESTING

### 3.7.1 General Testing Requirements

#### 3.7.1.1 Work Planning

3.7.1.1.1 Before requesting a final inspection, the Contractor shall perform a series of end-to-end installation performance tests. The Contractor shall submit for approval a proposal describing the test procedures, test result forms, and timetable. Owner shall be notified 2 weeks prior to any testing so that the testing may be witnessed.

3.7.1.1.2 Acceptance of the simple test procedures discussed below is predicated on the Contractor's use of the recommended products (including, **but not limited to**, twisted-pair, fiber, and outlet devices specified in the Products section), and adherence to the inspection requirements and practices set forth.

3.7.1.1.3 The Contractor shall test:

- All riser cable from MDF termination points to IDF termination points

- All station cable from MDF/IDF termination points to outlet device

### **3.7.2 Riser Cable Testing**

#### **3.7.2.1 Optical Fiber Cable Testing Requirements**

3.7.2.1.1 After installation the Contractor shall test each fiber strand using an OTDR (Optical Time Domain Reflectometer) to ensure that it meets the manufacturer's specifications.

3.7.2.1.2 The procedure for testing optical fiber cables requires a power meter and a light source with the capability to record test data on a CD in non-proprietary standard format. A hard copy of the summary test results on CD shall be provided to the Owner including link loss and a reference reading. The power meter and the light source shall have the proper interface (patch cord) to test LC connector terminations.

3.7.2.1.3 Each optical fiber strand shall be tested using the same patch cord for each port to keep readings consistent.

3.7.2.1.4 All OTDR tests shall be performed using the same 100-foot launch cable.

3.7.2.1.5 After installation, the Contractor shall also test each fiber strand utilizing a power meter at both 1310 nm and 1550 nm wavelengths to include:

- Continuity
- Length (calculated from difference between footage markers on cable)
- Total segment (end-to-end) loss (dB) at each end
- Bi-directional testing
- Acceptable connector loss shall not exceed 0.4 dB
- If loss is greater than 0.4 dB, check connector for proper buffing or contaminants before retesting
- If the source of high loss is the LC-to-LC interface and it cannot be corrected, verify that the fault does not lie with the pigtail assembly
- When loss is greater than 0.75 dB, replace the pigtail assembly

If any fractures, no matter how small, are detected during examination of the fiber in the LC, the pigtail assembly shall be replaced.

#### **3.7.2.2 Twisted-pair Copper Riser**

3.7.2.2.1 A visual inspection shall be made to ensure that the cables have been terminated on the punch-down blocks in proper color code order. An end-to-end continuity

test is to be made for each pair to ensure wire continuity and correct tip and ring polarity. Riser cable shall be tested from the MDF frame punch-down blocks to each IDF punch-down block.

- 3.7.2.2.2 Vertical and horizontal riser cables shall be tested to ensure that they meet the current requirements of EIA/TIA-568-A cabling standard for the category of cable being installed (i.e., Category 3 cable shall meet Category 3 parameters). Documentation shall include cable ID, pair ID, results of testing, and as-built information.

### **3.7.3 Station UTP Cable Testing**

#### **3.7.3.1 Copper Cable Testing Requirements**

- 3.7.3.1.1 All testing shall be done using the permanent link parameters.
- 3.7.3.1.2 All pairs shall test “pass” and meet appropriate performance parameters. Open, split, mis-terminated pairs, deviations from the manufacturer’s installation specifications, defective connections, and bad installation practices shall not be accepted and shall be corrected. Test all station cables.
- 3.7.3.1.3 Test results shall meet or exceed the performance test requirements as specified in the current ANSI/TIA/EIA specifications.

### **3.7.4 Copper and Fiber Optic Test Records**

#### **3.7.4.1 Required Submission to Owner**

- 3.7.4.1.1 Provide one (1) hard copy of summary (one line per jack) test results to UW ITechnology as each MDF/IDF room is completed. Save electronically complete documentation of all tests. Documentation shall include outlet number and results of performance testing done with the cable analyzer. Analyzer documentation of testing shall consist of test result recorded in a “.txt” or “.csv” file onto a CD in each MDF or IDF. Test results shall be submitted and approved prior to substantial completion and final payment approval.
- 3.7.4.1.2 Test records for cable shall be maintained using an organized format. The forms for twisted-pair and optical fiber cable shall record MDF/IDF Room number, riser pair/strand number or outlet ID, outcome of test, re-test results after problem resolution, and signature of the technician completing the tests. Test results shall be submitted in electronic format.

#### **3.7.4.2 Defects Identified through Testing**

- 3.7.4.2.1 When errors are found, the source of each error shall be determined and corrected and the cable retested.
- 3.7.4.2.2 All defective components shall be replaced and retested following the procedure described above.

- 3.7.4.2.3 A list shall be submitted for University approval of any defective components that the Contractor is unable to correct with a detailed explanation and alternative proposals.

**END OF PART 3**