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1. SERVICE ENTRANCE AND TERMINATION -- OUTSIDE PLANT

1.1 GENERAL

1.1.1 INTRODUCTION

This section provides the necessary guidelines to install service entrances to buildings and information for the termination of cables entering buildings. Topics addressed are voice, data and video.

All outside plant voice, data, and video cabling, conduit and manholes shall be designed and/or approved by the Office of Information Technologies (IT@UC). UC Public Safety is responsible for the campus Fire Alarm System.

1.2 CABLE

1.2.1 GENERAL

Prior approval and coordination with IT@UC, UC Planning+Design+Construction, Facilities Management, and other concerned parties are necessary when the situation requires pulling cable through a conduit occupied by another cable.

All cables associated with the campus telecommunications network (telephone, data, LAN, WAN, campus TV, and fiber optics) shall be connected and disconnected by IT@UC or its designee.

Only those cables specified will be installed in any facility.

All trunk cables requiring splicing will be done in accordance with specified system splicing instructions that will be determined on a site-specific basis. The proper manufacturer-recommended splice closure for the splice at hand shall be used. Project specifications will indicate the name and title of the person responsible for supplying and installing trunk cabling and splice closures. When splice on connectors are used, a standard Ortronics fiber “patch” cabinet may be used.

There shall be no cable with voltages higher than 48 volts in communications duct banks.
All copper trunk cables entering a building shall be terminated on protection blocks. Only solid state protectors shall be used. See specifications in Section 5. The contracted installer will be responsible for furnishing and installing protectors. Repair or replacement of damaged cable is the responsibility of the party involved in causing the damage. All damages shall be reported immediately to IT@UC. UC Planning+Design+Construction, shall also be notified for damages due to activities of project contractors and for damages due to activities of other than project contractors.

1.2.2 LABELING

The owner of the cable shall identify all cables in each manhole with a designated cable number and pair counts. The tag shall be made of brass or plastic designed to be used in such an application.

Whenever possible, all abandoned cable shall be removed from tunnels, manholes and conduit. If it is not feasible to remove abandoned cable, it shall be clearly tagged as abandoned, with appropriate labeling as above, and shall be reported to IT@UC and Facilities Management.

1.2.3 AERIAL

Most university low voltage cabling is underground. No aerial wiring shall be installed on campus unless approved by IT@UC and UC Planning+Design+Construction. Information shall be obtained from IT@UC in reference to ownership of aerial cables and poles.

1.3 CONDUIT

1.3.1 GENERAL

Conduit sizing and quantities between buildings shall be determined by IT@UC and will be communicated UC Planning+Design+Construction, the Division of the University Architect for inclusion in the project specifications. Minimum requirements are outlined in the following paragraphs.

All campus buildings shall be connected to the nearest manhole/tunnel or new manhole/tunnel, if one is to be installed.
Prior approval and coordination with IT@UC, UC Planning+Design+Construction, and other concerned parties is necessary when the situation requires any modification to the conduit system.

Repair or replacement of damaged conduit is the responsibility of the party involved in causing the damage. All damages shall be reported to IT@UC, UC Planning+Design+Construction and Facilities Management immediately.

1.3.2 REQUIREMENTS

All new facilities or renovations will be required to meet minimum requirements. Minimum voice, data, and video conduit required for each building shall be 4 conduits.

- Two shall be four-inch, Type C, 4-Cell Multi-Guard Multi-Cell PVC Raceway, or Maxcell Equivalent
- Two shall be four-inch, Schedule 40, PVC.

No more than the equivalent of 180 degrees of bends is allowed in a run, including offsets.

A Kevlar pull string or a measure tape shall be installed and tied off in each conduit. Pull wires used outside of facilities shall be stainless steel or copper; #12 AWG or strings shall be of the Kevlar type. Pull wires/strings used inside facilities and flow ducts shall be nylon measure tape.

In cases where the building has direct access to the tunnel system, i.e., a tunnel section terminates at the building; cable trays of equivalent capacity may be used in lieu of the 4 or more conduits normally required for the size and type of the building.

To allow for future communication upgrades, including reducing multi-pair copper cable counts and increasing optical fiber media counts; a specific number of conduits shall be dedicated for that purpose. And to further that effort and achieve maximum conduit utilization, those conduits shall contain flexible, fabric innerduct.

TEXTILE INNENDUCT MANUFACTURERS
A. Provide products offered by MaxCell Group

1. Substitutions will not be acceptable.

Standard Outdoor Textile Innerduct: Micro (33mm), 2-inch, 3-inch and 4-inch single or multi-cell polyester/nylon textile innerduct containing 1250lb polyester flat woven pull tape.

Detectable Outdoor Textile Innerduct: Micro (33mm), 2-inch, 3-inch and 4-inch single or multi-cell polyester/nylon textile innerduct containing 1250lb polyester flat woven pull tape, and a solid copper, polyvinyl color coated conductor (19AWG minimum) for tracing and rated for a minimum of 6 amps and 600 volts. Conductor shall be placed in the sidewall edge fold of the textile sleeve.

Size descriptions of the MaxCell product refer to the minimum conduit size allowed for placement.

Multiple packs of Maxcell may be installed in a single conduit. Up to 3 packs of 3-inch, 3-cell (9 pathways) may be placed in an empty 4-inch conduit. Similarly, up to 2 packs of 4-inch, 3-cell may be placed in an empty 4-inch conduit.

MaxCell may be placed in an occupied duct with a fill rate of 50% or less.

**Textile Innerduct Installation**

Make a 2" incision, approximately 18" from the end of textile innerduct. Pull out and cut off approximately 2 feet of pull-tape. Thus allowing the pull tape ends to retract back into the cells.

Using approximately 6 feet of pull tape, tie a non-slip knot to the incision. Then tie 3 to 6 half-hitch knots down to the end of textile innerduct. Apply black vinyl tape over all knots and the end of textile innerduct. Using a Bow Line knot tie a swivel to the end of 3 feet pull tape. For multi-pack installations one swivel is sufficient, but stagger each textile innerduct.

Using a Bow Line knot, attach the pull rope located in the rigid conduit to the other end of the swivel. Install textile innerduct – ensuring that no twist is introduced to the innerduct.
Provide suitable textile innerduct slack in the maintenance holes, hand holes, pull boxes, and at turns to ensure there is no kinking or binding of the product.

1.3.3 UNDERGROUND

All underground conduits and ducts, rigid or PVC, added to a project shall be added in groups of 2, 4, 6, 8, 10, 12 or more. Communications duct shall be 66.6 percent four-inch Schedule 40; 33.3 percent four-inch Type C 4-Cell Multi-Guard Multi-Cell PVC Raceway, with a minimum of four-inch and two-inch 4-Cell Multi-Guard. Under no circumstances are single underground conduit runs acceptable.

All underground conduit, duct bank and raceways shall be concrete encased (3500psi minimum). Additional reinforcement is to be used when crossing roadways or when recommended by UC Planning+Design+Construction.

The minimum separation for communications ducts and power ducts in a joint trench environment is 3 inches (8 cm) of concrete, 4 inches (10 cm) of masonry or 12 inches (30 cm) of well-tamped earth. All communications ducts shall also be a minimum of 48 inches from steam pipes and condensation lines if crossing perpendicular. The minimum depth for buried conduit and ducts is 30 inches below grade or underside of roadbed to top of duct/conduit.

When communication ducts run parallel to steam lines a minimum of a two-foot separation is required to avoid conduction of heat. All other duct separations must comply with the National Electric Code.

Rigid steel conduit, encased in reinforced concrete, shall be used in any location subject to abuse, such as under slabs or foundations.

All underground conduits shall be four inches in diameter.

All necessary precautions shall be taken by the contractor during construction to prevent the lodging of dirt, plaster or trash in all conduit, tubing, flow duct, fittings and boxes. All conduit in floors, concrete or below grade, shall be swabbed free of debris and moisture before wires are pulled.
UC Planning+Design+Construction and Facilities Management shall approve all diggings and excavation on UC campus.

1.3.4 **TUNNELS**

Where conduit, ducts or cable trays are in tunnels, they shall be kept at least 48 inches from parallel runs of flues, steam pipes, hot gas pipes, hot water pipes or any other utility line which is hot during normal operation of the facility it serves. All conduit sections crossing steam lines shall be rigid and shall be provided with a means of insulation from the steam lines, unless written exception is provided by UC Planning+Design+Construction.

1.3.5 **CONDENSATION**

Duct banks shall be pitched to drain to manholes.

1.3.6 **TRAPS**

All conduit, tubing, raceways, ducts and duct banks shall be installed in such manner to insure against collection of trapped condensation. Raceway runs shall be arranged to be void of traps.

When conduit passes through exterior concrete walls of any facility, the entrance shall be watertight. Provide pipe sleeves in the concrete with 1/2-inch minimum entrance seal.

All conduits shall have watertight connections and be sloped properly so they will drain into the manhole and away from the building entrance.

1.3.7 **TYPES**

Gas pipe and water pipes shall not be used for conduit under any circumstances.

Three types of conduit are accepted for underground conduit systems. Project specifications will detail the types of conduit to be used in the various locations covered by the project.

- **Rigid galvanized steel conduit with threaded fittings.** This conduit shall be installed with reinforced concrete casing in areas subject to abuse. If not concrete encased, this
conduit shall be painted with two coats of coal tar base paint or have epoxy coating applied by manufacturer.

- **Schedule 40 PVC conduits.** This conduit shall be installed with reinforced concrete casing. No PVC conduit is acceptable without reinforced concrete.

- **Type C Multi-Guard Multi-Cell PVC conduit.** This conduit shall be installed with reinforced concrete casing. PVC conduit without reinforced concrete is not acceptable.

Field wrapping or coating shall extend to six inches above ground level where conduit is installed by a pole or side structure or inside a pedestal.

The duct envelope shall be rectangular in the cross section and be a minimum concrete thickness of three inches around any conduit. The duct envelope shall be sized and placed as shown on construction documents.

A minimum of four # 4, steel reinforcing rods shall be installed in all duct bank envelopes. Where conduit enters a building or a manhole the rears must be doweled into the existing structure to prevent shearing of the conduits in case of settlement.

All conduit and ducts must be terminated with bell ends at the manhole, facility or other termination point. Where trench walls are unstable or the trench width is wider than the envelope, the envelope shall be formed as required. Duct spacers shall be provided at a maximum of seven feet intervals. Conduit shall be anchored at three foot six inch intervals and at each spacer to prevent duct floating during concrete installation.

Each duct run shall be done with a continuous concrete pour. Broken pours are not allowed without written exception from UC Planning+Design+Construction;...and provided #4 rebar or larger is extended twelve inches beyond the end of the envelope at the end of each day’s pour and at all stub-outs.

A yellow color agent shall be sprinkled on top of the concrete used for underground communications ducts. The color agent is to comply with industry standards. Marker tape shall be placed on top of the concrete duct casing.

### 4.1 **MANHOLES**
1.4.1 GENERAL

1.4.2 INTERIOR
Manholes shall not be smaller than 4 feet wide, 6 feet long and 7 feet high.

The maximum depth of all manholes shall be ten feet from the manhole cover to bottom of the manhole, unless otherwise approved by IT@UC and Planning+Design+Construction.

The manhole cover and opening shall be 36 inches in diameter and shall be engraved with the word “TELEPHONE.” Manhole covers shall not have recessed handles that pull out when needed for removal. IT@UC & UC Planning+Design+Construction shall assign the manhole number.

The maximum distance between manholes connected in any one run shall not exceed 400 feet.

All materials used in a manhole shall be resistant to corrosion. All steel shall be galvanized or zinc coated. All racks in manholes shall be PVC or galvanized or zinc coated steel.

Manholes shall have pulling rings opposite to the conduit entrance on each wall.

1.5 DRAWINGS

1.5.1 GENERAL

Detailed diagrams can be obtained from the University of Cincinnati’s Planning+Design +Construction. Refer any questions specifically not addressed in this document to IT@UC.

2. TELECOMMUNICATIONS ROOMS AND CABLE TERMINATION

2.1 OVERVIEW
2.1.1 DEFINITION

Telecommunication rooms are special-purpose rooms that house telecommunications equipment and wiring. These rooms have specific requirements due to the nature, size and complexity of the equipment and wiring housed in the room.

2.1.2 SPACE

There may be up to three different types of telecommunications rooms within a building, each supporting critical functions as part of the building wiring and communications systems. In general, each room must be large enough to accommodate the wiring and equipment that will be located within them, plus additional space for growth. The three types of rooms are:

- The Main Cross-Connect Room (MCR); sometimes called the Main Distribution Frame (MDF); there is normally only one MCR per group of buildings. On the campus of the University of Cincinnati, this room is also known as the "Node Room" and is the distribution point for the backbone fiber and copper infrastructure feeding that group of buildings. The Node Room houses the VoIP system, Analog Gateway and Core network related electronic equipment. This room may also serve as an Intermediate Cross-Connect (IC) or Building communication room (BCR). See Section 14 for a typical room layout.

- The Building Communication Room (BCR), Building Equipment Room (BER), sometimes called the Main Distribution Frame (MDF). There is normally only one MDF per building. This room may serve as a Telecommunications Room (TR). Typical MDF room size is 10'x 10'. See Section 14 for a typical MDF room layout.

- The Telecommunications Room (TR), sometimes called the Telecommunications Closet (TC), Intermediate Distribution Frame (IDF), Wiring Closet, or Horizontal Cross-connect. There is usually at least one TR per floor. More than one TR per floor is required when the terminated wiring distance between any communications jack and the TR exceeds 295 feet (90 meters). Typical TR size is 10'x 10'. See Section 14 for a typical TR layout.

2.1.3 GENERAL

Project specifications will indicate who is to be responsible for furnishing, installing and terminating the various types of communications cabling, racks, panels and other items
specified in Section 2. Unless otherwise noted, the project electrical contractor will be responsible.

All work shall comply with the National Electrical Code, Ohio Building Codes, IT@UC Communications Standards, and the Division of Administration and Finance Planning+Design+Construction Design Guidelines.

Telecommunications rooms may vary according to the size of the building, number of floors, tenancy characteristics and telecommunications services required. Consideration to the future needs of the facility and the end users is a necessity.

Electrical panels, other than those exclusively servicing the telecommunication room in which it is located, are strictly prohibited in telecommunications rooms. Services that are not telecommunications related are prohibited in these rooms. This includes, but is not limited to, janitorial services, supply storage, etc. There will never be an exception to these restrictions. Because of the growth of emergency and security systems campus-wide and the size of the associated equipment, Fire and other alarm panels are now installed in a separate room usually adjacent to the TR, or BCR called an EIDF. Systems installed in this room also include: Bearcat Card, CATV, Door Access and any building automation cabling or equipment.

A 50 percent growth factor shall be built in and provided in each riser unless otherwise specified. Consequently any cable or conduit or cable tray work that pertains to telecommunications must be designed and/or approved by IT@UC. Project specifications will include this growth factor.

To facilitate proper installation, routing, and placement of cables, wires, premise equipment and terminal fields, telecommunication closets shall be located on each floor, as close as possible to the middle of the building and stacked one above the other, unless otherwise instructed or approved by IT@UC. Architects must pay special attention to telecommunication closet locations to overcome distance limitations. The total distance of the conduit path, from outlet to the TR, BCR or MCR, when the BCR or MCR also serves as a TR, shall not exceed 295 feet (90 meters) including termination loss. If a construction or renovation project has a floor plan and infrastructure layout that provides designs for the addition of data jacks/cables that are beyond the maximum 295 feet (90 meters), another TR will be required on that floor to accommodate those out of distance drops; or those cables/jacks will have to be omitted. Note: In rare cases...for a few pre-approved connections, Fiber can/will be installed instead of UTP.
Every PC or other single device with a network connection must be cabled back to the nearest telecommunications closet in the building. The MCR/BCR/TR room(s) shall house all and only the equipment directly related to the telecommunications systems and its environmental support systems.

The project contractor shall submit "As Built" drawings to UC Planning+Design+Construction with each job upon acceptance. IT@UC and various other UC departments will use these drawings.

2.2 REQUIREMENTS

2.2.1 GENERAL

All telecommunications room doors are to have ASSA ABLOY / SARGENT IN Series WiFi enabled locksets installed for access (see link below). [https://www.assaabloyacademy.com/Local/assaabloyacademyCOM/Americas/IQP/SARGENT%20IN120%20IN220%20Catalog.pdf](https://www.assaabloyacademy.com/Local/assaabloyacademyCOM/Americas/IQP/SARGENT%20IN120%20IN220%20Catalog.pdf). All TR doors are to be keyed alike, using the Universities standard - key cores. Currently, the university designated key code identifier for IT@UC TRs is “A2DA” (subject to change*). The brand of cylinders currently being used across both campuses for new Telecommunication Rooms are “KeyMark” by “Medeco”. Locks shall be spring lock (self-locking). *UC Public Safety will supply the key number and IT@UC will be responsible for authorizing employee and contractor badge access when needed, and for any keys that are assigned.

Due to the eventual location of communication racks and equipment in the BCR/TR’s doorways shall be designed with minimum measurements of 3’-0” by 6’-8” and shall open outward into the corridor to prevent damage to the racks and electronic equipment and allow for growth (e.g. additional racks and equipment).

Floors shall be sealed concrete or tile. Carpet is prohibited.

Telecommunication rooms shall be located above any threat of flooding. Rooms located in basements shall have floor drains with positive drainage, otherwise sump pumps must be provided. When sump pumps are required they shall be connected to a UPS system.

Fire treated plywood, 3/4 inch thick, must be mechanically fastened to the walls specified in the project specifications of each Main Cross-Connect, Building Communications Room, and Telecommunications Closet. The plywood shall be painted with two coats of
fire resistant paint of a neutral color. The fire treated plywood is to begin at four inches AFF and end at 8'-4" AFF.

The recommended ceiling height is minimum 8’-6”. Finished ceilings are prohibited in telecommunications rooms.

Install a minimum of four 4-inch sleeves between stacked telecommunications rooms, with sleeves extended 4 inches AFF and 4 inches below the ceiling of the room below. Buildings taller than 4 stories shall require an increase in the minimum number of sleeves as follows:

- 5-8 stories: 8 sleeves floors 1-4; 4 sleeves floors 5-8
- 9-12 stories: 12 sleeves floors 1-4; 8 sleeves floors 5-8; 4 sleeves floors 9-12
- Etc.

Note: EZ Path 44s should be substituted for the 4” sleeves whenever possible. Please consult STI (Specified Technologies Incorporated) catalog for floor grid kits.

### 2.2.2 ENVIRONMENT

All telecommunications Node Rooms and Data Center quality spaces shall be environmentally controlled to maintain the room environment at a temperature range of 65 to 75 degrees Fahrenheit, with a relative humidity level of 35 to 75 percent non-conducting, 24 hours a day, 7 days a week. IT@UC must be consulted about the type of Air Conditioning unit. Telecommunications rooms shall be conditioned with a fresh air exchange of three air changes per hour. If HVAC must be shut down then an exhaust connected to emergency power must be provided to remove heat. Generally the system must remove 7,000 BTU per hour. For TRs the building’s central air conditioning system is suitable.

No plumbing, HVAC, or electrical conduit shall pass through or be directly above the telecommunications room. The space above the ceiling is needed for broadband amplifiers and/or assorted equipment.
2.2.3 ELECTRICAL

Lighting shall be 4 foot fluorescent type and provide a minimum of 50 Foot Candles at 3 feet above the floor and be connected to the emergency generator when available. See typical fixture layout in Section 14.

A minimum of two double duplex AC outlets must be provided to power telephone system components, computer interfaces, network electronics and any other telecommunications requirements in each TR. Outlet locations should be obtained during the building design stage. If designated to be mounted on the wall, the outlet must be installed at a height of 7 feet AFF. Outlets must be flush when cut through plywood.

Each double duplex outlet shall be connected to a dedicated circuit breaker. Each dedicated electrical circuit shall be 20-amp, 110V, 60 HZ type unless designated otherwise. One of the two (2) circuits must also be tied to the buildings emergency generator when available. The other circuit shall be connected to building main power. If a back-up generator is unavailable, one of the two 20 amp circuits MUST be connected to a dedicated circuit breaker to a panel on a different floor.

It has been determined at this point that a 30 amp circuit is not a requirement to support the UPS systems to be installed in each TR going forward. It will be determined on a project by project basis whether or not to install 30-amp circuits (NEMA-L6-30) in selected TR(s). All breaker panels are to be labeled and identified to avoid being turned off in error. Breakers servicing the telecommunication rooms shall be equipped with locking devices to prevent turn off.

2.2.4 GROUNDING

All telecommunications rooms shall have a grounding bar that shall be 3 feet long for TR’s and 10 feet long for BCR’s and MCR’s. Both shall be 4 inches wide by 1/4 inch thick with pre drilled NEMA bolt hole sizing and spacing. This bar shall be attached to the main building grounding system with a wire not smaller than #6 AWG copper. The ground wire shall not share the cable tray with communications cabling. It may be installed in a separate conduit, which may be attached to the outside of the communications cabling cable tray.

Each distribution point shall be grounded to the main building ground, NEC and EIA/TIA 607 requirement shall be followed.
See Section 14 for typical locations of the grounding bars.

2.2.5 LABELING

Communications, computer and television conduit is to be clearly identified, at every junction box, via a painted section or by use of conduit stickers indicating each conduit run:

Green = computer and telephone, Yellow = television, Orange = fiber optic.

All Distribution Frames, and connecting blocks must be properly identified by destination.

All riser cables shall be properly marked. Marker is to be a flat piece of aluminum or wire tied plastic labels. This marking shall be permanent and indicate:

- The Origination (Cable it is feeding from).
- The Destination (Telecommunications room it is feeding).

All voice and data cable pairs in riser cables or the entrance cable must be terminated on a connecting block and identified.

2.3 CABLE

2.3.1 GENERAL

A 50 percent growth factor shall be built in for riser cable and provided for unless otherwise specified; consequently any cable work that pertains to telecommunications must be designed and/or approved by IT@UC. Project specifications will include this growth factor.

Each telephone and data cable shall have a minimum of 4 pairs; in some cases a larger cable may be required. IT@UC will inform the contractor, via the project specifications, in such cases.

Plenum or PVC communications cable may be run exposed above ceilings, provided this cabling is supported independent of other utilities, such as conduits, pipes, ceiling support systems, and not laid directly on the ceiling panels. PVC jacketed cable may be used in non-plenum areas if such use meets NFPA and NEC standards and codes.
All cables from the IC or Building Communications Room (BCR) must be 100 percent terminated in each Telecommunications room.

To facilitate future cable installations a new pull string, tied off at both ends, shall be installed simultaneously with the pull-in of cable.

All station run communication cables shall be copper, 24 AWG minimum, Superior-Essex category 5e for voice, and Superior Essex 10GainXP Category 6A cable for all data needs; horizontal station cabling, and Wireless Access Points. All station run cable shall be Plenum rated.

All structured cabling and supportive backbone cabling for any University of Cincinnati Construction or renovation project MUST be installed by one of the Structured Cabling Vendors awarded to UC’s Term Contract at that time.

The structured cabling vendors company must be a Legrand/Ortronics certified installer at the CIP level. The CIP certification allows the company to offer the nCompass limited lifetime warranty for both copper and fiber optics from Legrand/Ortronics and Superior Essex. The awarded Vendor’s certification must be for the Cincinnati region.

Note Important: Any renovation project or activities that do not include replacing the structured cabling in the entire facility/building, will receive a Category 6 data cabling solution instead of 6A. IT@UC will NOT mix a Category 6 Structured cabling solution in any TR with a Category 6A installation.

2.3.2 TELECOMM SERVICE (VOICE) RISER CABLE

Telecomm Service (Voice) riser cable shall be category 3, 24 AWG. All riser cable shall be run through and held in place with Erico/Caddy’s Vertical Backbone Cable Support or IT@UC approved equipment in telecommunications rooms and on backboards. Block placement and management backboards, will be specified by IT@UC. The contractor shall install designation labeling strips with cable counts and jack ID.

2.3.3 FIBER OPTIC RISER

Fiber optic riser cable shall consist of a minimum of 24 strands of single mode fiber. Termination in the BCR and TR shall be on standard Ortronics fiber patch panels utilizing
LC type connectors. See Section 13 for fiber cable and patch panel specifications. Fiber riser shall be installed in riser-rated inner duct (3/4" I.D. min) or must be armored fiber. The fiber cable(s) shall be secured to the backboard at the junction box.

2.4 RACKS AND PANELS

2.4.1 GENERAL

Each distribution point on the telecommunication room backboard shall be identified as a building entrance and/or a floor service panel.

Junction/pull boxes are to be provided on any conduit run longer than 100 feet.

All voice terminations at the BCR (Building Communications Room) in the MCR or TR will be on standard 110 type connecting blocks, without legs, mounted on B-line wall modules as appropriate.

Note: All racks, cabinets, cable management and panels shall be Legrand/Ortronics. Cabinet and rack types will be determined on a case by case basis depending on the project scope of work and the size of allocated telecomm space. See section 13 for rack and cabinet descriptions and part numbers.

2.5 WIRE DRESS

2.5.1 VOICE STATION WIRES

Organize and label voice station cables in serial number order. Individually bundle and route the unshielded voice pair groups to each of the voice punch down block columns, located on the wiring surface labeled "Voice."

2.5.2 DATA STATION WIRES

Drop data station wires from telecommunications room cable tray behind data patch panel rack. Organize and label the cables in jack serial number order. Individually bundle and route unshielded twisted pairs to the network panel punch down locations, located directly in the rack patch panel.
2.6 DATA RACK AND PATCH PANEL

The following installation method shall be used to install network distribution panels and associated equipment.

In Telecommunications Rooms containing over 144 data terminations; mount a minimum of two 7’ x 19” racks in the indicated positions; a third rack may be necessary if the amount of data cables to be installed reaches the maximum capacity. Position the racks to maintain a minimum of 3 feet clearance from the front of the rack to the front facing room wall and 3 feet clearance from the rear of the rack to the rear facing room wall. If a row of racks is to be installed in a telecommunications room, maintain a minimum of 2-foot clearance from the rightmost or leftmost rack to the opposing wall. Anchor racks to the finished floor using an isolation kit. Ground the rack to the telecommunications room grounding busbar with #6 AWG copper wire.

Mount data patch panels and fiber distribution panel in the rack next to wall. At the top of the rack install a 4-U wire-management device except when the rack contains a fiber distribution box. Lay out the patch panels starting with one 2-U wire-management device then a 24 port patch panel, followed by a 2-U wire-management device. Continue by alternating between 2-U wire-management devices, and 24 port patch panels until the rack is full. A data rack is considered to be at its maximum (full) capacity at 288 data cables. A full data rack will have 1 4-U wire management device, 12 - 24 port patch panels and 13 2-U wiremanagement devices. When data jacks for multiple floors are serviced out of the same TR, BCR or MCR, the TR must be large enough to accommodate a minimum of three 7’ x 19” racks, with the third rack positioned in the same row. The patch panels shall be laid out and labeled as follows:

Mounting of patch panels shall begin in the rack next to the wall. The rack in the middle shall be reserved for active electronics. All racks with active electronics will get a 4-U wiremanagement device or fiber distribution box at the top; followed by a 2-U wire manager and a 24 port patch panel. Continue by alternating between 2-U wire management devices and 24 port patch panels until the rack is full. An Active data equipment rack is considered to be at its maximum (full) capacity at 12 - 48 port data switches. A full active equipment rack will have 1 4-U wire management device or fiber distribution box, 12 – 48 port data switches and 13 2-U wire management devices.

If it is decided that multiple floors will be terminated in the same TR and on the same rack, the top most floor(s) will be located on the patch panel(s) at the top of the rack(s). If the TR will be serving 2 floors, and quantities for any floor exceeds 144 data cables,
additional racks may be required. If the TR will serve 3 floors and quantities for any floor exceeds 96 data cables, additional racks maybe required. Data jacks from each floor will be grouped together when the 19”racks are initially installed and all the cables going to that TR are terminated. They must be pre-labeled with the appropriate patch panel ID numbers. IT@UC must be consulted for rack, cabling and equipment layout approvals. Additional racks may be required to satisfy this layout.

**NOTE:** UPS’s will be installed in each TR (if not existing) going forward on all construction and renovation projects. One UPS will be installed for very 2 network switches...with electrical circuits installed per 2.2.3 above.

See Section 13 for a complete list of UC standard equipment & wiring devices. Consult IT@UC for final approval of alternate devices.

A minimum of 2 – dedicated 20 amp double duplex electrical outlets are required in each TR preferably at the bottom of each rack to support the UPS systems for the Data switches and any other active network equipment. A dedicated 20 amp circuit is required for every 2 UPSs installed.

1. One circuit **must** be connected to the building generator if available.
2. The 2nd circuit should be connected to building main power only.
3. If building generator power is unavailable one of the two 20 amp circuits MUST be connected to a dedicated circuit breaker to a panel on a different floor.

30-amp circuits (NEMA-L6-30) may be required in order to support other IT systems. **This will be decided on a project by project basis.** IT@UC must be consulted for rack, cabling, power and equipment layout approvals on all projects.

Because of the lack of available space on the patch panel for labeling, Patch panel labels cannot accurately match the jack labels as described in Section 3.1.2. For this reason, the TR number required on the jack label is not required on the patch panel ID, but each patch panel ID must contain the floor code letter. The rack furthest from the wall is reserved for future growth.

*Note typical rack drawings are located in Section 14. IT@UC must be consulted before rack installation begins*

**2.6.1 PUNCH DOWN**
Fasten the B-line modules as appropriate to the plywood-wiring surface with #10 x 3/4 inch screws. Attach Legrand/Ortronics legless 110 punch down blocks to the B-line module. Route all cables to be punched down to these blocks through the B-line mounting module so they can be dressed from under the 110 blocks. Lay down all station wire pairs in jack serial number order from lowest serial number at the top left most position to the highest serial number at the bottom right position.

- **VOICE 4-Pair.** Use Legrand/Ortronics part number OR-30200022, white 300 pair legless 110 blocks. Locate the punch blocks on the B-line module surface in the area designated as Voice Station Wires. Punch down the four unshielded pairs on the block. Minimum bend radius must meet the cable manufacturers’ specifications for category 5e wiring.

**DATA 4-Pair.** Use Legrand/Ortronics part number OR-PHD66U24 – 24 port, **category 6** 110 style loaded patch panels. Mounting and installation of patch panels should begin in the left most rack unless otherwise directed by IT@UC. Punch down the four unshielded pairs on the patch panel as directed by the manufacturer. NOTE that the patch panels for terminating the data jacks may be located on the floor above or below the floor on which the jack is located. In this case, the station wiring must be run through the riser to the patch panel terminating floor. No intermediate cross connects are permitted between the data jack and the Legrand/Ortronics patch panels. Minimum bend radius must meet the cable manufacturers’ specifications for Category 6 wiring.

- **DATA 4-Pair.** Use Legrand/Ortronics part number OR-PHD6AU24 – 24 port, **category 6A** 110 style loaded patch panels. Mounting and installation of patch panels should begin in the left most rack unless otherwise directed by IT@UC. Punch down the four unshielded pairs on the patch panel as directed by the manufacturer. NOTE that the patch panels for terminating the data jacks may be located on the floor above or below the floor on which the jack is located. In this case, the station wiring must be run through the riser to the patch panel terminating floor. No intermediate cross connects are permitted between the data jack and the Legrand/Ortronics patch panels. Minimum bend radius must meet the cable manufacturers’ specifications for Category 6A wiring.

### 2.6.2 WIRING AND CABLING STANDARDS
See Section 13 for a complete list of IT@UC standard wire, wiring components, racks, part numbers etc. This is the equipment required for all installations. Exceptions or substitutions must be approved by IT@UC.

All structured cabling and supportive backbone cabling for any University of Cincinnati Construction or renovation project MUST be installed by one of the Structured Cabling Vendors awarded to UC’s Term Contract at that time.

The Structured cabling vendors company must be a Legrand/Ortronics certified installer at the CIP level. The CIP certification allows the company to offer the nCompass limited lifetime warranty for both copper and fiber optics from Legrand/Ortronics and Superior Essex. The awarded Vendor’s certification must be for the Cincinnati region.

3. VOICE AND DATA OUTLETST--INSIDE PLANT WIRING AND RACEWAYS

3.1 GENERAL

3.1.1 OVERVIEW

All telephone and data station wiring shall be continuous wire from the TR, BCR or MCR for voice and from the patch panel for data to the communication outlet. All station cables will be free of kinks, chafes, and tight bends. Any ceiling tiles removed by the contractor for cable installation will be re-installed in good condition. Replacement of damaged tiles is the contractor’s responsibility.

The building occupant’s present and future requirements will determine the needs of multiple jack outlets. Final approval for the layout of jack outlets shall rest with IT@UC. During the programming stage, IT@UC will consult with the building occupant(s) and supply the desired jack layout to the project architect for inclusion in the project specifications.

See Section 13 for a complete list of UC standard wiring devices. Consult IT@UC for final approval of alternate devices.

All non-VoIP voice outlets shall terminate in RJ-45 USOC eight-conductor modular jack assemblies; Legrand/Ortronics part number OR-63700005-68. Going forward voice outlets will only be installed when required or requested. When required the voice outlet shall be the topmost outlet in the wall plate. In some cases this outlet will be a stand alone wall jack. Wire color-coding shall be per USOC specifications.
NOTE: Any non-data network related telecomm service requested will continue to be installed on Category 5e cabling, on RJ-45 USOC voice outlets and terminated on 110 hardware in the TR, unless another type of outlet is specifically identified.

All data outlets shall terminate in Legrand/Ortronics RJ-45 eight-conductor modular jack assemblies. The data outlet(s) shall be the lower outlet(s) in the wall plate. Wire color-coding shall be per EIA/TIA-568B specifications. All pairs shall be terminated on both voice and data jacks.

The total wire path length from the data outlet to the telecommunications closet block must not exceed 295 feet (90 meters). This is important to meet Ethernet requirements of IEEE 802.3. Please note that in some cases the Telecommunications Closet that houses network electronics will service both the voice and data jacks on the floor above and below, as well as the floor it is on. This must be considered when determining adherence to the maximum length for the data outlet wiring.

All Bearcat Card data outlets shall terminate in Legrand/Ortronics RJ-45 eight-conductor modular jack assemblies. With the upgraded system they are now just data jacks. The data outlet(s) shall be the lower outlet(s) in the wall plate, or may be installed as a single outlet. Wire color-coding shall be per EIA/TIA-568B specifications. All pairs shall be terminated.

3.1.2 LABELING

Each end of all cables will be labeled at their termination locations.

All jack modules shall be color coded to UC standards indicating that the top jack is voice (gray) and that the bottom jack for a Cat 6A data cabling solution is (orange). Horizontal mounted jack positions shall be data on the right and voice on the left. Dual voice/data jacks will utilize a double gang 4 position face plate with voice jacks in the top two positions, data jacks in the bottom two positions. All jacks shall be marked with identification numbers as detailed below.

Note Important: Any renovation project or activities that do not include replacing the structured cabling in the entire facility/building, will still receive a Category 6 data cabling solution instead of 6A. Data jacks for a Category 6 solution are Green.
IT@UC will provide the identification number range to be used for the building(s). If the project timeline permits, before any wiring begins, the installing contractor shall provide to IT@UC a list of jack identification numbers used, their corresponding room numbers, patch panel termination points, and drawings that detail location within the room. Jack identification numbers at the jack locations shall also be placed on the as built drawings provided by the contractor. An updated spreadsheet detailing the above-mentioned information shall be provided by the contractor as additions or changes occur and a final copy after project completion.

**COMMUNICATION OUTLET IDENTIFIER**

Each Communication Outlet will be labeled with 11-character identification. For example, five characters, a dash “-”, a letter and one four digit number. Every single-gang voice/data faceplate will have two 11-character labels, one for the top outlet and one for the bottom outlet. Every double-gang voice/data faceplate will have four 11-character labels, two for the top outlets and two for the bottom outlets.

The first five characters of the number represent the room number of the TR that feeds the Communication Outlet location. The letter is a code for the floor on which the outlet is located, with “A” representing the lowest floor in the building, “B” representing the next floor up, and so forth. The lowest usable floor in the building will always be represented with “A” regardless if that floor has any voice or data jacks located on the floor. The next four digits represent the termination location of the cable on the 110 blocks for UTP Voice Outlets, Legrand/Ortronics category 6A patch panels for UTP Data Outlets, and Fiber Patch Panels for Fiber Outlets. Each IDF will have a block of numbers assigned to it, in the range of 0001 to 3999. These are sequential numbers starting at 0001. If the building has more than one TR, each TR will have the same block of numbers assigned to it. For example, 0001 through 3999 for TR number 1, 0001 through 3999 for TR number 2 and so on, as required. The block of numbers will be assigned as follows: 0001 to 2999 is reserved for UTP Voice Outlets and UTP Data Outlets, 3000 to 3999 is reserved for Fiber Outlets.

IT@UC will assign these blocks to each TR during the Infrastructure Design Phase. UTP Voice Outlets are to be labeled sequentially with odd numbers from the block of assigned numbers for the associated TR, beginning with 0001, 0003, 0005, and so on, as required. UTP Data Outlets are labeled sequentially with even numbers from the block of assigned numbers for the associated TR, beginning with 0002, 0004, 0006, and so on, as required. Fiber Outlets are labeled sequentially from the block of numbers assigned for the associated TR, beginning with 3000, 3001, 3002, and so on, as required.
• **EXAMPLE 1**  **UTP Analog/Voice Outlet 00G24-A0023**

By looking at this Jack Identifier you can determine the following:

00G24-A0001 (Characters 1, 2, 3, 4, 5). Identifies room number “G24” as the TR feeding this UTP Voice Outlet located on floor A (character 7), the lowest floor in the building.

00G24-A0001 (Characters 8, 9, 10, 11). Identifies this Outlet as a UTP Voice Outlet since it is an odd number. The position on the 110 block is counted sequentially with odd numbers from left to right and top to bottom.

• **EXAMPLE 2**  **UTP VoIP/Data Outlet 00124-B2048**

By looking at this Jack Identifier you can determine the following:

00124-B0002 (Characters 1, 2, 3, 4, 5). Identifies room number “124” as the TR feeding this UTP Data Outlet on the floor B.

00124-B0002 (Characters 8, 9, 10, 11). Identifies this Outlet as a UTP Data Outlet since it is an even number. The position on the Legrand/ Ortronics patch panel is counted sequentially with even numbers from left to right and top to bottom.

• **EXAMPLE 3**  **Desktop Fiber Outlet 00324-E3036**

By looking at this Jack Identifier you can determine the following:

00324-E3036 (Characters 1, 2, 3, 4, 5). Identifies room number 324 as the TR feeding this Fiber Outlet.

00324-E3036 (Characters 8, 9, 10, 11). Identifies this Outlet as a Fiber Outlet since it is in the range of 3000 to 3999. The position on the Fiber Patch Panel is counted sequentially from left to right and top to bottom. The outlet is located on floor E.

Door Access cables and outlets are installed, terminated and utilized in the same manner as standard data outlets, and should be labeled as such.
• **EXAMPLE 4**  Door Access Outlet  00124-B2050

By looking at this Jack Identifier you can determine the following:

00124-B2050 (Characters 1, 2, 3, 4, 5). Identifies room number “124” as the TR feeding this UTP data outlet on the floor B.

00124-B2050 (Characters 8, 9, 10, 11). Identifies this Outlet as a UTP Data Outlet since it is an even number. The position on the Legrand/Ortronics patch panel is counted sequentially with even numbers from left to right and top to bottom.

**Fire Alarm cables and outlets are currently installed, terminated and utilized in a manner similar to standard voice outlets, and should be labeled as such.**

• **EXAMPLE 5**  Fire Alarm Outlet  00G24-A0025

By looking at this Jack Identifier you can determine the following:

00G24-A0025 (Characters 1, 2, 3, 4, 5). Identifies room number “G24” as the TR feeding this UTP voice outlet on the floor A (character 7), the lowest floor in the building.

00G24-A0025 (Characters 8, 9, 10, 11). Identifies this Outlet as a UTP Voice Outlet since it is an odd number. The position on the 110 block is counted sequentially with odd numbers from left to right and top to bottom.

**ATM cables and outlets are installed, terminated, and utilized in the same manner as a standard voice outlet and should be labeled as such.**

• **EXAMPLE 6**  ATM Outlet  00G24-A0015

By looking at this Jack Identifier you can determine the following:

00G24-A0015 (Characters 1, 2, 3, 4, 5). Identifies room number “G24” as the TR feeding this UTP voice outlet on the floor A (character 7), the lowest floor in the building.
00G24-A0015 (Characters 8, 9, 10, 11). Identifies this Outlet as a UTP Voice Outlet since it is an odd number. The position on the 110 block is counted sequentially with odd numbers from left to right and top to bottom.

With the recent upgrade to the Bearcat Card system; Communications jacks and outlets for Bearcat-Card services are now installed, terminated and utilized in the same manner as standard data outlets, and should be labeled as such.

- **EXAMPLE 7**  Bearcat-Card Outlet  00124-B2048

  By looking at this Jack Identifier you can determine the following:

  00124-B0002 (Characters 1, 2, 3, 4, 5). Identifies room number “124” as the TR feeding this UTP Data Outlet on the floor B.

  00124-B0002 (Characters 8, 9, 10, 11). Identifies this Outlet as a UTP Data Outlet since it is an even number. The position on the Legrand/ Ortronics patch panel is counted sequentially with even numbers from left to right and top to bottom.

Help Phone & Area of Rescue communication cables and outlets are installed, terminated, and utilized in the same manner as a standard voice outlet and should be labeled as such.

- **EXAMPLE 8**  Help Phone or Area of Rescue Outlet  00G24-A0075

  By looking at this Jack Identifier you can determine the following:

  00G24-A0075 (Characters 1, 2, 3, 4, 5). Identifies room number “G24” as the TR feeding this UTP voice outlet on the floor A (character 7), the lowest floor in the building.

  00G24-A0075 (Characters 8, 9, 10, 11). Identifies this Outlet as a UTP Voice Outlet since it is an odd number. The position on the 110 block is counted sequentially with odd numbers from left to right and top to bottom.

3.1.3 **WIRING**
The cabling and wiring products listed in Section 13 are required for use at UC because of their reliability, durability, performance and warranty among certified brands. Alternates or equivalents are not acceptable.

**Note Important:** Any renovation project or activities that do not include replacing the structured cabling in the entire facility/building, will still receive a Category 6 data cabling solution instead of 6A. IT@UC will NOT mix a Category 6 Structured cabling solution in any TR with a Category 6A installation.

Note: Category 3 wiring is only to be used for voice riser cable.

### 3.2 OUTLET LOCATION

#### 3.2.1 LOCATIONS AND QUANTITIES

Unless otherwise specified, the following minimum number of outlets shall be installed in the following quantities, depending on the function for that particular office/room. **Spaces not explicitly covered below shall have jack quantities and locations determined on a case-by-case basis during the design stage of the project.**

Note: A typical outlet consists of 1 voice and 1 data jack not to exceed 4 total jacks. In cases involving VoIP a single data jack will cover both voice and data service requirements.

- Faculty/Administrative Offices: Each office shall have two communication outlets per designated occupant. The outlets shall not be collocated, but be placed on opposite or adjacent walls.

- Clerical/Staff Offices: One communication outlet per designated occupant, at the location of each desk and one additional outlet for every two occupants or fraction thereof.

- Secretary/Administrative Assistants Offices: One communication outlet per designated occupant, and two additional outlets per office area.

- Conference Rooms: A minimum of two communication outlets and one CATV outlet per room for rooms up to 200 square feet. A minimum of four communication outlets and one CATV outlet per room for rooms over 200 square
feet. One outlet shall be located on each wall. Rooms with more than 500 square feet shall have additional outlets equally spaced on each wall.

• Laboratories/Graduate Student Offices: One wired communications outlet for every occupant. Additional outlet requirements will be determined based on size and in the design phase of the project.

• Classrooms/Lecture Halls/Auditoriums: One to multiple communication outlets depending on room and/or occupancy size; one voice only jack - Wall phone mounting at Instructors workstation/Lectern.

<table>
<thead>
<tr>
<th>Number of Outlets</th>
<th>Student Occupancy</th>
<th>CATV* Outlets</th>
<th>Ceiling Data Outlets for Wireless</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 – 15</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>15 – 50</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4 or more</td>
<td>50 – Over</td>
<td>4</td>
<td>3 or more &quot;**&quot;</td>
</tr>
</tbody>
</table>

NOTE: * One TV outlet in the front of room and another in the ceiling for projection TV. If the classroom is designated as an Electronic Classroom, then the Electronic Classroom requirements in Section 4 may supersede the CATV outlet requirements listed above.

** Large Lecture Halls/ Auditoriums may require up to 9 wireless data outlets

The recommended location priority for the outlets would be:

1. Chalkboard and ceiling
2. Inside walls with proper spacing
3. Projection booth/rear wall
4. Remaining sides

• Residence Hall Rooms: One communication outlet per occupant or potential occupant of each room. One CATV outlet per room. The locations will be determined during design stages of the project.

• Residence Hall Lounges: One or more communication outlets and one CATV outlet per lounge. The quantity and locations will be determined during design stages of the project.
• Hotel Rooms: Two communication outlets and one CATV outlet per room. Typical communication outlet locations are at the nightstand and at the desk. Actual quantities and final locations will be determined during design stages of the project.

• Storage Areas: One communication outlet per room. Two outlets for rooms over 500 square feet and one additional outlet for each additional 2000 square feet.

• Janitor Closets: Consult the Division of the University Architect. Some closets require communications outlets for telephones, computers or time reporting devices.

• Mechanical Rooms: Consult the Division of the University Architect. Some rooms require communications outlets for telephones or energy management devices.

• Building Communication Rooms and Telecommunications closets: One communication outlet per room.

• Other spaces, including locations for data jacks for Wireless LAN access points, not covered above will be determined on a case by case basis during the design stage of the project.

3.3 OUTLET INSTALLATION

3.3.1 MOUNTING

Use a dual gang outlet box similar to Steel City, part number 72171-3/4 or UC approved equivalent. When mounting the outlet box in a steel studded wall, use a back brace.

Use Steel City plaster rings, part number 72-C13, (single gang) or 72-C-17 (double gang) or their IT@UC approved equivalent. It is absolutely critical that the inside opening area match the outlet installation enclosure. The plaster rings must be level and positioned flush with the finished surface.

Use a single gang plaster ring for single voice/data outlets. Use a double gang plaster ring for dual voice/data outlets.

Outlets are to be mounted at standard industry heights and positions, unless otherwise specified by IT@UC. Standard mounting height of communication outlets:
CATV cable is normally installed at the height of TV mounting. Use only a single gang plaster ring.

NOTE: Electrical outlets shall be provided for TV and projection devices. See Wiremold/Legrand Evolution wall boxes for recessed options.

### 3.4 WIRING PATHWAYS

#### 3.4.1 GENERAL

To avoid electromagnetic interference (EMI), all pathways should provide clearance of at least:

- 4 feet (1.2 m) from motors or transformers
- 1 foot (0.3 m) from conduit and cables used for electrical power distribution
- 5 inches (12 cm) from fluorescent lighting or power lines over 2kVA, and up to 24 inches from any power line over 5kVA. In general, communications cabling is routed separately or several feet away from power cabling. Similarly, communications cabling is routed away from large motors, generators, induction heaters, arc welders, x-ray equipment, and radio frequency, microwave or radar sources. Whenever possible, pathways should cross perpendicular to fluorescent lighting and electrical power cables or conduits.

### 3.5 CONDUIT

#### 3.5.1 GENERAL

All conduit work shall meet the requirements of the National Electrical Code.
All voice, data and video wiring inside rooms shall be protected by metallic conduit or other means such as Legrand/Wiremold or troughs in the floor. Aluminum is not acceptable in caustic environments. EMT conduit shall be used for all interior wiring. All conduits are to be concealed.

No more than an equivalent of two 90-degree bends are allowed in a run between junction boxes or pull boxes.

No 90¼ conduit (LBs) are permitted.

Entrance to junction boxes or distribution panels shall be adjacent to the corners.

The use of plenum cable instead of conduit shall be determined on a case-by-case basis. IT@UC must be contacted for approval.
In major renovation and new construction projects where the MCR/BCR and Telecommunications Rooms are not in alignment, the contract shall include provisions for installation of three riser conduits (4 inches minimum diameter) from the MCR/BCR to each TR. A pull string and appropriate junction pull box shall also be provided in each conduit run to facilitate future installation of cable(s). Maxcell fabric innerduct should be used to create multiple pathways in 4” conduit where fiber will be installed.

All conduits in slab shall be a minimum of 1 inch...No exceptions.

All sleeves must protrude 4 inches AFF and below and be capped at both ends. Coordinate with IT@UC for the number of conduits entering the facility. All sleeves must be bonded to the telecommunications bonding system.

No horizontal conduit run shall be more than 100 feet between pull boxes.

Conduit for telephone or computer outlets shall be terminated in a dual gang box. Steel City, part numbers 52151-1, 72151-1, 52-C-17 or 72-C-17 for 1 inch with dual gang plaster ring and 52151-3/4, 72151-3/4, 52-C-13 or 72-C-13, for 3/4 inch with single gang plaster ring. UC approved equivalents to the Steel City part numbers may be used.

All communications outlets shall be 1 inch conduit, with a minimum of bends, from the outlet to the cable tray, wire way or homerun directly to the telecommunications closet. Homerun conduit is required when the cable path above the ceiling is not easily accessible. Examples of ceilings where conduit is required include dry wall and
interlocking ceiling tiles. Pull boxes must be installed every 180 degrees or 100 feet of the conduit run. All conduit stubs must be bonded to the telecommunications grounding system. See Section 4 for conduit requirement for Electronic Classroom outlets.

3.5.2 **CONDUIT/RACEWAY CAPACITY**

Conduit shall be sized using industry standard guidelines for telecommunications distribution methods. Guidelines can be found in the Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual and/or cabling manufacturers’ guidelines.

Any surface mount raceway (metallic or non-metallic) should be from Legrand/Wiremold and be able to utilize the appropriate communication and A/V modules from Legrand/Ortronics.

3.5.3 **FLOOR MOUNTED ASSEMBLIES**

All Floor Mounted Assemblies including floor boxes, poke through, floor outlets, floor mounted whips, tombstones, etc. shall be sized using industry standard guidelines for telecommunications distribution methods; specifically relating to cable fill ratios and limitations. Guidelines can be found in the Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual and/or through individual cabling manufacturers’ installation guidelines.

All Poke-throughs and floor boxes should be of the Evolution series from Legrand/Wiremold.

All Evolution Floor boxes are designed to work in concrete, raised floor and wood floor applications and are fully adjustable both pre and post concrete pour. The enclosure will have removable dividers and a tunnel feature that allows all compartments to be connected. The modules are removable through the top or back of the floor box. The floor box hinge must is able to open to a full 180° and lie flat on the floor surface providing easy access to interior modules. Cable egress doors lock in position when open and will automatically close around wires to protect cabling and avoid tripping hazards. Floor boxes will accept single, double or triple wall plates as well as accommodate power, communications and A/V devices. Floor boxes are designed to maintain up to a 2 hour fire rating.
The *Evolution poke throughs* provide the interface between power, communication and audio/visual (A/V) cabling in an above grade concrete floor and the workstation or activation location where power communication and/or A/V device outlets are required. These poke-thru devices provide recessed device outlets that will not obstruct the floor area. The poke-thru device shall be compatible with the complete line of Legrand / Ortronics workstation connectivity outlets and modular inserts.

Poke Through units shall permit all wiring to be completed at floor level. The 6AT, and 6ATCFF units shall mount in a 6” [152mm] cored hole, actual 6 1/16” [154mm] core hole. The 8AT units shall mount in an 8” [203mm] cored hole, actual 8 1/16” [205mm] core hole. Use is defined by the UL Fire Resistance Directory as a minimum spacing of “2 ft. [610mm] on center and not more than one device per each 65 sq. ft. [6m2] of floor area in each span.”

### 3.6 CABLE TRAYS

#### 3.6.1 GENERAL

All cable trays shall be Legrand/Cablofil and designed to accommodate all types of cabling. Consequently any cable work that pertain to telecommunications must be designed and/or approved by IT@UC. **Note:** All cable tray systems shall be designed specifically for communications cabling installations in plenum rated environments. All telecommunications pathways (Caddy J-hooks, Legrand/Cablofil cable tray or Legrand/Wiremold raceways) shall be used for IT@UC medium (voice, data and fiber optic cabling) only.

The minimum dimensions for a cable tray shall be 12 inches wide and 4 inches deep. In certain instances, only when indicated in the design specifications and approved by IT@UC, a smaller tray may be used. The tray must consist of continuous, rigid, welded steel or stainless steel wire mesh cable management system. The cable tray systems are defined to include, but are not limited to, straight sections, supports and accessories. Wire mesh cable tray will have continuous Safe-T-Edge T-welded top side wire to protect cable insulation and installers. Basket tray shall be spliced using EDRNs on the sides as well as an SWK washer/nut in the bottom of the tray.

Contract documents shall show cross section of the communication wire way or cable tray. The drawing must show reference to other utilities in the building. All sections of the cable tray must be bonded together with approved bonding methods and devices. For installation of other types of “approved” low voltage cables in the cable tray, IT@UC
recommends a separate tray or at minimum a divider in the basket tray to prevent interference from unshielded cables.

Supports for cable trays larger than 12 inches in width are to be installed according to the Legrand/Cablofil specifications. Supports for cable trays 12 inches or less may be farther apart but must meet Cablofil/Legrand installation requirements. A single support is not acceptable. All supports are to be fastened to the building structure above. If the cable tray will be of a wall mount type, it must be installed properly to provide proper permanent support at trays maximum capacity.

Legrand/Cablofil Radius Drop outs shall be used whenever multiple cables are exiting the tray.

STI’s EZ Path’s (44, 33 or 22 series) shall be used in conjunction with the tray whenever cabling is going through a fire rated wall. STI’s Smoke & Acoustical Pathway shall be used in conjunction with the tray whenever cabling is going through a non-fire rated wall.

IT@UC will not install any cable or perform any work until all installations are made to comply with specifications.

3.6.2 MOUNTING

Cable trays must maintain a minimum of 6-inch clearance from obstructions above the tray and a minimum of 8 feet AFF. Trays are to provide access via the most direct path to all communications outlets on the floor. Install sweeping factory 90’s for all turns. Use end-of tray terminations where wire drops down to walls to prevent abrasions and cuts from metal tray edges. Use a trapeze supported cable tray mounting method suspended by manufacturer recommended size all-thread. Fasten all-thread to ceiling anchors, allowing no bends in all-thread. Support the cable tray in this manner at every section-to-section junction and at 5 feet to 6 feet intervals (mid span) between joints. Whenever possible, the tray should be no closer than 6 inches from the structural ceiling, ducts or pipes, considering all other possible obstructions. A minimum of 5 inches distance from lighting, especially fluorescent lighting, is desired.

3.7 OPEN TOP CABLE SUPPORTS AND RINGS

3.7.1 GENERAL
All open top cable supports (Caddy J-hooks) must be suspended from or attached to the structural ceiling or walls with hardware or other installation aids from Caddy specifically designed to support their weight. When used, Caddy J hooks shall be located on 48 to 60 inch centers to adequately support and distribute the cables weight. These types of supports may typically hold up to fifty 0.25-inch diameter cables. No other cables shall be run in the same j-hooks along with the voice and data cables. A separate painted (white, red, blue, green) Caddy j-hook system must be provided to facilitate the installation of other low voltage cabling.

For larger quantities of cables that convene at the Telecommunications Closet, provide Legrand/Cablofil cable trays or other special supports that are specifically designed to support the required cable weight and volume.

3.8 DRAWINGS

Refer any questions specifically not addressed in this document to IT@UC or Division of Administration and Finance Planning+Design+Construction

4. TELEVISION CABLE AND ELECTRONIC CLASSROOM OUTLETS

4.1 OVERVIEW

4.1.1 GENERAL

For detailed specifications regarding CATV television cabling, see Section 13.

Project specifications will indicate who is to be responsible for furnishing, installing and terminating the various types of communications cabling, outlets, panels and other components specified in this section. Unless otherwise noted, the project electrical contractor will be responsible. All cabling must be installed unless specifically excluded in the project specifications. Under no circumstance, will IT@UC allow CATV cabling installations in cable tray, J-hook systems or horizontal sleeves installed for UC voice and or data cabling. All CATV cabling must be installed and supported by a separate, contractor supplied system (Caddy J-hooks) All horizontal penetrations needed to facilitate these installations, shall be the responsibility of the contractor.
4.1.2 LABELING

Television cables are to be clearly identified via a painted section or by use of conduit stickers indicating each conduit run. Yellow = television.

4.1.3 CABLE

Television outlet cable shall be RG-6/U type shielded coaxial 75 ohm, Belden, part number 9116 or equivalent for non-plenum applications and Belden part number 9116P or equivalent for plenum applications.

Television riser cables in multistory buildings or buildings with first floor BCR/MCR shall be 75 ohm’s RG-6/U type quad shielded coaxial 75 ohm, Belden, part number 1189A or IT@UC approved equivalent. Obtain all cable sizes from IT@UC.

CATV outside plant cable for all tunnel and underground conduit locations shall be Comm-scope P3 500 JCASS or equivalent.

4.1.4 OUTLETS

Each CATV/video outlet may provide video capabilities and are generally terminated in a type F male connector on a standard wall plate. Customer requirements will be conveyed to IT@UC.

Each CATV outlet shall be home run to the nearest EIDF or Telecommunications Room.

4.2 VIDEO/PROJECTION DEVICES, CABLING AND OUTLETS

4.2.1 GENERAL

IT@UC Telecommunications Infrastructure Design or Media Services shall provide the specifications and cable parts for projection devices and /or monitors.

Projection devices are either ceiling or table type mounts. In each case the conduit must be connected to the front of the classroom.

4.3 ELECTRONIC CLASSROOMS
4.3.1 GENERAL

IT@UC Telecommunications Infrastructure Design or Media Services shall provide the specifications for the conduits and outlet(s) required for a room designated as an Electronic Classroom. An Electronic Classroom outlet will provide for the connection of voice, data, video, audio and control devices.

4.3.2 LABELING

Each end of all cables (UTP, coax, fiber, audio, etc.) and all pairs will be labeled with their outlet identifier at their termination locations.

4.3.3 CONDUIT / OUTLET BOXES

In general, the necessary conduit shall be provided as follows:

- Primary Electronic Classroom - three 2-inch conduits...from (8”X8”X6”) outlet box (in-floor under Lectern or Podium)...up to cable tray or J-hook system in the ceiling to provide UTP data cables for servicing video projector – wall mounted monitors, stereo speakers and alarm.
- Primary Electronic Classroom one 2-inch sleeve from cable tray or J-hook system in the classroom ceiling to penetrate a wall leading to the cable tray or J-hook system in the hallway.
- Primary Electronic Classroom analog wall telephone outlet box - one 3/4- inch conduit to cable tray or J-hook system in the ceiling to provide Cat 5e cable to local Telecommunication Room.

The location and necessity of each will be determined during final design, based on the intended function of the room. The room will always have one primary Electronic Classroom outlet.

Wall Boxes: Wiremold/Legrand Evolution Series Wall Boxes will be utilized for use in new construction and renovation construction projects. Boxes shall be compatible with complete line of Legrand/Wiremold AVIP devices, Legrand/Ortronics workstation connectivity outlets and modular inserts, and most audio/video manufacturers’ products.

1. Wall boxes provide the interface between power, communication and audio/video (A/V) cabling new construction and renovation location where power and communication and/or A/V device outlets are required. Boxes shall provide recessed device outlets that will not obstruct the wall area.
2. Wall boxes shall permit all wiring to be completed at box level.

See Section 14 for Electronic Classroom box location templates.

4.3.4 CABLE

The voice UTP cables shall each be four pair category 5e Superior Essex telephone cable.

The data UTP cables shall be four pair Superior-Essex category 6A cable.

Note Important: Any construction or renovation project activities that do not include replacing the structured cabling in the entire facility/building, will still receive a Category 6 data cabling solution instead of 6A. IT@UC will NOT mix a Category 6 Structured cabling solution in any TR with a Category 6A installation. This does not include any cabling that will be installed within the Electronic Classrooms. There will be Category 6A cables installed among these cables in all new and renovated classrooms (Refer to table in section 4.3.6).

Detailed description of these cables with manufacturer and part number can be found in Section 13.

4.3.5 INSTRUCTOR WORKSTATION/LECTERN-SWITCHES

LECTERN-SWITCHES WILL BE INSTALLED WHEN A CLASSROOM DESIGN REQUIRES MORE THAN (4) DATA CABLES/JACKS. (Consult UCIT ECSS for determination).

ANY CLASSROOM DESIGN REQUIRING (4) DATA CABLES/JACKS OR LESS...WILL ACQUIRE it's DATA CONNECTIVITY FROM THE LOCAL TELECOMMUNICATIONS ROOM SERVING THAT CLASSROOM and NO SWITCH WILL BE INSTALLED IN THE INSTRUCTOR WORKSTATION/LECTERN. (Consult UCIT ECSS for determination).

An IT@UC Managed 16-port data switch can be installed with ECSS's approval prior to installation (Cisco Catalyst - 2960L lectern switches are available in 8, 16, 24 and 48 port varieties). The model used would depend upon the amount of connections needed for the classroom. The switch is to be located within instructor workstation/Lectern or cabinet/rack location.

4 - 4 pair Superior-Essex category 6A cables will be installed in the Instructor workstation (which will technically serve as a Telecommunications Room/Space) for the data-switch uplink
Connections. The four data cables will run back to and terminate in the local (TR) Telecommunications Room or BCR that serves that classroom.

1 - 6 strand Single mode fiber optic cable will be Installed in the Instructor workstation for data-switch uplink connectivity if needed.

**Complete cable needs in this case are as follows:**

1 – Analog voice/jack - 4 pair category 5e

4 – Data/Jacks - 4 pair Superior Essex category 6A

1 – 6 strand SM fiber w/LC connectors

Various cables from Instructor workstation to equipment and devices within room. See ECSS representative for details.

**SEE TABLE BELOW FOR STANDARD ELECTRONIC CLASSROOM CABLING NEEDS.**

### 4.3.6 OUTLETS

The Primary Electronic Classroom outlet box will contain:

<table>
<thead>
<tr>
<th>#</th>
<th>TYPE</th>
<th>Qty.</th>
<th>Example</th>
<th>Purpose</th>
<th>Termination</th>
<th>Location</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Projector location: Recessed/surface mount box near projector(s) TBD.</td>
<td>IT@UC Comm Standard – Cat 6A To be terminated at Instructor workstation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Camera location:</td>
<td>IT@UC Comm Standard – Cat 6A To be terminated at Instructor workstation</td>
</tr>
<tr>
<td>Section</td>
<td>Currents</td>
<td>Use</td>
<td>Jacks</td>
<td>Notes</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>18AWG 2CDR</td>
<td>1 ea per workstation</td>
<td>West Penn 25224B 18/2 Plenum speaker cable</td>
<td>Sound Reinforcement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Recessed/surface mount box near camera– Loc. TBD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>18/4 plus ground</td>
<td>1 ea per projector(s)</td>
<td>Security</td>
<td>Public safety will terminate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Instructor workstation:</strong> Leave ~10 feet coiled and label as SPEAKER</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Ceiling location:</strong> Pull to first speaker can location TBD and label as SPEAKER.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 ea per camera</td>
<td></td>
<td><strong>Projector(s) to workstation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 ea per workstation</td>
<td></td>
<td><strong>Camera to workstation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Workstation to security closet</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>UTP CAT6A</td>
<td>4</td>
<td>Superior Essex 10Gain XP CAT6A – Plenum</td>
<td>Instructor workstation/Lectern data switch uplink Connectivity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ANSI/TIA/EIA 568-B</td>
<td><strong>Instructor workstation:</strong> surface mount inside workstation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ANSI/TIA/EIA RJ-45 USOC</td>
<td>IT@UC Comm Standard – Cat 6A To be terminated at local TR serving classroom.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>UTP Cat SE</td>
<td>1</td>
<td>Superior Essex CATSe – Plenum</td>
<td>Instructor workstation/Lectern Analog phone Wall mount</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ANSI/TIA/EIA RJ-45 USOC</td>
<td><strong>Instructor workstation:</strong> surface mount inside workstation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IT@UC Comm Standard – Cat 5e To be terminated at local TR serving classroom on 110 hardware</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Single mode fiber - 6 strands</td>
<td>1</td>
<td>Superior Essex</td>
<td>Instructor workstation/Lectern data switch uplink Connectivity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Single-mode fiber LC connectors</td>
<td><strong>Instructor workstation:</strong> surface mount inside workstation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IT@UC Comm Standard – Cat 6A To be terminated at local TR serving classroom</td>
<td></td>
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</tr>
</tbody>
</table>

**Cable and jack colors TBD**

**ELECTRONIC CLASSROOM JACK TERMINATIONS**
In addition, a Cat 5e cable, terminated on an RJ-45 USOC wall mount voice jack, will be provided at the Instructors workstation/Lectern for an analog phone (exact location TBD). All Data wiring...within the Electronic Classroom and to the local Telecommunications Room shall be Superior Essex Category 6A.

4.3.7 PATCH PANELS AND TERMINATIONS

Analog voice cable/jack - 4 pair category 5e - voice station 110 blocks

Data cable/jack - 4 pair Cat 6A - Superior Essex category 6A data patch panels

Fiber Optic Cable - 6 strand Single Mode - Superior Essex –Ortronics - fiber 6-Pk

See Section 13 for part numbers of connectors and panels.

4.3.8 TABLE BOXES; CABLE RETRACTORS, UNDER-TABLE CABLE MANAGEMENT

A. Table Boxes: InteGreat™ A/V Table Boxes from Wiremold/Legrand

1. Cover: Brushed, anodized aluminum cover in a black or aluminum finish with beveled edges and “soft-touch” handle.
   a. Cover contains a “pocket” door which fully recesses into the box when open, giving access to connections without obstructing work surface. A finishing plate hides hardware on activation surface and permits labeling of the AVIP plates.
   b. Cover flange allows for 1/4-inch [6.4mm] of forgiveness in the cut out opening.

2. Activation Surface: Adjustable downward in 1/2-inch [12.7mm] increments, from one (1) inch to four (4) inches [25mm to 102mm] to allow cover to close even when large style connectors are used.

3. Provide table boxes with a 12 foot SJT cord for easy connection to electrical infrastructure.

4. Supply tables boxes with a cable grommet kit that can accommodate up to eight (8) pull out connections. Boxes shall also be capable of accepting up to five (5) Wiremold AVIP connectors.

5. Provide table boxes with two (2) 15 amp receptacles in top compartment and one (1) 15 amp receptacle on underside of box.
B. **Cable Retractors**: InteGreat™ Series cable retractors; mounts directly to InteGreat™ Series A/V Table Box or underside of conference room table using a horizontal mounting bracket.

1. **Cable Retractors with Category 6A Cable**: Catalog No. TBCRCAT6A; loaded with 12 feet [3.66m] of Cat6 cable that extends out five (5) feet [1.52m] from retractor. Supply retractor with a female input from building infrastructure and a male connector on the output side.

2. **Cable Retractors with VGA Cable**: Catalog No. TBCRVGA; loaded with 12 feet [3.66m] of VGA cable that extends out five (5) feet [1.52m] from retractor. Supply retractor with a female input from building infrastructure and a male connector on the output side.

3. **Cable Retractors with HDMI Cable**: Catalog No. TBCRHDMI; loaded with 12 feet [3.66m] of HDMI cable that extends out five (5) feet [1.52m] from retractor. Supply retractor with a female input from building infrastructure and a male connector on the output side. Provide input side with mounting tab that allows installer to cable tie HDMI to retractor to minimize chances of loose connections.

4. **Cable Retractor Horizontal Mounting Brackets**: Catalog No. TBCRHMK; permits retractor to mount horizontally under conference room table, enabling cable access through a table grommet. Multiple retractors can be mounted to each other by attaching the mounting brackets to each other.

C. **Under Table Cable Management Kit**: InteGreat™ Series under table cable management kit provides clean cable management for power, communication and A/V cables on horizontal underside of table.

1. **Under Table Cable Management Kit**: Catalog No. UTCM5; includes five (5) feet [1.524mm] length of divided base, five (5) feet [1.524mm] length of mounting hinge rail and four (4) latching clips; black, nonmetallic construction.

4.3.9 **TRANSITION CHANNELS**
D. Transition Channels: InteGreat™ Series transition channels continue cable management and protection from underside of the table to the floor, where cables can gain access to building infrastructure. Channel fits directly into under table cable management kit on underside of table and mates with poke-thru device or over floor raceway for smooth transition to building infrastructure.

1. Transition Channels: Catalog No. MRTC; consists of aluminum center spline with steel mounting plate and four (4) screws, black aluminum side channels, black nonmetallic bottom boot and two (2) black nonmetallic transition covers.
5. PROTECTION, GROUNDING AND BONDING

5.1 LIGHTNING PROTECTION

5.1.1 GENERAL

Lightning protection of telecommunications facilities is essential. While federal and state standards must be adhered to, local conditions may require additional investigations and/or modifications to meet site, equipment, environmental or safety requirements.

NEC Articles 250 "Grounding" and 800 "Communications Circuits" cover general requirements for grounding, bonding and protecting electrical and communications circuits. NFPA 78 "Lightning Protection" addresses zone protection and other items that are beneficial.

All cabling and wiring (including grounding to building ground) within the building and entrance facilities with protection from lightning and power failure via grounding and bonding shall be required by the contract documents.

5.1.2 MATERIALS

The two most frequently used lightning protectors are listed below. Contact IT@UC for a determination of the most appropriate protection for the condition.

- Circa Protector -- “Circa”, part number 1900A1-100, and Circa 3B3S-300 “Red” modules -100 for 100 pair.
- Use Circa , part number 1880ENA1/NSC-6 for single drops of 6-pair or less. Use Circa, part number 3B1E gas protector modules.

5.2 GROUNDING

5.2.1 GENERAL

All MCR (Node room) and BCR grounding shall use a single point scheme from the building main transformer. EIA/TIA 607 requirements must be followed. Legrand/Ortronics shall be utilized for all grounding materials.

All shields shall be bonded to a common ground.
All riser cable must be shielded and properly grounded to the building ground through grounding facilities provided at the MCR or BCR. All protector blocks shall be connected to the backboard ground busbar using NEC code 6 AWG copper wire.

5.3 BONDING

5.3.1 GENERAL

Bonding is to be durable, strong and of low impedance to assure electrical continuity. EIA/TIA 607 requirements must be followed. Legrand/Ortronics shall be utilized for all bonding materials.

The cable tray or wire way shall be grounded to the main building grounding system with a wire not smaller than #6 AWG copper. All conduit stubs and sleeves shall also be grounded to the buildings grounding system.

A resistance of .001 ohm or less indicates a high-quality junction and is required per the Building Industry Consulting Services International (BICSI) Telecommunications Distribution Methods Manual.

5.4 DRAWINGS

Refer any questions specifically not addressed in this document to IT@UC or UC Planning+Design+Construction.
6. INSTRUCTION AND TESTING/COMMISIONING

6.1 INSPECTION OF WORK

6.1.1 GENERAL

IT@UC designees shall have access to construction sites.

To enable IT@UC to inspect telecommunications facilities work, the contractor must:

- Provide a progress schedule with the installation of telephone raceways and spaces shown as a separate item.

- Immediately notify IT@UC of any change in architectural drawings and/or plans affecting telecommunications.

- Provide proper access and facilities for inspections.

- Notify IT@UC when any work is ready for inspection.

- All underground work must be inspected and approved by IT@UC, UC Planning+Design+Construction and Facilities Management before the site is covered with dirt or concrete. Failure to have the work inspected shall result in uncovering the area at the contractor’ expense.

Per contract documents, the contractor shall provide a final checkout certification letter and inspection reports to IT@UC on all telecommunications work.

6.2 TESTING

6.2.1 GENERAL

The contractor shall submit to IT@UC, a detailed test procedure to be used for every project. All Voice cables shall be tested for grounds, shorts, reversals and continuity of communications conductors and shields. All Data cables shall be tested for length, attenuation, impedance, grounds, shorts, reversals and continuity of communications conductors and shields. Additional testing parameters for Category 6 and 6A cables
when applicable can be found in Section 6.3. See Section 6.4.1 and Section 10 for testing requirements for fiber optic cable.

Before completion of any project, test results shall be submitted to IT@UC for final approval and acceptance and made part of the document. The contractor shall guarantee 100 percent good pairs on all cables.

IT@UC will perform verification testing it deems necessary before accepting a job. Failure during testing will result in re-pulling cables at the contractor’s expense.

6.2.2 STATION CABLES

All category 5e station cable installed for non-data network applications shall be tested for continuity, and USOC wire mapping using a Fluke cable analyzer. Station cables that do not pass the Fluke analyzer test will be repaired or replaced by the contractor at no additional cost, and re-tested to meet the required specifications. All Superior-Essex Category 6A and Category 6 cables when applicable, shall be tested according to the manufacturer’s recommendations. IT@UC recommends using a Fluke DTX-1800 Cable Certifier for testing and certification of the Category 6 or 6A cable. Category 6 and or 6A station cables that do no pass the test will be repaired or replaced by the contractor at no additional cost and re-tested to meet the required specifications. The contractor will provide to UC documented machine-readable test results for all stations. The format will comply with IT@UC Communications Standards.

6.3 LOCAL AREA NETWORK

Category 6A and Category 6 data cables when applicable shall be tested to meet manufacturer’s specifications for the type cable installed. All tests shall be performed at the manufacturer’s specified maximum data rate of the cable and will be tested for the following:

- All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-C; marginal passes (*PASS) are not acceptable. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards, the Ortronics
Certification Program Information Manual and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

- All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards, the Ortronics Certification Program Information Manual and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

**Copper Channel Testing**

- All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance.

- Horizontal cabling shall be tested using a Level III test unit for category 6 or 6A performance compliance.

The basic tests required are:

- Wire Map
- Length
- Attenuation
- NEXT (Near end crosstalk)
- Return Loss
- ELFEXT Loss
- Propagation Delay
- Delay skew
- PSNEXT (Power sum near-end crosstalk loss)
- PSELFEXT (Power sum equal level far-end crosstalk loss)

- Continuity - Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit in accordance with the manufacturers’ recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.
• Length - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA/EIA-568-C Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.

• Category 6 Performance

Shall meet the channel requirements outlined below for a 100-meter, 4-connector channel.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Margin vs. TIA-56C.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion Loss</td>
<td>5%</td>
</tr>
<tr>
<td>NEXT</td>
<td>6 dB</td>
</tr>
<tr>
<td>PSNEXT</td>
<td>6 dB</td>
</tr>
<tr>
<td>Return Loss</td>
<td>3 dB</td>
</tr>
<tr>
<td>ACRF</td>
<td>8 dB</td>
</tr>
<tr>
<td>PSACRF</td>
<td>9 dB</td>
</tr>
<tr>
<td>ACR</td>
<td>8 dB</td>
</tr>
<tr>
<td>PSAACRF</td>
<td>9 dB</td>
</tr>
</tbody>
</table>

• Category 6A Performance

Shall meet the channel requirements outlined below for a 100-meter, 4-connector channel.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Margin vs. TIA-56C.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion Loss</td>
<td>3%</td>
</tr>
<tr>
<td>NEXT</td>
<td>4 dB</td>
</tr>
<tr>
<td>PSNEXT</td>
<td>5 dB</td>
</tr>
<tr>
<td>Return Loss</td>
<td>4 dB</td>
</tr>
<tr>
<td>ACRF</td>
<td>8 dB</td>
</tr>
<tr>
<td>PSACRF</td>
<td>8 dB</td>
</tr>
<tr>
<td>PSANEXT</td>
<td>4 dB</td>
</tr>
<tr>
<td>PSAACRF</td>
<td>10 dB</td>
</tr>
<tr>
<td>ACR</td>
<td>7 dB</td>
</tr>
</tbody>
</table>
Test results, in both hardcopy and compact disc(s), are to be provided to IT@UC prior to acceptance of the wiring.

Fiber Testing

Testing procedures shall be in accordance with the following:

- ANSI/TIA/EIA-568-B
- ANSI/TIA/EIA-568-B.1
- ANSI/TIA/EIA-526-7, Method A.1
- ANSI/TIA/EIA-526-14A, Method B
- TSB-140 Tier 1 fiber testing is required. Tier 2 Fiber Testing is recommended

Preparation

- Properly clean all connectors, adapters, and jumpers prior to testing.
- Insure that the testing jumpers are of the same fiber core diameter and connector type as the fibers to be tested.
- The power meter shall be properly calibrated prior to testing. Contractor to provide written confirmation of the calibration, with the power meter serial number, to the IT@UC or P+D+C Project Manager if requested. If this documentation is not available upon request, the Contractor shall re-test all optical fiber cables after documented calibration of the power meter is accomplished.

Test Equipment

- Optical power meter and source (Certification tester Fluke or Agilent preferred). Suitable OTDR with launch cable for Tier 2 testing. OTDR Launch Cable length recommendation is 75 meters for MMF and 300 meters for SMF systems.

Testing

- All Multimode fibers shall be tested to the requirements of ANSI/EIA/TIA-568-B, TIA-525-14A (Method A.1) and TSB-140. Optical fibers shall be tested at both 850 nm and 1300 nm wavelengths for end-to-end insertion loss and Bi-Directional (MTR to TR-1, TR-1 to MTR)
- All Single-mode fibers shall be tested to the requirements of ANSI/EIA/TIA-568-B, TIA-526-7 (or Method A.1) and TSB-140. Optical fibers shall be tested at both 1310 nm and 1550 nm wavelengths for end-to-end insertion loss and Bi-Directional (MTR to TR-1, TR-1 to MTR)
• Insure that the power meter and light source are set to the same wavelength prior to testing each fiber.
• Connect an appropriate test jumper to the light source and power meter.
• Power on both the power source and light meter, allowing them to stabilize.
• Record the reference power reading in db. If the jumper is removed from the light source for any reason, the reference power reading must be re-established.
• Insert a second appropriate jumper, using an appropriate adapter, between the first jumper and the power meter. Record the power reading in db.
• Reference TSB-140 for additional recommendations and testing guidelines.
• Provide written documentation of all test results to University of Cincinnati. Provide electronic copy of test results, in original tester format, to manufacturer when registering project for warranty on-line.

6.4 DOCUMENTATION STANDARDS

6.4.1 CONTRACTOR DOCUMENTATION REQUIREMENTS

• IT@UC will provide the identification number range to be used for the building(s). If the project schedule allows; before any wiring begins, the installing contractor shall provide to IT@UC a list of jack identification numbers used, their corresponding room numbers, patch panel termination points, and drawings that detail location within the room. Jack identification numbers at the jack locations shall also be placed on the as built drawings provided by the contractor. An updated spreadsheet detailing the above-mentioned information shall be provided by the contractor as additions or changes occur and a final copy after project completion.

• Labeling of all termination hardware and cabinets with information provided by IT@UC.

• A complete set of as-build drawings upon prior to completion of the project, both on marked up blueprints and in AutoCAD (.dwg) format or PDF format. IT@UC will specify the version/release number of AutoCAD acceptable at the time of the project award.

• OTDR test results to manufacturer’s specifications and UC standards for all fiber optic feeder cable installed. Results shall be furnished both in hard copy and on compact discs in AutoCAD (.dwg) format. The documentation must include OTDR readings, fiber route diagrams and end-to-end attenuation results for multimode and singlemode fiber
optic feeder cable. All fiber OTDR readings shall be made bi-directional on all fiber optic feeder cable.

- Fiber optic riser cable shall be tested with a light meter only. Light meter tests shall be performed to manufacturer’s specifications and UC standards. Light meter test results, including recorded lengths, shall be provided in both hard copy and in AutoCAD format on compact disc.

- Station cable tests shall be performed to manufacturer’s specifications and IT@UC standards. Test results shall be provided in both hard copy and in AutoCAD format compact disc.

- Riser cable tests shall be performed to manufacturer’s specifications and IT@UC standards. Test results shall be provided in both hard copy and in AutoCAD format compact discs.

- Trunk cable tests shall be performed to manufacturer’s specifications and IT@UC standards. Test results shall be provided in both hard copy and in AutoCAD format compact discs.

- The contracted installer must submit all pertinent documents to Ortronics to secure the University’s horizontal cabling Warranty.

6.4.2 UC PROVIDED DOCUMENTATION

- Test documentation shall be provided on disk within three weeks after the completion of the project. The disk shall be clearly marked on the outside front cover with the words “Project Test Documentation”, the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.
• The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-C including applicable TSB’s and amendments. The appropriate Level III tester shall be used to verify Category 6 and 6A cabling systems.

• Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. The telecommunications contractor must furnish this information in electronic form (CD-ROM).

• Test documentation shall also be provided to the manufacturer within three weeks after the completion of the project. Test results shall be uploaded when registering the project for warranty using the manufacturer's on-line system. Test results shall be in the tester’s original format from an approved tester listed on manufacturer’s website. All test results must show a PASS; marginal passes (*PASS) are not accepted.

• When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

6.4.3 Warranty

• UC has adopted the nCompass solution for all internal infrastructure wiring as it pertains to voice and data networking for both copper and fiber systems. All installations must be performed according to the nCompass System Warranty and Performance Application and must be installed by Ortronics CIP’s.

• The nCompass Warranty combines a limited lifetime (40 years) extended product and applications assurance warranty. Ortronics (Manufacturer) can provide the warranty directly to the end-user.

• An Extended Product Warranty shall be provided which warrants functionality of all components used in the system from the date of registration. The Extended Product Warranty shall warrant the installed horizontal and/or backbone copper, and both the horizontal and the backbone optical fiber portions of the cabling system.

• The Application Assurance Warranty shall cover the failure of the wiring system to support the applications that are designed for the link/channel specifications of ANSI/TIA/EIA–568-B.1. These applications include, but are not limited to, 10BASE-T, 100BASE-T, 1000BASE-T, and 155 Mb/s ATM.
• The contractor shall provide a warranty on the physical installation.

6.4.4 Final Acceptance & System Certification

Completion of the installation, in-progress and final inspections, receipt of the test and as-built documentation, and successful performance of the cabling system for a two week period will constitute acceptance of the system. Upon successful completion of the installation and subsequent inspection, the end user shall be provided with a numbered certificate, from Ortronics, registering the installation.

7. FIRE STOPPING

7.1 OVERVIEW

Provide fireproof seals in accordance with the National Fire Protection Association (NFPA) and the National Electric Code (NEC), Article 300-21 and EIA/TIA 569 Standards.

Fire stop all penetrations in accordance with the current edition of the National Electrical Code.

Do not use concrete for fire stopping on cable trays, wireways or conduit. Contractors who use this method will be required to replace all cables affected.

7.1.1 GENERAL

EZ Path Fire rated cable pathway devices shall be used in fire-rated construction for ALL low-voltage, video, data and voice cabling, optical fiber raceways and certain high-voltage cabling where frequent cable moves, adds and changes may occur. Pathways required for high voltage cabling will be detailed on the prints. Such devices shall:

A. Meet the hourly fire-rating of fire rated wall and or floor penetrated.

B. Be tested for the surrounding construction and cable types involved.
C. Have UL Systems permitting cable loads from; “Zero to 100% Visual Fill.” This requirement eliminates need for fill-ratio calculations to be made by cable technicians to ensure cable load is within maximum allowed by UL System.

D. Not have inner fabric liner that tightens around and compresses cables tightly together encouraging potential cable damage or interference.

E. Be “Zero-Maintenance”, zero-maintenance is defined as; No action required by cabling technician to open and/or close pathway for cable moves, adds or changes, such as, but not limited to:

1. Opening or closing of doors.

2. Spinning rings to open or close fabric liner.

3. Removal and or replacement of any material such as, but not limited to, firestop caulk, putty, pillows, bags, foam muffins, foam, foam plugs, foam blocks, or foam closures of any sort.

4. Furnish letter from manufacturer certifying compliance with this definition of “Zero-Maintenance”.

F. Pathways shall be engineered such that two or more devices may be ganged together for larger cable capacities.

G. Pathways shall be engineered to be re-enterable so they can be retrofitted and removed from around existing cables without cutting and re-splicing them.

H. Cable Pathway Devices passing vertically through floors shall have equal F & T Rating. (See UL System # F-A-3037, Item #4 “EZ-PATH Grid T-Rating Kit” Part # TRK444)

I. Affix adhesive wall label immediately adjacent to devices to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed.

Non rated cable pathway devices shall be used in non-fire-rated construction for ALL low-voltage, video, data and voice cabling, optical fiber raceways and certain high-voltage cabling where frequent cable moves, adds and changes may occur. Pathways required for high voltage cabling will be detailed on the prints. Such devices shall:

A. Limit the movement of smoke and sound of wall and or floor penetrated.

B. Restore the STC Rating of the penetrated wall.
C. Provide L Ratings of <1 CFM when empty and <2.5 CFM at all other loading up to 100 percent.

D. Accommodate cable loads from; “Zero to 100% Visual Fill.”

E. Not have inner fabric liner that tightens around and compresses cables tightly together encouraging potential cable damage or interference.

F. Be “Zero-Maintenance”, zero-maintenance is defined as; No action required by cabling technician to open and/or close pathway for cable moves, adds or changes, such as, but not limited to:
   a. Opening or closing of doors.
   b. Spinning rings to open or close fabric liner.
   c. Removal and or replacement of any material such as, but not limited to, firestop caulk, putty, pillows, bags, foam muffins, foam, foam plugs, foam blocks, or foam closures of any sort.
   d. Furnish letter from manufacturer certifying compliance with this definition of “Zero-Maintenance”.

G. Pathways shall be engineered such that two or more devices may be ganged together for larger cable capacities.

H. Pathways shall be engineered to be re-enterable so they can be retrofitted and removed from around existing cables without cutting and re-splicing them.

I. Affix adhesive wall label immediately adjacent to devices to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed.

As an alternate to using a fire-rated or non-rated cable pathway device for single low voltage cables (up to 0.27 in. (7 mm) O.D) penetrating one or two-hour, gypsum board/stud wall assemblies or non-rated assemblies, either as a through-penetration or as a membrane-penetration, a fire-rated cable grommet may be substituted. The product shall consist of a molded, two-piece, plenum-rated grommet having a foam fire and smoke sealing membrane that conforms to the outside diameter of the individual cable. The grommet product shall be capable of locking into place to secure the cable penetration within the wall assembly. The grommet shall be UL Classified and tested to the requirements of ASTM E814 (UL1479) and CAN/ULC S115.
J. Cable pathway shall replace conduit sleeves in walls and floors, and; When installed individually in floors, devices shall pass through core-drilled opening utilizing tested floor plates.

K. When multiple units are ganged in floors, devices shall be anchored by means of a tested grid.

L. When installed individually in walls, devices shall pass through core drilled opening utilizing tested wall plates or integrated flanges.

M. When multiple units are ganged in walls, devices shall be anchored by means of a tested grid.

N. Cable tray shall terminate at each barrier (wall) and resume on the other side such that cables pass independently through devices. Cable tray shall be properly supported on each side of the barrier (wall). Cable tray shall NOT pass through the barrier (wall).
8. LOCAL AREA NETWORKS

8.1 OVERVIEW

8.1.1 GENERAL

All connections must be clearly labeled at both ends.

Use a 1-inch home run conduit from the outlet to the cable tray, wireway or directly to the telecommunications room, with pull boxes every 100 feet. Another method would be to stub the conduits above the drop ceiling and provide J-hooks no more than 60 inches (5 feet) apart to the nearest section of cable tray or TR/BCR.

Note: Under no circumstances shall flex type conduit be used.

The total wire path length from the outlet to the telecommunications room, including loss due to terminations, must not exceed 295 feet (90 meters) from the TR in any case.

8.1.2 DETERMINING REQUIREMENTS

Consult IT@UC for details.

8.1.3 WIRING TYPE

See Section 14 for specifications for UTP data cable.

8.1.4 TWISTED PAIR

Use only Ortronics RJ-45 category 6A connectors.

Maximum segment length, including loss due to terminations, is 295 feet (90 meters) from the IDF.

Do not run data (Ethernet) in the same jacket with voice because of ring voltage.

Office patch cords must be minimum Legrand/Ortronics Category 6A twisted pair.

Closet patch cords must be Legrand/Ortronics Category 6A twisted pair. See Section 13.2.2 for part numbers.
Labels containing the block location shall be installed at the RJ-45 end of all Legrand/Ortronics category 6A patch cords.

See Section 3.1.1 for standard wiring on the jacks.

All jack positions must be wired.

8.1.5 WIRELESS LANs

Due to the unique nature of wireless LANs and the probable interference between access points if frequency allocations (channel assignments) are not controlled, only approved wireless LAN equipment installed and configured by the Office of Information Technologies (IT@UC) will be permitted on campus. Beginning in 2018, UC is making a change from the current standard on Wireless Access Points from Aruba to Cisco. This change will continue to support a/g/n/ac radios. This solution conforms to the IEEE 802.11 standards and is fully compliant with the WECA (Wireless Ethernet Compatibility Alliance) Wi-Fi standard. Any wireless card that is IEEE 802.11a/g/n/ac and Wi-Fi compliant may operate successfully on campus, but functionality cannot be guaranteed. At this time, IT@UC recommends client adapter cards that support WPA2-Enterprise for any new purchases.

IT@UC has implemented two tiers of security for wireless network access on campus.

- The upper tier uses Wi-Fi Protected Access 2 (WPA2) which implements mandatory elements of the IEEE 802.11i standard. Users log onto the network using their Central Login user/password credentials and their data is then encrypted using the AES encryption standard.
- A lower tier of security for devices unable to support WPA2 with AES encryption is WPA2 with pre-shared key. This access will also be restricted by MAC address.

IT@UC will be responsible for channel assignment for all campus wireless Network equipment.

See Section 13.9.1 for approved intra-building wireless LAN equipment.

Inter-building wireless network equipment will be evaluated and approved by IT@UC on a case-by-case basis.

8.1.6 WIRELESS LAN ACCESS POINT COVERAGE
IT@UC has provided 100% wireless coverage across the university. All working spaces in buildings should be adequately covered with a wireless signal. Exclusions to this are areas predominately used for mechanical and storage functions. Note that the wireless AP access should not be substituted for the hard wired data jack at the instructor location(s) in classrooms, lecture halls and auditoriums.

- Outdoor Spaces: Varies dependent on the area to be covered and obstructions such as buildings and trees. One access point with a high gain antenna will cover up to a 500 ft. radius at full speed when no obstructions are present between the access point antenna and the user.

- Mechanical Rooms: Consult the Division of Administration and Finance Planning+ Design+ Construction. Some rooms may require wireless access for energy management and security devices.

- Building Communication Rooms and Telecommunications closets: To be determined on a case by case basis.

- Other spaces not covered above will be determined on a case by case basis during the design stage of the project.

9. WIDE AREA NETWORKS

9.1 OVERVIEW

9.1.1 GENERAL

The current UCNET network consists of Cisco 9500 series distribution switches providing redundant 1 gig fiber uplinks to each closet. The closet switches provide 100 mb to the desktop and are capable of providing power-over-Ethernet for devices such as wireless access points and VOIP phones. The core of the network provides 40 GB redundant uplinks to each of the distribution switches

9.1.2 SYSTEM DESIGN

IT@UC will provide the necessary design using an estimate process. The location of service access points and a list of materials required for the installation or expansion of the network will be provided.
9.1.3 DISTANCE LIMITATIONS

The distances are covered in Section 8.

9.1.4 INSTALLATION

Local mounting practices require hubs to be mounted to a relay rack that is bolted to the floor. The top of the rack is to have a route to the feeder conduits. The preferred method is a center hung cable tray if racks are located in the middle of the room or away from the perimeter of the TR/BCR. Otherwise a wall mount version should be used extending to the tray that wraps the perimeter of the Telecommunications Closet.

9.1.5 MOUNTING

Provide a rack mounted multi-outlet power strip. Provide two duplex outlets; to be attached to the 19” equipment rack(s). It shall have a dedicated breaker feed.

9.1.6 STANDARD EQUIPMENT

See Section 13 for the UC standard router and components.

10. FIBER OPTIC TECHNOLOGY

10.1 OVERVIEW

10.1.1 GENERAL

Every effort was made to ensure that the information in this document was complete and accurate at the time of printing. However, technology is ever changing, becoming more efficient and effective and is subject to change. IT@UC shall approve all fiber optic planning, installation and specifications in advance.

All cable that is to be connected or disconnected from the campus telecommunications network; telephone, data, video, to include, Local Area Network, Wide Area Network and fiber optics, shall be done by IT@UC or its designee.

The cable shall be new, unused, and of current design and manufacture. Contact IT@UC for the type of fiber optic cable to be used.
At the request of IT@UC, the cable manufacturer shall provide installation procedures and technical support concerning the items contained in this document.

10.2 INSTALLATION

10.2.1 GENERAL

All new outside plant conduit shall include at least two Multi-Guard Multi-Cell conduits. Proper parts are to be used, consult IT@UC. Inner duct is only used on existing facilities.

All fiber optic cables shall be terminated via LC fusion splice on connectors, unless otherwise specified, and properly connected to the distribution panel utilizing a cable end kit for each cable and an end kit for each tube. There shall be a 20-foot service loop at all splice locations and fiber patch panel locations. Fiber cable metallic sheath or strength member shall be grounded to proper ground.

When installing fiber optic cable, in existing conduit, which is not Multi-Cell or does not contain flow duct, it shall be pulled in a protective inner liner, minimum 3/4 inch inside diameter. When placed in a cable tray or on a runway where there is the possibility of someone standing, walking or sitting on the cable, it shall be placed inside a protective liner. When a floor trench is utilized (Walker type or equivalent) one chamber will be used exclusively for the fiber.

All cable placed along runways, relay racks and distribution shelves shall comply with the manufacturers' minimum bend radius requirements for that particular type cable. When cable is secured by ty wrap or other fasteners they shall not be pulled so tight at any point that the cable jacket is crushed flat or indented. Cable must move back and forth for MIC cable.

Use wireways on verticals of relay racks to accommodate the fiber cable on the backside and the fiber patch cords to the front of racks. See Section 14 for part numbers.

There should be a minimum of 20 ft. slack left in a telecommunications closet, tagged and mounted in a circular configuration on fire rated plywood (3/4 inches). This is necessary in the event of a fiber break.
All fiber strands shall be terminated in accordance with the industry standard color codes.

Label all fiber cable and all fiber strands at termination locations. IT@UC will provide fiber cable nomenclature.

Test all strands using an optical time domain reflectometer (OTDR) and optical loss test sets (OLTS). Provide computer readable test results of each fiber strand to IT@UC. See Section 6 for additional testing information.

10.3 SPECIFICATIONS

10.3.1 QUALITIES

For exact specifications contact IT@UC.

All fibers in the cable must be usable fibers, meet required specifications and be terminated and tested by the installing contractor.

All optical fibers shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical and environmental requirements of this specification.

The normal fiber for outside plant or building entrance cable will be a singlemode cable. Entrance Fiber counts will be determined based on the amount of TRs required for that building. We now require a minimum of 24 strands of Singlemode fiber to each TR. TRs that vary from 24 need to be approved by IT@UC. The size and overall count of the entrance fiber must at minimum, be large enough to accommodate the fiber riser to each TR in that building. Associated counts are based on occupancy potential, and the amount of active electronics required. IT@UC must be consulted to insure adequate size and composition. Superior-Essex fiber part numbers are listed in Section 13. This fiber cable meets or exceeds the following minimum specifications:

62.5/125 micron multimode fiber (only utilized when matching up with existing 62.5 fiber)

   End-to-end attenuation
   3.0 db @ 160 MHz @ 1310 Nm per kilometer
   1.50 db @ 500 MHz @ 1300 Nm per kilometer
Superior Essex laser optimized 50/125 Multimode

3.0/1.5 db @ 850/1300 nm; minimum LED: 1500/500 MHz

Standard – only serial gigabit Ethernet distance 600/600m (850/1300nm)
  10 gig distance guarantee 300m
  10 gig distance guarantee 550m

50/125 micron multimode fiber

  End-to-end multimode attenuation

Single mode fiber
  1.0 db @ 1310 Nm per kilometer
  .75 db @1550 Nm per kilometer
11. MISCELLANEOUS AND SPECIAL SITUATIONS

11.1 HANDICAPPED ACCESS

11.1.1 GENERAL

All conduit outlets for house phones, corridor phones, courtesy phones, Area of Rescue or Emergency Help phones are to meet height and location requirements in the American with Disabilities Act for handicapped access. This standard only refers to telecommunication requirements. All other utilities are the responsibility of the department involved.

Whereas any of the aforementioned phones or associated enclosures require electrical service, the project electrical contractor shall provide such electrical service and connections.

11.2 MATERIALS

Materials will be determined on a case by case basis. The IT@UC Infrastructure Design Group must be consulted.

11.2.1 SWIMMING POOLS

PVC conduit and plastic molding are not acceptable except in caustic environments such as swimming pools. Aluminum is not acceptable in caustic environments.

When poolside telephone service is desired and there is no building near to hang attachments on, install a pedestal and run a 1-1/4 inch conduit to the location. If the conduit length is longer than 100 feet, install a pull box according to NEC.

11.2.2 HELP AND ELEVATOR TELEPHONES

GENERAL

All conduit outlets for Emergency Help phones, Area of Rescue or courtesy phones are to meet height and location requirements in the American with Disabilities Act for handicapped access. This standard only refers to telecommunication requirements. All other utilities are the responsibility of the department involved.
Where Emergency Help phones or Help phone enclosures require electrical service, the project electrical contractor shall provide such electrical service and connections.

11.2.3 HELP PHONE CABLELING AND TERMINATIONS

Voice cables for Emergency “Help Phones” will be pulled from the proposed Help Phone location to the nearest or most appropriate TR.

If the Help Phone is on the exterior/outside and is standalone (installed on a pylon), it requires an underground rated 6 pair voice grade cable, installed from the Pylon/Help Phone (with a protector block) to a suitable location inside the nearest or most appropriate building…where it can be terminated on a protector block at that end and grounded. A yellow 5e voice cable needs to be run from the location of that protector block and terminated on that end, with the other end being terminated on a 110 block in the nearest TR.

See Section 13 for list of standard equipment used in these applications.

Note the electrical requirements for outside standalone mounting of Help Phones.

11.3 BEARCAT CARD CABLELING AND CONNECTIVITY

GENERAL

11.3.1 The Bookstore has a “Bearcat Card” system, which gives the UC students the ability to swipe their ID card and charge purchasers to their Bookstore account. All associated vending machines, cash registers, pay copiers and groups of laundry machines will have a jack behind them. Wiring to any should be terminated in the building EIDF or a single equipment closet, to be determined by IT@UC.

11.3.2 BEARCAT CARD CABLELING

Note Important: Any renovation project or activities that do not include replacing the structured cabling in the entire facility/building, will still receive a Category 6 data cabling solution instead of 6A. IT@UC will NOT mix a Category 6 Structured cabling solution in any TR with a Category 6A installation.
With The recent upgrade of the UC Bearcat Card system, equipment or device cables will now be installed, terminated, tested and activated the same as a standard data jack. In some cases a static IP will be required for the device or equipment to operate. The 4pair cables used for the Bearcat Card system will be Superior Essex Cat 6a Plenum.

11.3.3 Data Cables for “Bearcat Card” will be pulled from the proposed equipment or device location to the appropriate TR.

11.4 TERMINATIONS

11.4.1 “Bearcat Card” cables will be terminated with Ortronics RJ-45 eight-conductor modular jack assemblies with the opposing end on Superior Essex Cat 6A patch panels. Wire color-coding for jacks and patch panels shall be per EIA/TIA-568B specifications.

11.5 EQUIPMENT TYPES

11.5.1 When providing “Bearcat Card” wiring for washing machines and dryers, only one Data cable per laundry or group of laundry machines is required. A single 4-pair cable installation to a 6”x6” box is required, with a ¾” conduit between it and the washer/dryer control box. The cable will be terminated in the required box with a Legrand/Ortronics Cat 6A data jack. A Cat 6A patch cable shall be connected to this jack with the other end terminating in the washer/dryer control box. This connection is the responsibility of the washer/dryer vendor.

11.5.2 When providing Bearcat Card wiring for cash registers, copiers, and vending machines there must be a jack installed for each unit.

11.5.3 Digital Signage

When providing wiring for Digital Signage the environment must be taken into consideration and the appropriate cable should be installed…e.g. fiber optic or indoor or outdoor rated data cable.

See Section 13 for list of standard materials used in these applications.
12. CODES, STANDARDS AND REGULATIONS

12.1 OVERVIEW

12.1.1 GENERAL

To design facilities for an effective telecommunications system, the designer and installer must be familiar with national and local regulations. Both the designer and the contractor must be familiar with and adhere to the standards of the telecommunications and building industries.

EXTREMELY IMPORTANT:

All structured cabling and supportive backbone cabling for any University of Cincinnati Construction or renovation project MUST be installed by one of the Structured Cabling Vendors awarded to UC’s Term Contract at that time. Vendor installation companies must be a Legrand/Ortronics certified installer at the CIP level. The CIP certification allows the company to offer the nCompass limited lifetime warranty for both copper and fiber optics from Legrand/Ortronics and Superior Essex. This is a mandatory requirement in order for the University to obtain the enhanced performance & application warranty on the installation. NO exceptions will be permitted on this requirement and the contractor shall supply a copy of COMPANY’S certification before any project is awarded.

The following link will direct prospective contractors to the program details and certification process.

http://www.legrand.us/certification

12.1.2 AGENCIES

The following agencies and their codes, standards and regulations shall govern all telecommunications work performed at the University of Cincinnati.

- ANSI American National Standards Institute
- BICSI Building Industry Consulting Service International
- Building Officials and Code BOCA Administrators (Standard Building Code)
- EIA Electronic Industries Association
- FCC Federal Communications Commission
13. CABLING AND NETWORK STANDARD EQUIPMENT

Note: 1. All voice and data cable installations associated with new construction, or renovation projects that include the entire building must be Legrand/Ortronics authorized nCompass Category 6A Cabling installations. These projects will deploy a VoIP phone solution and will need a minimum amount of voice grade (5e) cabling.

2. For other or partial building renovation projects, we will continue to install Superior-Essex/Legrand Ortronics Cat 6 data cabling with Category 6 patch panels. Because in 2018 the University is migrating to a VoIP solution for voice service across campus, a minimum amount of 5e voice grade cabling will be required going forward.

3. Those buildings that currently have a Belden (mediatwist)/TE Connectivity install base will receive Superior-Essex/Legrand Ortronics Category 6 add-ons.

13.1 VOICE

13.1.1 VOICE CABLE

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13.2 DATA

13.2.1 DATA CABLE

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<td>Superior-Essex Green Plenum 10 Gain XP</td>
<td>Superior-Essex</td>
<td>6H-272-5B</td>
</tr>
</tbody>
</table>

13.2.2 DATA WIRING EQUIPMENT

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MANUFACTURER</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cat 6 Data Jack Green</td>
<td>Ortronics</td>
<td>OR-TJ600-45</td>
</tr>
<tr>
<td>Cat 6A Data Jack Orange</td>
<td>Ortronics</td>
<td>OR-TJ6A-43</td>
</tr>
<tr>
<td>Cat 6A A/V Data Jack Yellow</td>
<td>Ortronics</td>
<td>OR-TJ6A-44</td>
</tr>
<tr>
<td>Wall Jack Face Plate 4 Position</td>
<td>Ortronics</td>
<td>OR-40300546</td>
</tr>
<tr>
<td>Face Plate Blank Filler</td>
<td>Ortronics</td>
<td>OR-42100002</td>
</tr>
<tr>
<td>Category 6 – 24 patch panel w/wire manager</td>
<td>Ortronics</td>
<td>OR-PHD66U24</td>
</tr>
<tr>
<td>Category 6A-24 port patch panel w/wire manager</td>
<td>Ortronics</td>
<td>OR-PHD6AU24</td>
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13.2.3 PATCH CORDS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MANUFACTURER</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legacy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4ft Cat 6 Clarity Blue Patch cord</td>
<td>Ortronics</td>
<td>OR-MC604-06</td>
</tr>
<tr>
<td>7ft Cat 6 Clarity Blue Patch cord</td>
<td>Ortronics</td>
<td>OR-MC607-06</td>
</tr>
<tr>
<td>10ft Cat 6 Clarity Blue Patch cord</td>
<td>Ortronics</td>
<td>OR-MC610-06</td>
</tr>
<tr>
<td>15ft Cat 6 Clarity Blue Patch cord</td>
<td>Ortronics</td>
<td>OR-MC615-06</td>
</tr>
<tr>
<td>Data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4ft Cat 6A Clarity Orange Patch cord</td>
<td>Ortronics</td>
<td>OR-MC6A04-03</td>
</tr>
<tr>
<td>Description</td>
<td>Manufacturer</td>
<td>Part Number</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>7ft Cat 6A Clarity Orange Patch cord</td>
<td>Ortronics</td>
<td>OR-MC6A07-03</td>
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<tr>
<td>10ft Cat 6A Clarity Orange Patch cord</td>
<td>Ortronics</td>
<td>OR-MC6A10-03</td>
</tr>
<tr>
<td>15ft Cat 6A Clarity Orange Patch cord</td>
<td>Ortronics</td>
<td>OR-MC6A15-03</td>
</tr>
<tr>
<td><strong>Security Camera</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4ft Cat 6A Clarity Red Patch cord</td>
<td>Ortronics</td>
<td>OR-MC6A04-02</td>
</tr>
<tr>
<td>7ft Cat 6A Clarity Red Patch cord</td>
<td>Ortronics</td>
<td>OR-MC6A07-02</td>
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<tr>
<td>10ft Cat 6A Clarity Red Patch cord</td>
<td>Ortronics</td>
<td>OR-MC6A10-02</td>
</tr>
<tr>
<td>15ft Cat 6A Clarity Red Patch cord</td>
<td>Ortronics</td>
<td>OR-MC6A15-02</td>
</tr>
<tr>
<td><strong>Wireless Access Point</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4ft Cat 6A Clarity White Patch cord</td>
<td>Ortronics</td>
<td>OR-MC6A04-09</td>
</tr>
<tr>
<td>7ft Cat 6A Clarity White Patch cord</td>
<td>Ortronics</td>
<td>OR-MC6A07-09</td>
</tr>
<tr>
<td>10ft Cat 6A Clarity White Patch cord</td>
<td>Ortronics</td>
<td>OR-MC6A10-09</td>
</tr>
<tr>
<td>15ft Cat 6A Clarity White Patch cord</td>
<td>Ortronics</td>
<td>OR-MC6A15-09</td>
</tr>
<tr>
<td><strong>A/V Applications</strong></td>
<td></td>
<td></td>
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<tr>
<td>4ft Cat 6A Clarity Yellow Patch cord</td>
<td>Ortronics</td>
<td>OR-MC6A04-04</td>
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<tr>
<td>7ft Cat 6A Clarity Yellow Patch cord</td>
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<td>OR-MC6A07-04</td>
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<tr>
<td>10ft Cat 6A Clarity Yellow Patch cord</td>
<td>Ortronics</td>
<td>OR-MC6A10-04</td>
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<tr>
<td>15ft Cat 6A Clarity Yellow Patch cord</td>
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<td>OR-MC6A15-04</td>
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<tr>
<td><strong>UPS</strong></td>
<td></td>
<td></td>
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<tr>
<td>10 ft Cat 6A Clarity Green Patch Cord</td>
<td>Ortronics</td>
<td>OR-MC6A10-05</td>
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</tbody>
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### 13.3 FIBER OPTIC

#### 13.3.1 FIBER OPTIC CABLE

<table>
<thead>
<tr>
<th>Item</th>
<th>Manufacturer</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 strand SM armored fiber</td>
<td>Superior-Essex</td>
<td>L4012K401</td>
</tr>
<tr>
<td>12 strand MM armored fiber OM3</td>
<td>Superior-Essex</td>
<td>L4012N401</td>
</tr>
<tr>
<td>24 strand SM armored fiber</td>
<td>Superior-Essex</td>
<td>L4024KK1Q</td>
</tr>
<tr>
<td>24 strand MM armored fiber OM3</td>
<td>Superior-Essex</td>
<td>L4024NK1Q</td>
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#### 13.3.2 FIBER OPTIC WIRING EQUIPMENT
<table>
<thead>
<tr>
<th>Description</th>
<th>Manufacturer</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC Duplex Clip Pk of 20</td>
<td>Ortronics</td>
<td>OR-20500333</td>
</tr>
<tr>
<td>Conn. Panel 6 ST for MM</td>
<td>Ortronics</td>
<td>OR-OFP-STS06NB</td>
</tr>
<tr>
<td>Conn. Panel 6 ST for SM</td>
<td>Ortronics</td>
<td>OR-OFP-STS06NC</td>
</tr>
<tr>
<td>Conn. Panel 3 Duplex SC for MM</td>
<td>Ortronics</td>
<td>OR-OFP-SCD06LC</td>
</tr>
<tr>
<td>Conn. Panel 3 Duplex SC for SM</td>
<td>Ortronics</td>
<td>OR-OFP-SCD06AC</td>
</tr>
<tr>
<td>Closet Connector Housing (3 panel Capacity)</td>
<td>Ortronics</td>
<td>OR-FC01U-C</td>
</tr>
<tr>
<td>Closet Connector Housing (4 panel Capacity)</td>
<td>Ortronics</td>
<td>OR-FC02U-C</td>
</tr>
<tr>
<td>Closet Connector Housing (12 panel Capacity)</td>
<td>Ortronics</td>
<td>OR-FC04-U-C</td>
</tr>
<tr>
<td>LC LOMF 50/125 Splice on Connector</td>
<td>Ortronics</td>
<td>OR-205KNF9GA-50T</td>
</tr>
<tr>
<td>LC 62.5 MM ceramic (mechanical)</td>
<td>Ortronics</td>
<td>OR-205KAS9GA-62</td>
</tr>
<tr>
<td>LC SM UPC Splice on Connector</td>
<td>Ortronics</td>
<td>OR-205KNF9SA-09</td>
</tr>
<tr>
<td>SC LOMF 50/125 Splice on Connector</td>
<td>Ortronics</td>
<td>OR-205KNF9FA-50T</td>
</tr>
<tr>
<td>SC 62.5 MM ceramic (mechanical)</td>
<td>Ortronics</td>
<td>OR-205KAS9FA-62</td>
</tr>
<tr>
<td>SC SM UPC Splice on Connector</td>
<td>Ortronics</td>
<td>OR-205KNF9RA-09</td>
</tr>
<tr>
<td>ST 50um Splice on Connector</td>
<td>Ortronics</td>
<td>OR-205KNF9EA-50T</td>
</tr>
<tr>
<td>ST 62.5 MM Splice on Connector</td>
<td>Ortronics</td>
<td>OR-205KNF9EA-62</td>
</tr>
<tr>
<td>ST SM Splice on Connector</td>
<td>Ortronics</td>
<td>OR-205KNF9QA-09</td>
</tr>
</tbody>
</table>
## FIBER OPTIC WIRING JUMPERS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MANUFACTURER</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>62.5um ST-ST 3 meter</td>
<td>Ortronics</td>
<td>OR-P1DA2BREZEZ003M</td>
</tr>
<tr>
<td>62.5um ST-ST 7 meter</td>
<td>Ortronics</td>
<td>OR-P1DA2BREZEZ007M</td>
</tr>
<tr>
<td>62.5um ST-SC 3 meter</td>
<td>Ortronics</td>
<td>OR-P1DA2BREZFZ003M</td>
</tr>
<tr>
<td>62.5um ST-SC 7 meter</td>
<td>Ortronics</td>
<td>OR-P1DA2BREZFZ007M</td>
</tr>
<tr>
<td>62.5um ST-LC 3 meter</td>
<td>Ortronics</td>
<td>OR-P1DA2BREZGZ003M</td>
</tr>
<tr>
<td>62.5um ST-LC 7 meter</td>
<td>Ortronics</td>
<td>OR-P1DA2BREZGZ007M</td>
</tr>
<tr>
<td>62.5um SC-SC 3 meter</td>
<td>Ortronics</td>
<td>OR-P1DA2BREZGZ003M</td>
</tr>
<tr>
<td>62.5um SC-SC 7 meter</td>
<td>Ortronics</td>
<td>OR-P1DA2BREZGZ007M</td>
</tr>
<tr>
<td>62.5um SC-LC 3 meter</td>
<td>Ortronics</td>
<td>OR-P1DA2BREZGZ003M</td>
</tr>
<tr>
<td>62.5um SC-LC 7 meter</td>
<td>Ortronics</td>
<td>OR-P1DA2BREZGZ007M</td>
</tr>
<tr>
<td>8.3 ST-ST 3 meter</td>
<td>Ortronics</td>
<td>OR-P1DC2IRQZQZ003M</td>
</tr>
<tr>
<td>8.3 ST-ST 7 meter</td>
<td>Ortronics</td>
<td>OR-P1DC2IRQZQZ007M</td>
</tr>
<tr>
<td>8.3 ST-SC 3 meter</td>
<td>Ortronics</td>
<td>OR-P1DC2IRQZRZ003M</td>
</tr>
<tr>
<td>8.3 ST-SC 7 meter</td>
<td>Ortronics</td>
<td>OR-P1DC2IRQZRZ007M</td>
</tr>
<tr>
<td>8.3 ST-LC 3 meter</td>
<td>Ortronics</td>
<td>OR-P1DC2IRQSZS003M</td>
</tr>
<tr>
<td>8.3 ST-LC 7 meter</td>
<td>Ortronics</td>
<td>OR-P1DC2IRQSZS007M</td>
</tr>
<tr>
<td>8.3 SC-SC 3 meter</td>
<td>Ortronics</td>
<td>OR-P1DC2IRZRSZ003M</td>
</tr>
<tr>
<td>8.3 SC-SC 7 meter</td>
<td>Ortronics</td>
<td>OR-P1DC2IRZRSZ007M</td>
</tr>
<tr>
<td>8.3 SC-LC 3 meter</td>
<td>Ortronics</td>
<td>OR-P1DC2IRZSZS003M</td>
</tr>
<tr>
<td>8.3 SC-LC 7 meter</td>
<td>Ortronics</td>
<td>OR-P1DC2IRZSZS007M</td>
</tr>
<tr>
<td>50um ST-ST 3 meter</td>
<td>Ortronics</td>
<td>OR-P1DF2LREZEZ0003M</td>
</tr>
<tr>
<td>50um ST-ST 7 meter</td>
<td>Ortronics</td>
<td>OR-P1DF2LREZEZ0007M</td>
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<tr>
<td>50um ST-SC 3 meter</td>
<td>Ortronics</td>
<td>OR-P1DF2LREZFZ003M</td>
</tr>
<tr>
<td>50um ST-SC 7 meter</td>
<td>Ortronics</td>
<td>OR-P1DF2LREZFZ007M</td>
</tr>
<tr>
<td>50um ST-LC 3 meter</td>
<td>Ortronics</td>
<td>OR-P1DF2LREZGZ003M</td>
</tr>
<tr>
<td>50um ST-LC 7 meter</td>
<td>Ortronics</td>
<td>OR-P1DF2LREZGZ007M</td>
</tr>
<tr>
<td>50um SC-SC 3 meter</td>
<td>Ortronics</td>
<td>OR-P1DF2LRZRSZ003M</td>
</tr>
<tr>
<td>50um SC-SC 7 meter</td>
<td>Ortronics</td>
<td>OR-P1DF2LRZRSZ007M</td>
</tr>
<tr>
<td>50um SC-LC 3 meter</td>
<td>Ortronics</td>
<td>OR-P1DF2LRZSZS003M</td>
</tr>
<tr>
<td>50um SC-LC 7 meter</td>
<td>Ortronics</td>
<td>OR-P1DF2LRZSZS007M</td>
</tr>
<tr>
<td>50um LC-LC 3 meter</td>
<td>Ortronics</td>
<td>OR-P1DF2LRGZGZ003M</td>
</tr>
</tbody>
</table>
50um LC-LC 7 meter | Ortronics | OR-P1DF2LRGZGZ007M

13.4 RACKS

13.4.1 RACK AND ASSOCIATED EQUIPMENT

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MANUFACTURER</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>7’X19” MM20 Equipment Rack</td>
<td>Ortronics</td>
<td>OR-MM20716-B</td>
</tr>
<tr>
<td>Double Vertical Cabling Section</td>
<td>Ortronics</td>
<td>OR-MM20VMD712-B</td>
</tr>
<tr>
<td>Wire Management Panel (1U)</td>
<td>Ortronics</td>
<td>OR-60400131</td>
</tr>
<tr>
<td>Wire Management Panel (2U)</td>
<td>Ortronics</td>
<td>OR-60400057</td>
</tr>
<tr>
<td>Wire Management Panel (4U)</td>
<td>Ortronics</td>
<td>OR-MM6HMF4RU</td>
</tr>
<tr>
<td>Power strip</td>
<td>Tripp Lite</td>
<td>PDUMH20</td>
</tr>
</tbody>
</table>

13.5 ELECTRONIC CLASSROOMS

13.5.1 ELECTRONIC CLASSROOM COMPONENTS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MANUFACTURER</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double Gang Surface Mount Box</td>
<td>Ortronics</td>
<td>OR-404J2 (holds 2 jacks) OR-404J4 (holds 4 jacks)</td>
</tr>
<tr>
<td>Voice Jack (Gray)</td>
<td>Ortronics</td>
<td>OR-63700005-68</td>
</tr>
<tr>
<td>Cat 6 Data Jack (Green)</td>
<td>Ortronics</td>
<td>OR-TJ600-45</td>
</tr>
<tr>
<td>Cat 6A Data Jack (Orange)</td>
<td>Ortronics</td>
<td>OR-TJ6A-43</td>
</tr>
<tr>
<td>F Wall Jack Insert (2 req.)</td>
<td>Ortronics</td>
<td>OR-63700006</td>
</tr>
<tr>
<td>Blank Filler</td>
<td>Ortronics</td>
<td>OR-42100002</td>
</tr>
<tr>
<td>Fog White Voice Buttons (100/pkg)</td>
<td>Ortronics</td>
<td>OR-40309100</td>
</tr>
<tr>
<td>Green Data Buttons (100/pkg.)</td>
<td>Ortronics</td>
<td>OR-40325200</td>
</tr>
<tr>
<td>Video Station Cable RG-6/U</td>
<td>Belden</td>
<td>9116 (non-plenum)</td>
</tr>
<tr>
<td></td>
<td>Belden</td>
<td>9116P (plenum)</td>
</tr>
</tbody>
</table>

13.6 HELP AND ELEVATOR TELEPHONES

13.6.1 HELP AND ELEVATOR TELEPHONE EQUIPMENT
<table>
<thead>
<tr>
<th>ITEM</th>
<th>MANUFACTURER</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside Standalone Mounting Pole</td>
<td>Code Blue</td>
<td>Code Blue I (Custom)</td>
</tr>
<tr>
<td>Help Phone*</td>
<td>Gia-Tronics</td>
<td>Gai-Tronics (Custom)</td>
</tr>
<tr>
<td>Elevator Phone*</td>
<td>Ram Tech</td>
<td>R1C-E (Custom)</td>
</tr>
</tbody>
</table>

* Both phones have optional 2” Palm Button
13.7 Bearcat Card

13.7.1 Bearcat Card Wiring Equipment

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MANUFACTURER</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cat 6A Data Jack Orange</td>
<td>Ortronics</td>
<td>OR-TJ6A-43</td>
</tr>
<tr>
<td>Cat 6 Data Jack Green</td>
<td>Ortronics</td>
<td>OR-TJ600-45</td>
</tr>
</tbody>
</table>

13.8 CONDUIT

13.8.1 CONDUIT - MULTI-CELL

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MANUFACTURER</th>
<th>PART NUMBER</th>
</tr>
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<tbody>
<tr>
<td>PVC Multi-Guard Multi-Cell</td>
<td>Carlon</td>
<td>MXSS4S-020</td>
</tr>
<tr>
<td>PVC M-G M Fixed Bends</td>
<td>Carlon</td>
<td>MX_FN4S</td>
</tr>
<tr>
<td>PVC M-G M Flex Bends</td>
<td>Carlon</td>
<td>MXF_4</td>
</tr>
<tr>
<td>Accessories</td>
<td>Carlon</td>
<td>Per Mfg. Specs.</td>
</tr>
<tr>
<td>EMT Multi-Guard Multi-Cell</td>
<td>Carlon</td>
<td>MESS4S-010</td>
</tr>
<tr>
<td>EMT M-G M Fixed Bends</td>
<td>Carlon</td>
<td>ME_FN4S</td>
</tr>
<tr>
<td>EMT M-G M-C Terminators</td>
<td>Carlon</td>
<td>MET14</td>
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13.9 Network

13.9.1 WIRELESS LAN EQUIPMENT

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MANUFACTURER</th>
<th>PART NUMBER*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access Point</td>
<td>Cisco</td>
<td>As Determined</td>
</tr>
<tr>
<td>Antennas</td>
<td>As Determined</td>
<td>As Determined**</td>
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</table>

*Access Points may vary in part number depending on deployment scenario or as vendor releases newer hardware.

** External antennas will vary based on deployment scenario
### 13.9.2 WIRELESS PATCH CORDS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MANUFACTURER</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>4ft Cat 6 White Patch cord</td>
<td>Ortronics</td>
<td>OR-MC604-09</td>
</tr>
<tr>
<td>7ft Cat 6 White Patch cord</td>
<td>Ortronics</td>
<td>OR-MC607-09</td>
</tr>
<tr>
<td>10ft Cat 6 White Patch cord</td>
<td>Ortronics</td>
<td>OR-MC610-09</td>
</tr>
<tr>
<td>15ft Cat 6 White Patch cord</td>
<td>Ortronics</td>
<td>OR-MC615-09</td>
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</table>

### 13.10. CATV

#### 13.10.1 CATV Cable

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MANUFACTURER</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>RG-6/U Drop Cable non-plenum</td>
<td>Belden</td>
<td>9116</td>
</tr>
<tr>
<td>RG-6/U Drop Cable plenum</td>
<td>Belden</td>
<td>9116P</td>
</tr>
<tr>
<td>RG-6/U Riser Cable</td>
<td>Belden</td>
<td>1189A</td>
</tr>
<tr>
<td>Outside plant cable</td>
<td>Commscope</td>
<td>P3 500 JCASS</td>
</tr>
</tbody>
</table>

### 13.10.2 CATV WIRING EQUIPMENT

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MANUFACTURER</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>F Wall Jack Insert</td>
<td>Ortronics</td>
<td>OR-63700006</td>
</tr>
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</table>

### 13.11 Poke Through, Floor Box, Wall Box, Table Box EQUIPMENT

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MANUFACTURER</th>
<th>PART NUMBER or Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evolution Floor Box</td>
<td>Wiremold / Legrand</td>
<td>EFB Series</td>
</tr>
<tr>
<td>Evolution Poke Throughs 6&quot;</td>
<td>Wiremold / Legrand</td>
<td>6AT Series</td>
</tr>
<tr>
<td>Evolution Poke Throughs 8&quot;</td>
<td>Wiremold / Legrand</td>
<td>8AT Series</td>
</tr>
</tbody>
</table>
### 13.12 Pathway Products (fabric innerduct)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MANUFACTURER</th>
<th>PART NUMBER / Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard 4” 3 Cell fabric innerduct</td>
<td>Maxcell</td>
<td>MXC4003 series</td>
</tr>
<tr>
<td>Plenum 4” 3 Cell fabric innerduct</td>
<td>Maxcell</td>
<td>MXP4003 series</td>
</tr>
<tr>
<td>Riser 4” 3 Cell fabric innerduct</td>
<td>Maxcell</td>
<td>MXR4003 series</td>
</tr>
<tr>
<td>Detectable 4” 3 Cell fabric innerduct</td>
<td>Maxcell</td>
<td>MXD4003 series</td>
</tr>
<tr>
<td>Standard 3” 3 Cell fabric innerduct</td>
<td>Maxcell</td>
<td>MXC3456 series</td>
</tr>
<tr>
<td>Plenum 3” 3 Cell fabric innerduct</td>
<td>Maxcell</td>
<td>MXP3456 series</td>
</tr>
<tr>
<td>Riser 3” 3 Cell fabric innerduct</td>
<td>Maxcell</td>
<td>MXR3456 series</td>
</tr>
<tr>
<td>Detectable 3” 3 Cell fabric innerduct</td>
<td>Maxcell</td>
<td>MXD3456 series</td>
</tr>
</tbody>
</table>

### 13.13 Pathway Products (EZ Path Firestop)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MANUFACTURER</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>2” Firestop Device</td>
<td>STI</td>
<td>EZD22</td>
</tr>
<tr>
<td>3” Firestop Device</td>
<td>STI</td>
<td>EZD33FWS</td>
</tr>
<tr>
<td>3” Firestop Device Kit (for 4” conduit)</td>
<td>STI</td>
<td>EZDP133CWK</td>
</tr>
<tr>
<td>3” Firestop Device Kit (square mount)</td>
<td>STI</td>
<td>EZDP33FWS</td>
</tr>
<tr>
<td>3” Ganging Accessory (Qty 4) 3” EZ Paths</td>
<td>STI</td>
<td>EZP433W</td>
</tr>
<tr>
<td>6” Firestop Device</td>
<td>STI</td>
<td>EZD44S</td>
</tr>
<tr>
<td>6” Firestop Device Kit (square or round mount)</td>
<td>STI</td>
<td>EZDP44S</td>
</tr>
<tr>
<td>Ganging Accessory (Qty1-5) 6” EZ Paths</td>
<td>STI</td>
<td>EZP544W</td>
</tr>
<tr>
<td>Grid for riser applications</td>
<td>STI</td>
<td>EZGxxxxx</td>
</tr>
</tbody>
</table>
14. LOCATION TEMPLATES

ELECTRONIC CLASSROOM OUTLET BOX LOCATIONS
Door swings/opens outward instead of inward.
TYPICAL RACK LAYOUT

2 Racks

Rack A

Rack B

OR-60400157, STANDARD HORIZONTAL MANAGER

OR-PH6624, CATEGORY 6A, 24 PORT FLAT PATCH PANEL

NOTE, REPEAT: MANAGER, 24 PORT PATCH PANEL, MANAGER

OR-FC04U-C FIBER CABINET

NOTE, REPEAT: MANAGER, SWITCH, MANAGER

SINGLE GANG WORKBOX

DUPEX 110-20 amp INSTALLED ON BACK WALL, EQUIPMENT SIDE

Tripp Lite PDU2MH20
SUZQ0RTKCD2U

OR-MM20VM0712-B
MM20716-B RACK A

OR-MM20VM0712-B
MM20716-B RACK B

OR-MM20VM0712-B

TYPICAL RACK LAYOUT

3 Racks

Rack A  Rack B  Rack C

OR-M20VMD712-B  MM20716-B  OR-M20VMD712-B
OR-M20VMD712-B  MM20716-B  MM20716-B
OR-M20VMD712-B  MM20716-B  OR-M20VMD712-B

SU2200TXL1CDU

SINGLE GANG WORKBOX
DUPLUX 130-20 amp
INSTALLED ON BACK WALL, EQUIPMENT SIDE

Tripp Lite FOUR7HD
Tripp Lite FOUR7HD
Tripp Lite SU2200TXL1CDU
Tripp Lite SU2200TXL1CDU

ON-FC464 C FIBER CABINET

DR-6000LJC, STANDARD HORIZONTAL MANAGER

DR-PHA2AU24, CATEGORY 6A, 24 PORT FLAT PATCH PANEL

NOTE RACK A & C
REPEAT: MANAGER,
24 PORT PATCH PANEL,
MANAGER

DR-Pha2au24, Category 6a, 24 Port Flat Patch Panel
Note Rack A & C
Repeat: Manager,
24 Port Patch Panel,
Manager
15. GENERAL INFORMATION

15.1 INTRODUCTION

The University of Cincinnati offers students a balance of educational excellence and real-world experience. UC is a public research university with an enrollment of more than 44,000 students and has been named "Among the top tier of the Best National Universities," according to U.S. News & World Report.

15.2 CHARGE

UC Information Technologies (IT@UC) is responsible for planning, developing, managing and maintaining an effective, efficient and economical communications network system for the University community. IT@UC approves and coordinates all voice, data and video communications systems policies. With the convergence of voice, data and video technologies, IT@UC is committed to providing students, faculty and staff a seamless communications services network.

Communications systems are a tool for improving facilitating the education process and improving employee productivity reducing operating costs. In its role as a system integrator of networks, IT@UC supports the UC's academic mission and role as a thought leader among urban, public research universities.

15.3 FUTURE

The University of Cincinnati will continue to grow. IT@UC will continue to support the ever-increasing demands for more advanced technological capability and greater access to information databases, video conferencing, online learning, high-speed data networks, digital messaging, voice processing, and other communications requirements of the University.

IT@UC will continue to maintain a sophisticated and comprehensive communications infrastructure through which the University community can share access to enterprise technology resources, and therefore minimize expensive and unnecessary duplication. IT@UC will develop and expand network systems to enhance and facilitate the growth of the infrastructure by providing leadership and coordination for the planning, development, acquisition and utilization of new technologies.

15.4 CONTACTS

A list of University contacts and telephone numbers is provided for your convenience.
UC INFORMATION TECHNOLOGIES (IT@UC)
CIO of Information Technologies  
Nelson Vincent, EdD

UC INFORMATION TECHNOLOGIES
Enterprise Shared Services  
Paul Foster (Interim)
Assistant Vice President
Phone: 513-556-2264
FAX: 513-556-2010

UC INFORMATION TECHNOLOGIES
Enterprise Shared Services - Infrastructure Design  
Bennie J. Lovette RCDD
Associate Director – IT Infrastructure Design Consultant
Phone: 513-556-2076
FAX: 513-556-2010

UC INFORMATION TECHNOLOGIES
Enterprise Shared Services - Infrastructure Design  
Blake Stahl RCDD
IT Infrastructure Design Consultant
Phone: 513-556-1638
FAX: 513-556-2010

UC DEPARTMENTS of PLANNING+DESIGN+CONSTRUCTION,
REAL ESTATE and COMMUNITY DEVELOPMENT
University Hall, 6th Floor
PO Box 210186
Cincinnati, OH 45221-0186

University Architect: 513-556-1933
Director of Planning: 513-556-5200
Director of Real Estate: 513-556-2861
Director of Community Development: 513-556-5948
Director of Project Management: 513-556-8999
Director of Renovations: 513-556-5200

UC FACILITIES MANAGEMENT
UNIVERSITY HALL
CINCINNATI, OH  45219-0080
Maintenance West Campus: 513-556-1493
Maintenance East Campus: 513-558-2500
Utilities and Technical Support: 513-556-4828
MAPS

Detailed maps and floor plans for the University can be obtained from the UC Department of Planning+Design+Construction. Refer any questions specifically not addressed in this document to The Office of Information Technologies (IT@UC).