



UNIVERSITY OF CINCINNATI

OFFICE OF INFORMATION TECHNOLOGIES

COMMUNICATIONS STANDARDS

REVISION DATE: February 3, 2010

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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 (UCit). UC Public Safety is responsible for the campus Fire Alarm System.

1.2 CABLE

1.2.1 GENERAL

Prior approval and coordination with UCit, Construction Management, Facilities Management, and other concerned parties is 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 UCit 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.

There shall be no cable with voltages higher than 48 volts in communications duct banks.

All 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 UCit. Construction Management 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 UCit 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 UCit and the Division of the University Architect. Information shall be obtained from UCit 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 UCit and will be communicated to 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 UCit, the Division of the University Architect, 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 UCit, Construction Management 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 6 conduits.

- Two four-inch, Type C, 4-Cell Multi-Guard Multi-Cell PVC Raceway, or equivalent
- Four 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 6 or more conduits normally required for the size and type of the building.

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 the division of the University Architect.

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.

The Division of the University Architect 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 the Division of the University Architect.

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.

Rigid steel conduits installed underground shall be field-wrapped with 0.01 inch thick pipe-wrapping plastic tape applied with a 50 percent overlap, or shall have a factory applied plastic resin, epoxy or two coats of a field applied coal tar specifically made for this purpose. If the coal tar coating method is used, the contractor shall notify UCit prior to backfilling for inspection and approval of the coating before the conduit is covered.

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 Construction Management, 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.

1.4 MANHOLES

1.4.1 GENERAL

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 UCit and the Division of the University Architect.

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. UCit or the Division of the University Architect shall assign the manhole number.

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

1.4.2 INTERIOR

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 Design Guidelines and Standards. Refer any questions specifically not addressed in this document to UCit.

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. There is normally only one MCR per group of buildings. This room serves as the node room and houses PBX and/or backbone 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 Intermediate Cross-Connect or Intermediate Distribution Frame (IDF). There is normally only one IC per building. This room may serve, as a Telecommunications Room (TR). See Section 14 for a typical room layout.
- The Telecommunications Room (**TR**), sometimes called the Telecommunications Closet (TC), 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). See Section 14 for a typical room layout.

- 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.

The minimum size for a Main Cross-Connect Room (MCR) is 400 square feet. The preferable dimensions are 20'X20'. The minimum size for a Building Communication Room (BCR) is 100 square feet with 10x10 as the preferable dimensions. These rooms will be shared with computers, telephone equipment and data network equipment and racks. UCit shall be contacted for final footage approval.

The preferable minimum size for a Telecommunications Room (TR) is 100 square feet and the preferable dimensions for this room are 10'X10'. In no case shall this room be less than 48 square feet, with the minimum dimension of any side being 6 feet. This room may be shared with computers, telephone equipment and data network equipment and racks. UCit shall be contacted for final dimension approval.

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.

An approved FM200 type fire extinguisher must be provided just outside the door of each room. The extinguisher is to be enclosed in a flush mounted extinguisher cabinet with appropriate signage.

All work shall comply with the National Electrical Code, Ohio Building Codes, the UCit Communications Standards and the University of Cincinnati's 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 work that pertains to telecommunications must be designed and/or approved by UCit. 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 UCit. 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.

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 Construction Management with each job upon acceptance. UCit and various other UC departments will use these drawings.

2.2 REQUIREMENTS

2.2.1 GENERAL

All telecommunications room doors are to be keyed alike using BEST brand cylinders. Locks shall be spring lock (self-locking) and UCit will supply the key number and sign authorization for key cards.

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 an emergency power supply.

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.	

2.2.2 ENVIRONMENT

All telecommunications rooms 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. UCit 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. 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 FC 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 other telecommunications requirements. One outlet must be installed at a height of 7 feet AFF. Outlets must be flush when cut through plywood. Obtain outlet locations during the building design stage.

Each double duplex outlet shall be connected to a dedicated circuit breaker. Each dedicated electrical circuit shall be 20-amp, 110V, 60 HZ type. All circuits must be tied to an emergency generator when available.

30-amp circuits (NEMA-L6-30) may be required in order to support the UPS systems required for new technology such as VOIP.

All breaker panels are to be labeled and identified to avoid being turned off in error. Breakers servicing the telecommunication room shall be equipped with locking devices to prevent turn off. A minimum of two 20-amp circuits is to feed each room.

In order to support new technology, the electrical requirements will need to be reviewed on a project to project basis.

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 bolthole 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 UCit. 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. UCit 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 in conduit simultaneously with the pull-in of cable.

All station run communication cables shall be copper, 24 AWG minimum, ADC/Krone category 5e for voice, and ADC/Krone Category 6 data cable.

2.3.2 VOICE RISER CABLE

Voice riser cable shall be category 3, 24 AWG. All riser cable shall be run through and held in place with D-Rings or UCit approved equipment in telecommunications rooms and on backboards. Block placement and management backboards, will be specified by UCit. The contractor shall install designation labeling strips with cable counts and jack ID.

2.3.3 FIBER OPTIC RISER

Fiber optic riser cable shall be a composite cable consisting of a minimum of 12 strands multimode fiber and 12 strands single mode fiber. Termination in the BCR and TR shall be on standard Corning fiber patch panels utilizing SC type connectors. See Section 13 for fiber cable and patch panel specifications. Fiber riser shall be installed in riser-rated innerduct (3/4" I.D. min). 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 Ortronics 110D-900W or 110D-1800W wall modules as appropriate.

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 data terminations, mount three 7' x 19" racks in the indicated positions. 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. Leave a 6-U space from the top of rack before installing wire-management and patch panels except when the rack contains a fiber distribution box. Lay out the patch panels starting with one 1-U wire-management devices then a 24 port patch panel, followed by a 1-U wire - management device. Continue by adding wire-management, patch panel, wire-management until needs are satisfied, or rack fills. Data Rack is considered to be at its maximum capacity at 9 patch panels and 19 wire managers. 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. If quantities from each floor exceed 168 data cables, (this figure includes a 50% growth factor) each floor will require a separate rack. 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. Data jacks from each floor will be grouped, and terminated in sections. Each section of patch panels shall have a label to reflect the originating floor. Additional patch panels shall be added in each section to allow for a minimum of 50% growth. *This rule does not apply to Student residential installations since they are wired to their maximum potential.* They must be pre-labeled with the appropriate patch panel ID numbers. Note the 50% growth factor is a generic average. Growth factors for these situations are determined on a case-by-case basis. UCit must be consulted for a final determination.

Sections will be ordered with the top most floor at the top of the rack and the bottom most floor at the bottom of the rack.

Additional racks may be required to satisfy this layout. If so, the top most floor will be located on the patch panel(s) at the top of the rack(s).

A 20 amp electrical outlet is required at the bottom of each rack.

30-amp circuits (NEMA-L6-30) may be required in order to support the UPS systems required for new technology such as VOIP.

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. UCit must be consulted before rack installation begins.

2.6.1 PUNCH DOWN

Fasten the Ortronics 110D-900W or 110D-1800W modules as appropriate to the plywood-wiring surface with #10 x 3/4 inch screws. Attach Siemens 110DW2-300 legless 110 punch down blocks to the Ortronics module. Route all cables to be punched down to these blocks through the Ortronics 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 Siemens, part number 110DW2-300, white 300 pair legless 110 blocks. Locate the punch blocks on the Homaco 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 5 wiring.
- DATA 4-Pair. Use ADC/Krone, part number 6653-1-676-24 - 24 port, category 6 patch panels. Mounting and installation of patch panels should begin in the left most rack unless otherwise directed by UCit. 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 ADC/Krone patch panels. Minimum bend radius must meet the cable manufacturers' specifications for Category 6 wiring.

2.6.2 WIRING AND CABLING STANDARDS

See Section 13 for a complete list of UCit standard wire, wiring components, racks, part numbers etc. This is the equipment required for all installations. Exceptions or substitutions must be approved by UCit.

3. VOICE AND DATA OUTLETS--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 high band block 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 UCit. During the programming stage, UCit 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 UCit for final approval of alternate devices.

All voice outlets shall terminate in RJ-45 eight-conductor modular jack assemblies. The voice outlet shall be the topmost outlet in the wall plate. Wire color-coding shall be per USOC RJ-61 specifications.

All data outlets shall terminate in ADC/Krone 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 OneCard data outlets shall terminate in ADC/Krone RJ-45 eight-conductor modular jack assemblies. The OneCard outlet(s) shall be installed and located in a wall plate separate from voice and data outlet(s). Wire color-coding shall be per EIA/TIA-568B

specifications. The opposing end shall be terminated on Siemens 110 blocks located in the EIDF if provided, consult with UCit for location otherwise. All pairs shall be terminated on both ends. The total wire path length from the OneCard data outlet to the BCR termination block is not as critical as standard data cabling requirements.

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 is data (green). 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.

UCit will provide the identification number range to be used for the building(s). Before any wiring begins, the installing contractor shall provide to UCit 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.

Following is a description of how the jack identification numbers are formed. UCit will identify each building with a four-character alpha building code that will be assigned. For example:

Medical Sciences Building	MSBB
Medical Sciences Service	MSBS
Campus Services Building	CSBD
Dyer Hall	DYEH
McMicken Hall	MCMH
Stetson Square	STET
Procter Hall	PROH

These building codes will prefix the following Jack Identifier Labels. For example, "MSBB-00G24-0023". However, this four-character building prefix will not be attached to the faceplates at each Communication Outlet.

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, ADC/Krone category 6 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.

UCit 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 Voice Outlet 00G24-A0023**

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

00G24-AXXXX (Alpha numeric 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.

XXXXX-A0023 (Digits 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 Data Outlet** **00124-B2048**

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

00124-BXXXX (Alpha numeric 1, 2, 3, 4, 5). Identifies room number "124" as the TR feeding this UTP Data Outlet on the floor B.

XXXXX-B2048 (Digits 8, 9, 10, 11). Identifies this Outlet as a UTP Data Outlet since it is an even number. The position on the ADC/Krone patch panel is counted sequentially with even numbers from left to right and top to bottom.

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

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

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

XXXXX-E3036 (Digits 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-BXXXX (Alpha numeric 1,2,3,4,5). Identifies room number "124" as the TR feeding this UTP data outlet on the floor B.

XXXXX-B2050 (Digits 8, 9, 10, 11). Identifies this Outlet as a UTP Data Outlet since it is an even number. The position on the ADC/Krone Highband block 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-AXXXX(Alpha numeric 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.

XXXXX-A0025(Digits 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.

Payphone and 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** **Payphone Outlet** **00G24-A0015**

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

00G24-AXXXX(Alpha numeric 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.

XXXXX-A0015(Digits 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.

Communications jacks for One-Card services are labeled differently. They are always located separate from voice and data cabling and are generally terminated in an EIDF,

- **EXAMPLE 7** **One-Card Outlet** **00G24-OC068**

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

00G24-OCXXX (Alpha numeric 1,2,3,4,5). Identifies room number "G24" as the TR feeding this UTP One-Card outlet. The floor where the outlet is located is not symbolized in this scheme.

XXXXX-OC068 (Digits 7, 8,) Identifies this Outlet as a One-Card Outlet by the letters "OC".

XXXXX-OC068 (Digits 9, 10, 11,) Represent the numerical identifier for the One Card Outlet. This number will range from 001 to 999 only. UCit will assign these numbers once all of the projects One-Card outlets have been identified. The position on the 110 block is counted sequentially with (odd and even) numbers from left to right and top to bottom.

Code Blue & 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 Code Blue or Area of Rescue Outlet 0G24-A0075**

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

00G24-AXXXX(Alpha numeric 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.

XXXXX-A0075(Digits 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 cable and wiring listed in Section 13 are required for use at UC because of their durability, reliability, performance and warrantee among certified brands. Alternates or equivalents are not acceptable.

Note: Level 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 four communication outlets depending on room and student occupancy size and one voice only jack near the entrance door for wall phone mounting.

Number of Outlets	Student Occupancy	CATV Outlets	Ceiling Data Outlets for Wireless
1	1 - 15	1	1
2	15 - 50	2	2
4	50 - Over	4	3

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.

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.
- Patient Care Rooms: One communication outlet per occupant.
- 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 UCit 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 UCit. Standard mounting height of communication outlets:

Desk	18 inches, AFF. (Single gang plaster ring)
Wall	60 inches, AFF. (Single gang plaster ring only)
Handicapped wall mount	48 inches, AFF. (Single gang plaster ring only)
Electronic Classroom	See Section 4

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.

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 wire mold 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 290-degree bends are allowed in a run between junction boxes or pull boxes.

No 90¼ condulets (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. UCit 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 four 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).

All conduits in slab shall be a minimum of 1 inch. All exceptions shall be determined during the design stage of the project and shall be subject to the approval of UCit and the Division of the University Architect.

All sleeves must protrude 4 inches AFF and below and be capped at both ends. Coordinate with UCit 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 conduiting 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.

3.5.3 FLOOR MOUNTED ASSEMBLIES

All Floor Mounted Assemblies including poke throughs, 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.

3.6 CABLE TRAYS

3.6.1 GENERAL

All cable trays shall be designed to accommodate all types of cabling. Consequently any cable work that pertains to telecommunications must be designed and/or approved by UCit. Note that installation shall be in non-return air plenum space only. All telecommunications pathways (J-hooks, cable tray or raceways) shall be used for UCit 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, a 6-inch wide by 3-inch deep tray may be used.

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, UCit recommends "Mono-Systems"- Dual rail Aluminum cable tray, catalog number B22230324, which has three sections allowing other cables to run in the same tray and still prevent interference from unshielded cables.

Supports for cable trays larger than 12 inches in width are to be installed according to the manufacturers' specifications. Supports for cable trays 12 inches or less may be farther apart but must meet the manufacturers' 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.

UCit 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 center spline 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 (J-supports) and cable rings must be suspended from or attached to the structural ceiling or walls with hardware or other installation aids specifically designed to support their weight. When used, J-supports or cable rings 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 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 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 UCit or the Division of the University Architect.

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 UCit 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 (J-hooks, Bridle rings, D-rings, etc.). 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 UCit approved equivalent. Obtain all cable sizes from UCit.

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 UCit.

Each CATV outlet shall be home run to the nearest Telecommunications Closet.

4.2 VIDEO/PROJECTION DEVICES, CABLING AND OUTLETS

4.2.1 GENERAL

UCit Network and Telecommunications Operations 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

UCit Network and Telecommunications Operations or Media Services shall provide the specifications for the conduiting 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 outlet box (12"X16"X10") in front of room to hall cable tray - two 1-inch conduits.
- Primary Electronic Classroom outlet to ceiling mounted box (6"X6"X4") servicing video projector - one 2-inch conduit.
- Primary Electronic Classroom outlet to under the floor box (8"X8"X6") servicing the lectern/podium location - one 2-inch conduit.
- Primary Electronic Classroom outlet to ceiling for servicing stereo speakers and/or wall mounted monitor - one 2-inch conduit.

- Primary Electronic Classroom wall telephone outlet box to hall cable tray - one 3/4- inch conduit.
- Audio Outlet Boxes for Speakers - 3/4- inch each to ceiling

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.

See Section 14 for Electronic Classroom box location templates.

4.3.4 CABLE

The voice UTP cables shall each be four pair category 5e ADC/Krone telephone cable.

The data UTP cables shall be four pair "ADC/Krone" category 6 cable.

The video cables will be RG-6/U type.

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

4.3.5 OUTLETS

The Primary Electronic Classroom outlet box will contain a double-gang faceplate with an RJ-45 USOC jack for voice, three (3) RJ-45 EIA/TIA-568B jacks for data, two (2) F connectors for video and two (2) blank fillers for future jack requirements. The jacks will be wired to the TC or BCR serving as a TC using a variety of cable. See Section 13 for cable and outlet part numbers.

#	Type	Qty.	Example	Purpose	Termination	Cover Plate Location	Comments
1.	RF Coax - CATV type	2 ea.	RG-6U Belden 9116 non-plenum Belden 9116P Plenum	Media distribution For cable TV	F connectors	4 (2A module)	
2.	Unshielded Twisted Pair Category 5e	1 - 4 Pr.	ADC/Krone Cat 5e	ITE telephone, STE, Fax, modem	1 RJ-45	1 (ITE RJ-45) (2A module)	Terminate per UCit Comm Standards
3.	Unshielded Twisted Pair Cat 6	3 x 4 Ea.	ADC/Krone Cat 6	10/100 BASET ATM, AX Link Alarm	2 RJ-45	3 (data RJ-45) 6 (data RJ-45)	Terminate per UCit Comm Standard
4.	Various			In-room data projector:	Blank		Future

#	Type	Qty.	Example	Purpose	Termination	Cover Plate Location	Comments
				RGBS, video; audio to PA; Other.	Cover plates		
5.	Blank Location				Blank filler	2, 5	Unused wall Plate location

ELECTRONIC CLASSROOM JACK TERMINATIONS

In addition, an RJ-45 wall mount phone jack will be provided in the wall telephone location, which is usually in close proximity to the primary outlet box. Data wiring shall be ADC/Krone Category 6 to the Telecommunications Closet.

4.3.6 PATCH PANELS AND TERMINATIONS

The Electronic Classroom cables shall be terminated in the (TR) Telecommunications Room or BCR, which serves as a Telecommunications Room as follows:

Voice 4 pair category 5e - voice station 110 blocks

Data 4 pair ADC/Krone category 6 data patch panels

Second Data 4 pair ADC/Krone category 6 data patch panels

RG-6/U - type F female connectors, coiled and wire tied

If a wall phone is installed at the wall phone plate, it may share the same PBX port as the front wall voice jack, via cross connect in the TR.

See Section 13 for part numbers of connectors and panels.

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 three most frequently used lightning protectors are listed below. Contact UCit for a determination of the most appropriate protection for the condition.

- Circa Protector -- "Circa", part number 1900A1-100, and Circa C3b3S-BAL "Red" modules -100 for 100 pair.
- Use SC-Carrier, part number 110ANA1-06 for single drops of 6-pair or less. Use SC-Carrier or Circa, part number 3B1E-W 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.

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.

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 UCit or the Division of the University Architect.

6. INSPECTION AND TESTING/COMMISSIONING

6.1 INSPECTION OF WORK

6.1.1 GENERAL

UCit designees shall have access to construction sites.

To enable UCit 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 UCit of any change in architectural drawings and/or plans affecting telecommunications.
- Provide proper access and facilities for inspections.
- Notify UCit when any work is ready for inspection.
- All underground work must be inspected and approved by UCit, Construction Management 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's expense.

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

6.2 TESTING

6.2.1 GENERAL

The contractor shall submit to UCit, 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 cables can be found in Section 6.3. See Section 6.4.1 and Section 10 for testing requirements for fiber optic cable.

Upon completion, test results shall be submitted to UCit for final approval and acceptance and made part of the document. The contractor shall guarantee 100 percent good pairs on all cables.

UCit 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 voice applications shall be tested for continuity, and USOC wiremapping 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 ADC/Krone category 6 cable shall be tested according to the manufacturer's recommendations. UCit recommends using a Fluke DSP-4300 Cable Certifier for testing and certification of the Category 6 cable. Category 6 station cables, that do not 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 UCit Communications Standards.

6.3 LOCAL AREA NETWORK

Category 5e and Category 6 data cables 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:

<u>parameters:</u>	<u>ADC/Krone</u>	<u>Category 6</u>	<u>additional</u>
<ul style="list-style-type: none">• Continuity• Length• Return Loss• Resistance• Crosstalk			<ul style="list-style-type: none">• Channel Impedance• Link Impedance• PSNEXT• PSELFEXT• PSACR• Delay Skew• Insertion Loss Deviation• Differential Impedance

Test results, in both hardcopy and compact disc(s), are to be provided to UCit prior to acceptance of the wiring.

6.4 DOCUMENTATION STANDARDS

6.4.1 CONTRACTOR DOCUMENTATION REQUIREMENTS

- UCit will provide the identification number range to be used for the building(s). Before any wiring begins, the installing contractor shall provide to UCit 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 UCit.
- A complete set of as-built drawings upon completion of the project, both on marked up blueprints and in AutoCAD (.dwg) format. UCit 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 UCit 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 UCit 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 UCit 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 UCit 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 ADC/Krone to secure the University's TrueNet horizontal cabling Warranty and the Corning NPI, fiber optic Warranty.

6.4.2 UC PROVIDED DOCUMENTATION

- Contract drawings for the project.
- Labeling information for termination equipment.

7. FIRE STOPPING

7.1 OVERVIEW

7.1.1 GENERAL

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.

Use "EZ-Path fire rated pathways for all horizontal penetrations through fire rated walls where 4-inch sleeves are typically applied. Each 3"x3" x 10.5 sleeve provides a greater cable loading capacity than the conventional 4-inch sleeve of EMT. They never require fire-stop maintenance whether empty or full. They can also be filled to 100% installation capacity, instead of the 40% allowed with conduit sleeves. Applies to "1" or "2" hour rated wall constructions. See section 13 for parts information.

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 UCit for details.

8.1.3 WIRING TYPE

See Section 14 for specifications for UTP data cable.

8.1.4 TWISTED PAIR

Use only ADC/Krone RJ-45 category 6 connectors.

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

Maximum number of trunk segments is 1024.

Maximum number of repeaters is four (5 segments with 3 tapped).

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

Office patch cords must be minimum ADC/Krone Category 6 (C6T) twisted pair.

Closet patch cords must be ADC/Krone Highband. See Section 13.2.2 for part numbers.

Labels containing the block location shall be installed at the RJ-45 end of all ADC/Krone category 6 patch cords. Optionally, these labels may be color-coded. If color-coding is used, use the following:

10MB shared Ethernet	White
100MB shared Ethernet	Yellow
10/100MB switched Ethernet	Purple
25MB ATM	Green
OC-3 ATM	Blue
Management cables between electronics	Orange

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 (UCit) will be permitted on campus. UCit has standardized on Aruba Access Points supporting g/a/N radios. This solution conforms to the IEEE 802.11ag standards and is fully compliant with the WECA (Wireless Ethernet Compatibility Alliance) Wi-Fi standard. Any wireless card that is IEEE 802.11n and Wi-Fi compliant may operate successfully on campus, but functionality cannot be guaranteed. At this time, UCit recommends client adapter cards that support WPA2-Enterprise for any new purchases.

UCit 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 legacy wireless clients that are unable to support WPA2 security is authentication of the wireless user via RADIUS, and encryption using a 128-bit WEP key. Users will need to have the MAC address of their wireless card registered. This registration will be approved on a case by case basis since WEP security will be phased out in the near future.

UCit will be responsible for channel assignment for all campus wireless Ethernet equipment. Unless otherwise specifically permitted by UCit, only wireless channels 1, 6 and 11 will be used on campus.

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

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

8.1.6 WIRELESS LAN ACCESS POINT COVERAGE

The following are the initial starting points for the recommended number of access points to provide wireless LAN coverage, if desired, in the various types of spaces on campus. Spaces not explicitly covered below will require a site survey or blueprint review during the design stage of the project to determine the recommended access point quantities and locations. **The quantities stated below are initial guideline numbers only.** For example, after a site survey, it may be determined that a single access point may provide the desired coverage for light use in 3 or 4 adjacent classrooms.

Please note that the University's wireless network does not replace the wired network, it complements it. If you are running a computer from a fixed location, that is for example, a computer lab, a residence hall room, or office locations, then we recommend use of a traditional hard wired Ethernet connection. This is primarily due to performance implications associated with 802.11 wireless LANs. While the g card is marketed as a 54Mbps card, you should generally expect to get an actual maximum network throughput in the 20-25 Mbps range. Similar throughput reductions can be expected with any 802.11 wireless device. Because a wireless access point is a shared half-duplex resource, as more users in an area are connected to the same access point, the throughput of each connection may decrease.

- Faculty/ Administrative Offices: NONE
- Clerical/Staff Offices: NONE
- Secretary/ Administrative Assistants Offices: NONE
- Conference Rooms: One
- Laboratories/Graduate Student Offices: NONE
- Classrooms/Lecture Halls/Auditoriums: See chart below for number of access points

Student Occupancy	Heavy Use	Medium Use	Light Use
Up to 25	1	1	1
26 - 50	2	1	1
51 - 75	3	2	1

For spaces with occupancies greater than 75, use one access point per 25 seats for heavy use, use one access point per 50 seats for medium use and use one access point per 75 seats for light use.

Definitions:

Heavy - up to 25 students all accessing the network concurrently, for example, using the network along with the instructor to access web pages, low to medium quality streaming video, large file transfers, CAD drawing retrieval, etc.

Medium - all 26-50 students are using the network, but not in a coordinated fashion, for example all working on a project independently as part of the classroom instruction.

Light - all 51-75 students using the network on a more or less casual basis and concurrency of use is random and more or less minimal. Also in this category is highly concurrent use of low bandwidth applications such as email.

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.

- Residence Hall Rooms: NONE
- Residence Hall and Other Student Lounges, Public Study Areas, Dining Areas and other common spaces: One per 75 seats.
- Library Study Areas: One per area, accommodating up to 50 users. For areas with a seating capacity greater than 50, one access point per 50 seats.
- Hotel Rooms: NONE
- 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.

- Storage Areas: NONE
- Janitor Closets: NONE
- Mechanical Rooms: Consult the Division of the University Architect. 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 6500 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 4 GB redundant uplinks to each of the distribution switches.

9.1.2 SYSTEM DESIGN

UCit 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 ladder rack above 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. UCit 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, telecable, and fiber optics, shall be done by UCit or its designee.

The cable shall be new, unused, and of current design and manufacture. Contact UCit for the type of fiber optic cable to be used.

At the request of UCit, 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 UCit. Innerduct are only used on existing facilities.

All fiber optic cables shall be terminated via duplex SC 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 tywrap 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. UCit will provide fiber cable nomenclature.

Test all strands using an optical time domain reflectometer (OTDR) and optical loss test sets (OLTS). Fiber cable runs less than 100 meters in length shall be tested with an approved light meter. Provide computer readable test results of each fiber strand to UCit. See Section 6 for additional testing information.

10.3 SPECIFICATIONS

10.3.1 QUALITIES

For exact specifications contact UCit.

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 is a composite multimode/singlemode cable. Associated counts are based on occupancy potential, and the amount of active electronics required. UCit must be consulted to insure adequate

size and composition. Corning gigabit fiber part numbers are listed in Section 13. This fiber cable meets or exceeds the following minimum specifications:

62.5/125 micron multimode fiber

End-to-end attenuation

3.0 db @ 160 MHz @ 1310 Nm per kilometer

1.50 db @ 500 MHz @ 1300 Nm per kilometer

Corning laser optimized 50/125 Multimode (Pretium 300)

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

Standard - only serial gigabit ethernet distance 600/600m (850/1300nm)

Pretium 300 - 10gig distance guarantee 300m

Pretium 550 - 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 and pay 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.

11.1.2 PUBLIC PAY PHONES

TT, Text Telephones (formally TDD), must be accessible to handicapped individuals.

The height of the coin slot shall be 48 inches for all installations.

If a total number of four or more public pay telephones (including both interior and exterior phones) are provided at a site, and at least one is in an interior location, then at least one interior public text telephone shall be provided.

Where pay phones or pay phone enclosures require electrical service, the project electrical contractor shall provide such electrical service and connections.

11.2 MATERIALS

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 pullbox according to NEC.

11.2.2 HELP AND ELEVATOR TELEPHONES

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

Note the electrical requirements for outside standalone mounting Help Phones.

11.3 ONECARD CABLING AND CONNECTIVITY

GENERAL

11.3.1 The Bookstore has a “OneCard” system, which gives the UC students the ability to swipe their ID card and charge purchases to their Book store 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 UCit.

11.3.2 ONECARD CABLING

OneCard wires will be routed away from all other wires in the closet, terminated on its own 110 block, and mounted on the backboard away from all other 110 blocks. The 4pair cables used for the OneCard system will be ADC/Krone (PVC) Part # TN- 5ETR-VT-02. They are to be purple in color to distinguish them from all other cables and simplify trouble shooting. A shelf will be mounted on the back board for the terminal server. The terminal server will be provided by the UC Book Store.

11.3.3 The cables will be pulled from the jack or proposed equipment location to the building BCR. Maximum cable lengths for OneCard are not as critical as industry data cabling requirements.

11.4 TERMINATIONS

11.4.1 OneCard cables will be terminated with ADC/Krone RJ-45 eight-conductor modular jack assemblies (purple in color), with the opposing end on Siemens 110 blocks.

11.4.2 After terminating all (two or more) cables on the designated 110 blocks, they will be looped together on the 110 block with a single 4 pair cross-connect and then connected to a terminal server.

11.5 EQUIPMENT TYPES

11.5.1 When providing OneCard 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 is required to a 6”x6” box with a ¾” conduit between it, and the washer/dryer control box. The cable will be terminated in the required box with an ADC/Krone cat 5 data jack. A 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 OneCard wiring for cash registers, copiers, and vending machines there will be a jack installed for each unit.

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:

The installing contractor(s) must be Corning NPI Certified and a ADC/Krone authorized TrueNet^a Cabling System Certifier for all voice and data outlets inside plant station wiring, all fiber optic cabling associated with new construction, and for renovations that include the entire building. This is a mandatory requirement in order for the University to obtain the TruNet^a enhanced performance warranty on the installation. NO exceptions will be permitted on this requirement.

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
Telecommunications Distribution Methods Manual - 2000 Edition
Building Officials and Code BOCA Administrators (Standard Building Code)
EIA Electronic Industries Association
FCC Federal Communications Commission
International Conference of ICBO Building Officials (Uniform Building Code)
IEEE Institute of Electrical and Electronic Engineers, Inc.
NBC National Building Code
NFPA National Fire Protection Association
NEC National Electrical Code
OBBC Ohio Basic Building Code
TIA Telecommunications Industry Association
UL Underwriters Laboratories
The UCit Communications Standards Manual

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 ADC/Krone authorized TrueNet^a Cabling installations.
 2. For other renovation projects, we will install at minimum, an ADC/Krone 5e voice and data installation with 5e patch panels. Those buildings that currently have a Belden (mediatwist)/ADC/Krone install base will receive ADC/Krone Category 6 additions.

13.1 VOICE

13.1.1 VOICE CABLE

ITEM	MANUFACTURER	PART NUMBER
ADC/Krone C5eT Yellow PVC	ADC/Krone	TN5ETR-YLRB
ADC/Krone C5eT Yellow Plenum	ADC/Krone	TN5ESP-YLR2
ADC/Krone C5eT Green PVC	ADC/Krone	TN5ETR-GNRB
ADC/Krone C5eT Green Plenum	ADC/Krone	TN5ESP-GRR2
25 pr. ARMM Riser w/shielding	ESSEX	02-097-03 or equivalent Level 3
50 pr. ARMM Riser w/shielding	ESSEX	02-100-03 or equivalent Level 3
100 pr. ARMM Riser w/shielding	ESSEX	02-104-03 or equivalent Level 3
200 pr. ARMM Riser w/shielding	ESSEX	02-108-03 or equivalent Level 3
300 pr. ARMM Riser w/shielding	ESSEX	02-110-03 or equivalent Level 3
400 pr. ARMM Riser w/shielding	ESSEX	02-112-03 or equivalent Level 3

For an acceptable horizontal data cabling alternative, contact UCit Network & Telecommunication Services.

13.1.2 VOICE WIRING EQUIPMENT

ITEM	MANUFACTURER	PART NUMBER
100 pr. 110 Block w/Legs	Systimax/Commscope	110AW2-100
300 pr. 110 Block w/Legs	Systimax/Commscope	110AW2-300
300 pr. 110 Block w/o Legs	Systimax/Commscope	110DW2-300
110 Block Wall Module	Ortronics	110D-900W
4 pr. Clips	Systimax/Commscope	110C-4
5 pr. Clips	Systimax/Commscope	110C-5
Wall Jack Face Plate 2 Position	ADC/Krone	6644-1-152-02
Wall Jack Face Plate 4 Position	ADC/Krone	6644-1-154-02
Wall Jack Face Plate 6 Position	ADC/Krone	6644-1-156-02 (3 position no long used)
Face Plate Blank Filler	ADC/Krone	SFBI10
Voice Jack	ADC/Krone	6467-1-098-00
Wire Management for IDF	Systimax/Commscope	188B2
25 Pair Protector	Systimax/Commscope	489BCCI-25
50 Pair Protector	Systimax/Commscope	489BCCI-50
100 Pair Protector Circa	Circa	1900A1-100
Solid State Protector Module for 189B1	Systimax/Commscope	3B1E-W
RELTEC Protection Block	Emerson	R66P25QCVS
Gas state Protector 5 Pin Red with Heat Coil	Systemax/Commscope	4B3EW
Protector Module 5 Pin Red Solid state with Heat Coil	Systemax/Commscope	4C3S-75
Protector module 5 Pin Red Solid state w/o Heat coil	Systemax/Commscope	3C3S
Protector Module 5 Pin Red Solid state with Heat Coil	Systemax/Commscope	4C3S
6 Pair Protector	Avaya	110ANA1-06

13.2 DATA

13.2.1 DATA CABLE

ITEM	MANUFACTURER	PART NUMBER
ADC/Krone Blue Plenum C6T	ADC/Krone	TN6SP-BLRB
ADC/Krone Grey PVC C6T	ADC/Krone	TN6TR-GYRB

13.2.2 DATA WIRING EQUIPMENT

ITEM	MANUFACTURER	PART NUMBER
Data Jack	ADC/Krone	6830-1-830-07
Wall Jack Face Plate 2 Position	ADC/Krone	6644-1-152-02
Wall Jack Face Plate 4 Position	ADC/Krone	6644-1-154-02
Wall Jack Face Plate 6 Position	ADC/Krone	6644-1-156-02
Face Plate Blank Filler	ADC/Krone	6644-1-160-02
24 port Category 6 patch panel w/wire manager	ADC/Krone	6653-1-677-24UC*

* must include UC in part number - this is a special panel made exclusively for UC - includes plastic wire manager

13.2.3 PATCH CORDS

ITEM	MANUFACTURER	PART NUMBER
4ft Cat 6 Truenet Blue Patch cord	ADC/Krone	6645-2-781-04
7ft Cat 6 Truenet Blue Patch cord	ADC/Krone	6645-2-781-07
10ft Cat 6 Truenet Blue Patch cord	ADC/Krone	6645-2-781-10
15ft Cat 6 Truenet Blue Patch cord	ADC/Krone	6645-2-781-15
Highband 7ft Cat 6 Blue Patch cord	ADC/Krone	TP6TB-BL07
Highband 10ft Cat 6 Blue Patch cord	ADC/Krone	TP6TB-BL15

13.3 FIBER OPTIC

13.3.1 FIBER OPTIC CABLE

ITEM	MANUFACTURER	PART NUMBER
24 mm/48 sm Composite Under-ground GIG Composite Fiber Cable	Corning	072XW4-141XXA20-GIGA (specify composition)
12mm/12sm Composite Indoor Composite Fiber Cable	Corning	024XS4-AW175A20

13.3.2 FIBER OPTIC WIRING EQUIPMENT

ITEM	MANUFACTURER	PART NUMBER
SC Duplex Clip	Corning	95-400-01-BP
Colored Icon, Red for MM	Corning	ICN-RDC-024
Colored Icon, White for SM	Corning	ICN-WTC-024
Conn. Panel 6 ST for MM	Corning	CCH-CP06-15T
Conn. Panel 6 ST for SM	Corning	CCH-CP06-19T
Conn. Panel 3 Duplex SC for MM	Corning	CCH-CP06-91
Conn. Panel 3 Duplex SC for SM	Corning	CCH-CP06-59
Conn. Panel 3 Duplex SC for MM 50um Laser Optimized	Corning	CCH-CP06-E7
Closet Connector Housing 0-36	Corning	CCH-03U
Closet Connector Housing 37-72	Corning	CCH-04U
Unicam LC 50um LOMMF ceramic	Corning	95-050-99-X
Unicam LC 62.5 MM ceramic	Corning	95-000-99
Unicam LC SM ceramic UPC polish	Corning	95-200-99
Unicam SC 50um LOMMF ceramic	Corning	95-000-41-X
Unicam SC 62.5 MM ceramic	Corning	95-0041
Unicam SC SM SPC polish ceramic	Corning	95-200-41
Unicam SM UPC polish ceramic	Corning	95-200-42
Unicam ST 50um LOMMF ceramic	Corning	95-050-51-X
Unicam ST 62.5 MM ceramic	Corning	95-000-51
Unicam ST SM SPC polish ceramic	Corning	95-200-51
Unicam ST SM UPC polish ceramic	Corning	95-200-52

13.3.2 FIBER OPTIC WIRING JUMPERS

ITEM	MANUFACTURER	PART NUMBER
62.5um ST-ST 3 meter	Corning	STPSTPD-03
62.5um ST-ST 7 meter	Corning	STPSTPD-07
62.5um ST-SC 3 meter	Corning	STPSCPD-03
62.5um ST-SC 7 meter	Corning	STPSCPD-07
62.5um ST-LC 3 meter	Corning	LCCSTPD-03
62.5um ST-LC 7 meter	Corning	LCCSTPD-07
62.5um SC-SC 3 meter	Corning	SCPCSPD-03
62.5um SC-SC 7 meter	Corning	SCPCSPD-07

62.5um SC-LC 3 meter	Corning	LCCSCPD-03
62.5um SC-LC 7meter	Corning	LCCSCPD-07
62.5um LC-LC 3 meter	Corning	LCCLCCD-03
62.5um LC-LC 7 meter	Corning	LCCLCCD-07
8.3 ST-ST 3 meter	Corning	STCSTCD03-SPSM
8.3 ST-ST 7 meter	Corning	STCSTCD07-SPSM
8.3 ST-SC 3 meter	Corning	STCSCCD03-SPSM
8.3 ST-SC 7 meter	Corning	STCSCCD07-SPSM
8.3 ST-LC 3 meter	Corning	LCCSTCD03-SPSM
8.3 ST-LC 7 meter	Corning	LCCSTCD07-SPSM
8.3 SC-SC 3 meter	Corning	SCCSCCD03-SPSM
8.3 SC-SC 7 meter	Corning	SCCSCCD07-SPSM
8.3 SC-LC 3 meter	Corning	LCCSCCD03-SPSM
8.3 SC-LC 7 meter	Corning	LCCSCCD07-SPSM
8.3 LC-LC 3 meter	Corning	LCCLCCD03-SPSM
8.3 LC-LC 3 meter	Corning	LCCLCCD07-SPSM
50um ST-ST 3 meter	Corning	FBL+-2222-03
50um ST-ST 7 meter	Corning	FBL+-2222-07
50um ST-SC 3 meter	Corning	FBL+-2277-03
50um ST-SC 7 meter	Corning	FBL+-2277-07
50um ST-LC 3 meter	Corning	FBL+2D-225D-03
50um ST-LC 7 meter	Corning	FBL+2D-225D-07
50um SC-SC 3 meter	Corning	FBL+-7777-03
50um SC-SC 7 meter	Corning	FBL+-7777-07
50um SC-LC 3 meter	Corning	FBL+2D-775D-03
50um SC-LC 7 meter	Corning	FBL+2D-775D-07
50um LC-LC 3 meter	Corning	FBL+2D-5D5D-03
50um LC-LC 7 meter	Corning	FBL+2D-5D5D-07

13.4 RACKS

13.4.1 RACK AND ASSOCIATED EQUIPMENT

ITEM	MANUFACTURER	PART NUMBER
7'X19" Standard Equipment Rack	Chatsworth	55053-503
Double Vertical Cabling Section	Chatsworth	11729-503
Wire Management Panel	Ortronics	OR-808004759

13.5 ELECTRONIC CLASSROOMS

13.5.1 ELECTRONIC CLASSROOM COMPONENTS

ITEM	MANUFACTURER	PART NUMBER
Double Gang Surface Mount Box	Interlink	2344-2
Double Gang Faceplate	Interlink	AC-DFP-006
Keystone Jack Insert	Interlink	3A-U1KEY
Voice Jack	ADC/Krone	6467-5-198-00
Data Jack	ADC/Krone	6830-1-183-07
Keystone Jack Insert (Video)	Interlink	3A-U2KEY
F Wall Jack Insert (2 req.)	ADC/Krone	6645-1-157-02
Blank Filler (3A size)	Interlink	3A-BL
Gray Voice Buttons (100/pkg.)	Interlink	DI-02V-GY
Green Data Buttons (100/pkg.)	Interlink	DI-02D-GR
Video Station Cable RG-6/U	Belden	9116 (non-plenum)
Video Station Cable RG-6/U	Belden	9116P (plenum)
Fiber MM Station Cable	Corning/ Anixter	370947

13.6 HELP AND ELEVATOR TELEPHONES

13.6.1 HELP AND ELEVATOR TELEPHONE EQUIPMENT

ITEM	MANUFACTURER	PART NUMBER
Outside Standalone Mounting Pole	Code Blue	Code Blue I (Custom)
Help Phone*	Ram Tech	R1C-S (Custom)
Elevator Phone*	Ram Tech	R1C-E (Custom)

* Both phones have optional 2" Palm Button

13.7 OneCard

13.7.1 OneCard Wiring Equipment

ITEM	MANUFACTURER	PART NUMBER
ADC/Krone C5et cable (PVC) Purp	ADC/Krone	TN-5ETR-VT-02
ADC/Krone C5et RJ-45 568b jac (purple)	ADC/Krone	6467-5-181-70
100 Pair 110 Block w/Legs	Systemax	110A W2-100

13.8 CONDUIT

13.8.1 CONDUIT - MULTI-CELL

ITEM	MANUFACTURER	PART NUMBER
PVC Multi-Guard Multi-Cell	Carlton	MXSS4S-020
PVC M-C M-G Fixed Bends	Carlton	MX__N4S
PVC M-C M-G Flex Bends	Carlton	MXF_4
Accessories	Carlton	Per Mfgr. Specs.
EMT Multi-Guard Multi-Cell	Carlton	MESS4S-010
EMT M-G M-C Fixed Bends	Carlton	ME_FN4S
EMT M-G M-C Terminators	Carlton	MET14

13.9. Network

13.9.1 WIRELESS LAN EQUIPMENT

ITEM	MANUFACTURER	PART NUMBER
Access Point - AP125	Aruba	AP-125
Access Point - AP124	Aruba	AP-124
Antenna, 2db Flexible	Centurion	WXR2400TNSP
Antenna, 5.5db Bi-Directional	Centurion	CAF94149-RT36
Antenna, 5db Terrace Diversity	Centurion	CAF95988-RT36H
Antenna, 9db Whisper Patch	Centurion	CAF95950-RT36
Antenna, 3db Microsphere Diversity	Centurion	CAP94165-RT36
Antenna, 8.5db Outdoor Patch	Centurion	CAF94118-RT36

13.9.2 WIRELESS PATCH CORDS

ITEM	MANUFACTURER	PART NUMBER
4ft Cat 6 White Patch cord	ADC/Krone	6645-2-780-04
7ft Cat 6 White Patch cord	ADC/Krone	6645-2-780-07
10ft Cat 6 White Patch cord	ADC/Krone	6645-2-780-10
15ft Cat 6 White Patch cord	ADC/Krone	6645-2-780-15
Highband 7ft Cat 6 White Patch cord	ADC/Krone	TP6TB-WT07

Highband 10FT Cat 6White Patch cord	ADC/Krone	TP6TB-WT10
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13.10. CATV

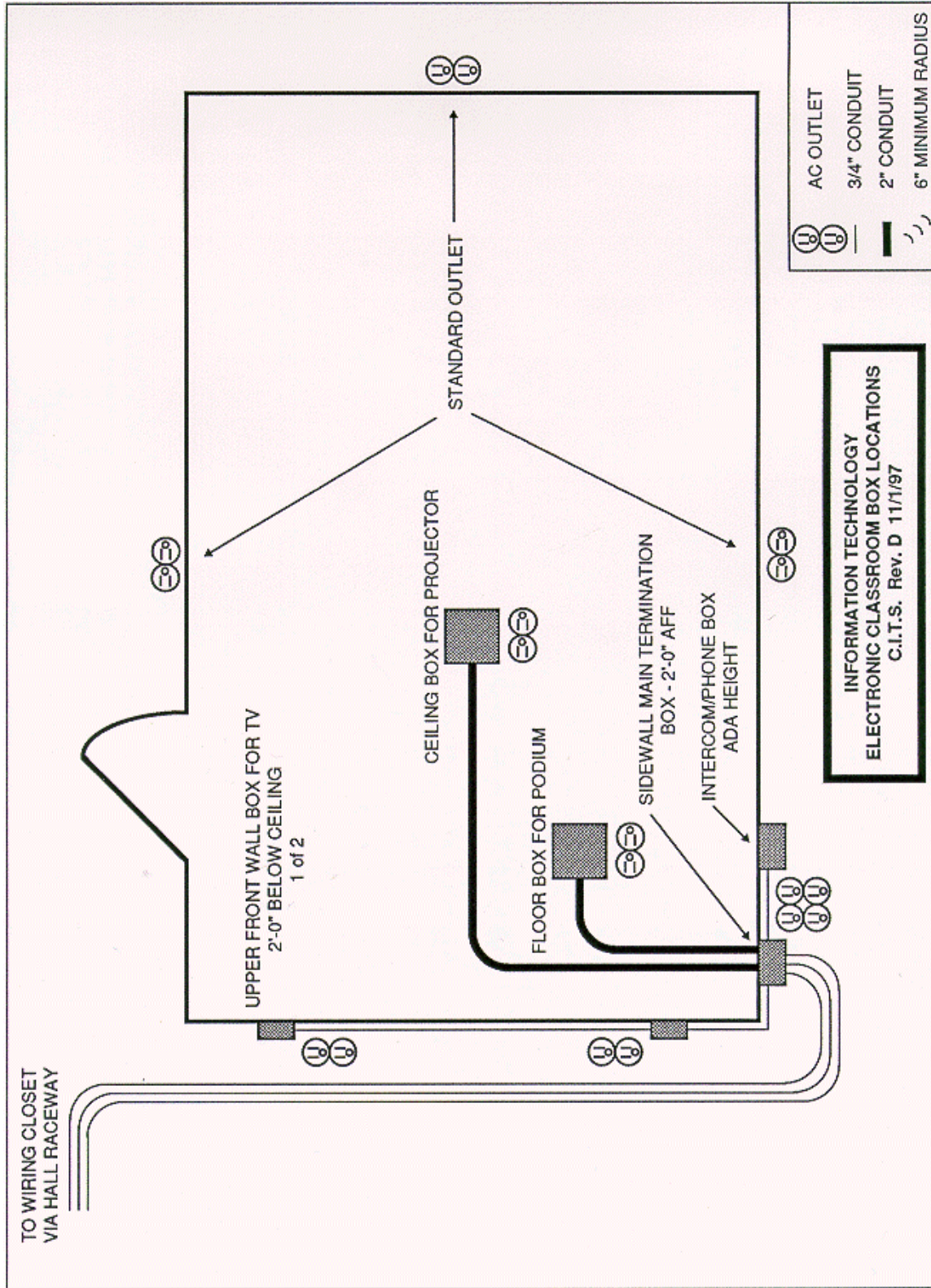
13.10.1 CATV Cable

ITEM	MANUFACTURER	PART NUMBER
RG-6/U Drop Cable non-plenum	Belden	9116
RG-6/U Drop Cable plenum	Belden	9116P
RG-6/U Riser Cable	Belden	1189A
Outside plant cable	Commscope	P3 500 JCASS

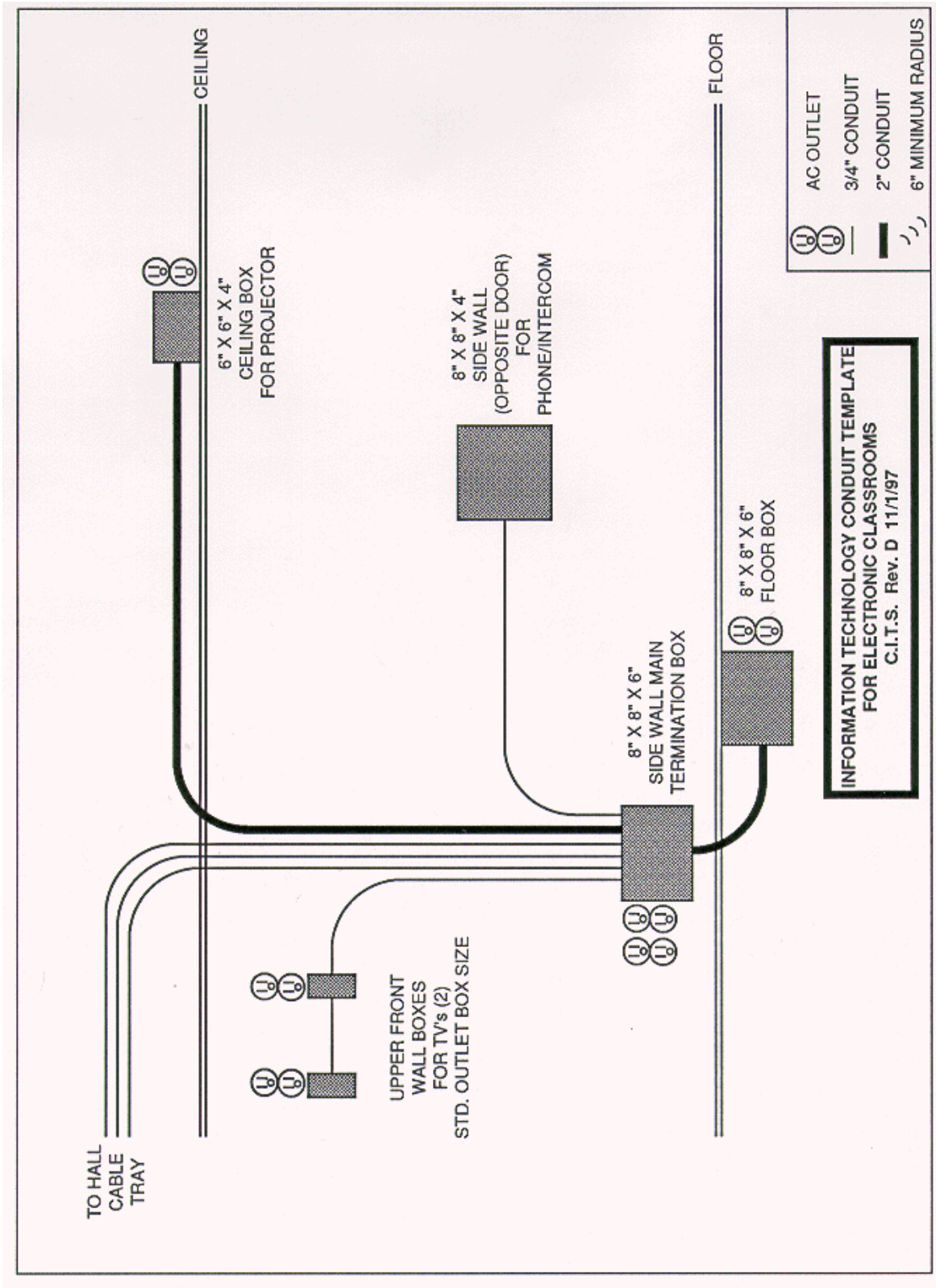
13.10.2 CATV WIRING EQUIPMENT

ITEM	MANUFACTURER	PART NUMBER
F Wall Jack Insert	ADC/Krone	6645-1-157-02

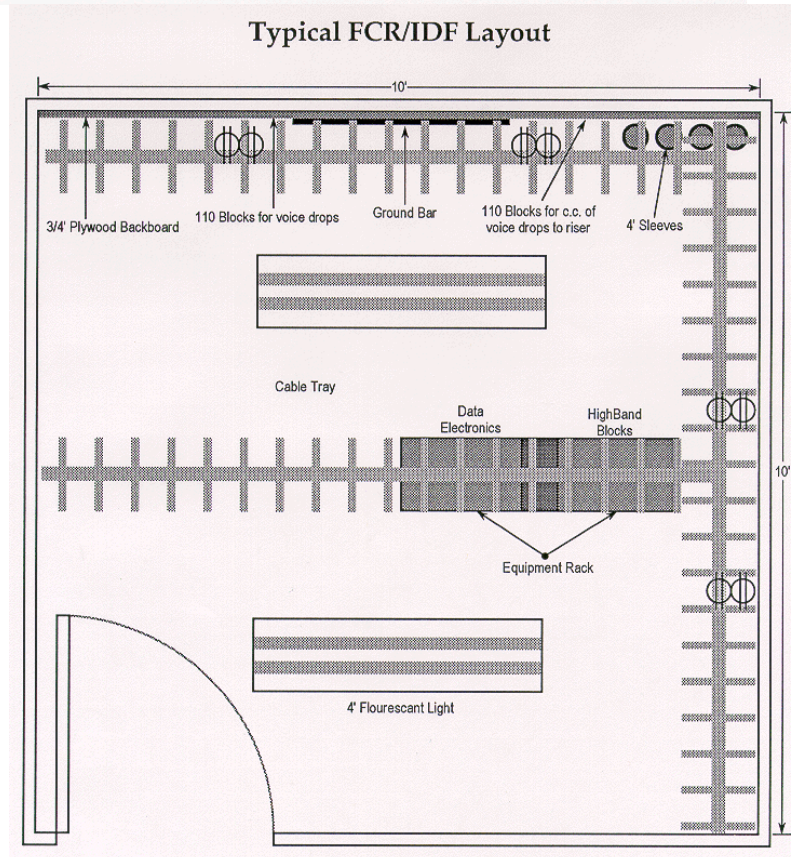
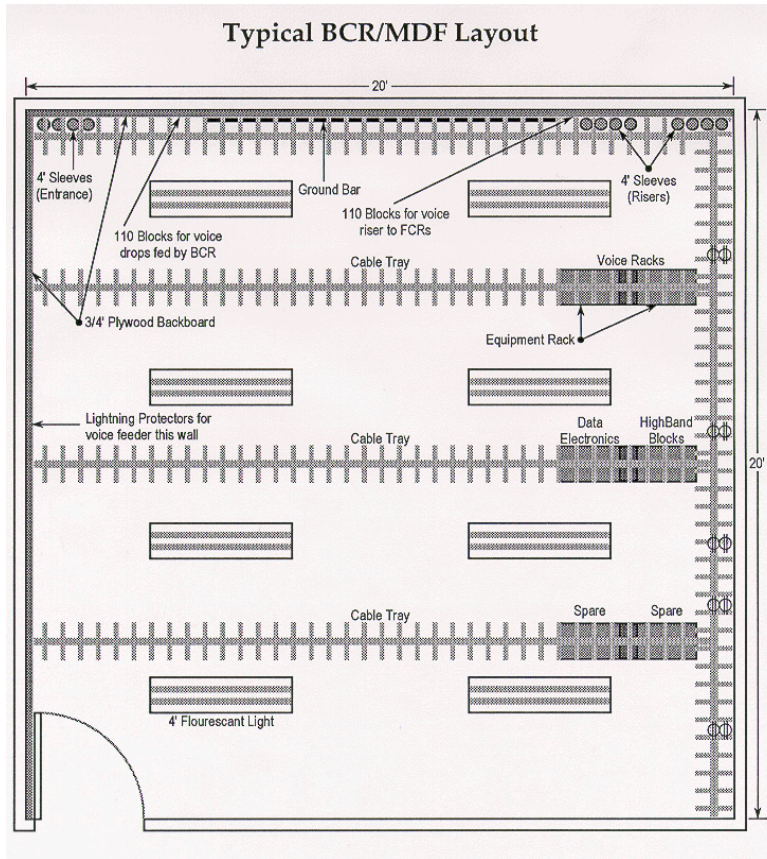
ELECTRONIC CLASSROOM OUTLET BOX LOCATIONS



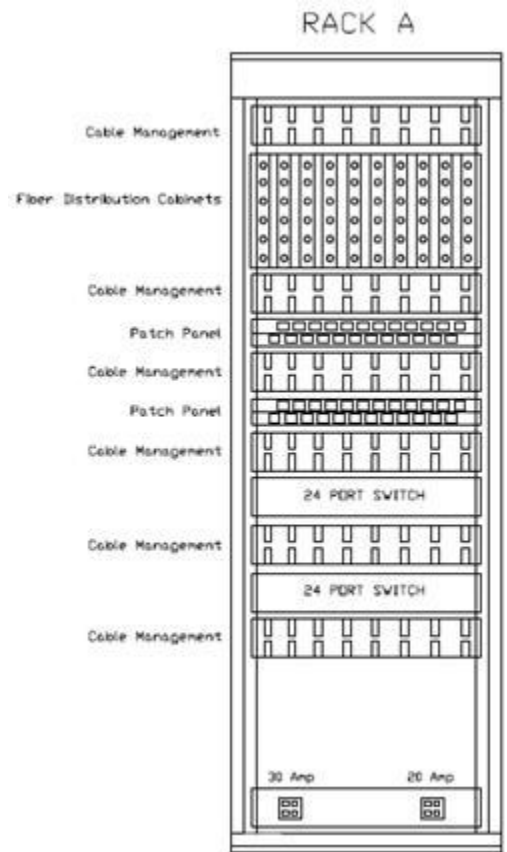
ELECTRONIC CLASSROOM CONDUIT TEMPLATE



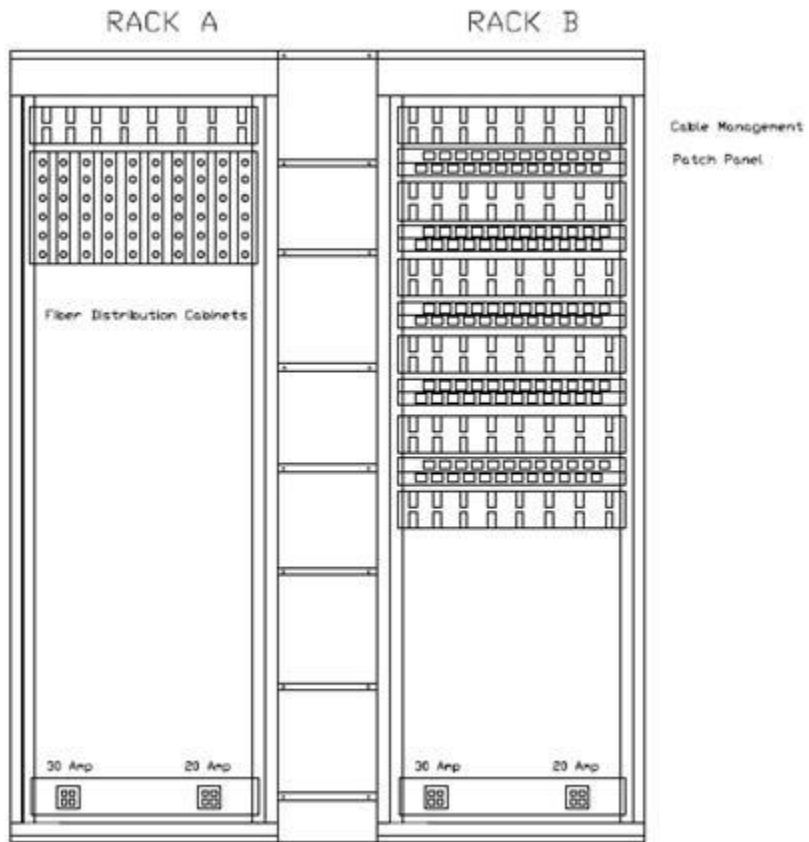
TYPICAL BCR ROOM LAYOUT



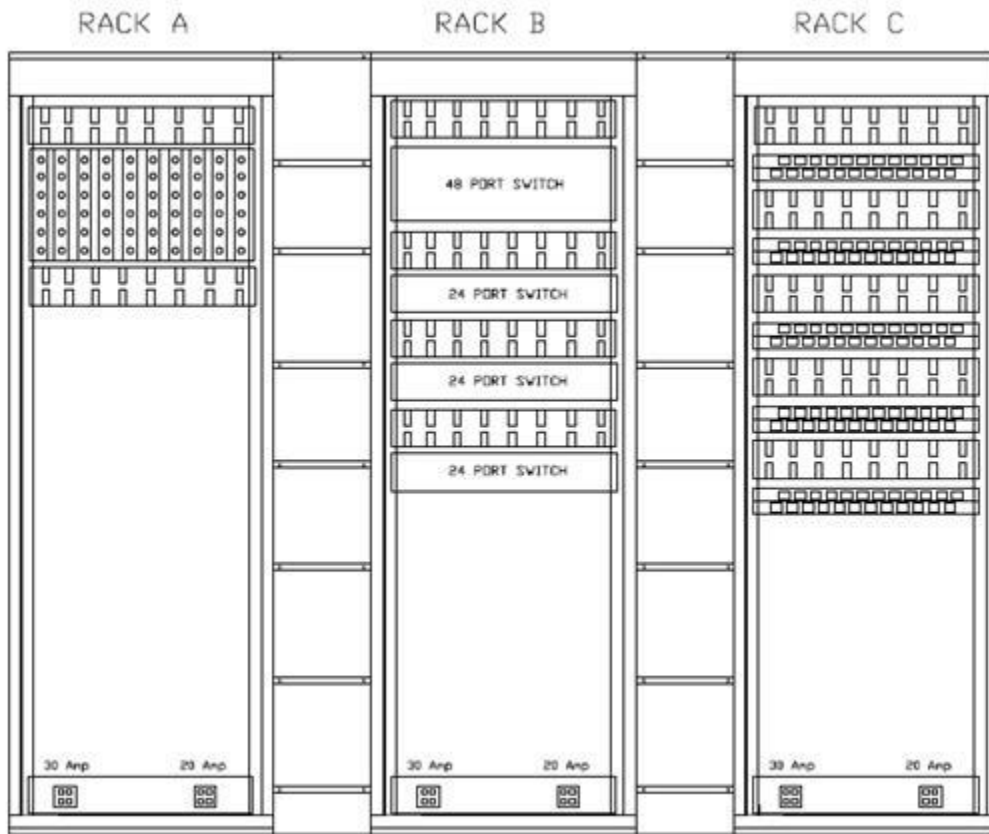
TYPICAL RACK LAYOUT



TYPICAL RACK LAYOUT



TYPICAL RACK LAYOUT



15. GENERAL INFORMATION

15.1 INTRODUCTION

The University of Cincinnati is a unique institution with various interests and constituencies geographically dispersed throughout the greater Cincinnati area. There are 17 academic colleges including 3 medical colleges, offering 87 Doctoral, 122 Masters, 146 Bachelors and 90 Associate degree programs.

The University of Cincinnati has 37,072 students, 2,512 full-time faculty and 3,108 part time faculty. It is home to a medical center and associated hospital that comprise the main research installation for the tri-state region.

15.2 CHARGE

The Office of Information Technologies (UCit) has the responsibility for planning, developing, managing and maintaining the most effective, efficient and economical communications network system. In its role as a system integrator of networks, UCit supports all University needs by approving and coordinating all voice, data and video communications systems policies. With the convergence of voice, data and video technologies, UCit is committed to a seamless communications services network.

In recent years, the focus on communications system planning, operations and procurement for voice, data and video communications has moved increasingly into the forefront of the attention of University administrators and department heads. Communications systems are now seen as a tool for improving employee productivity, facilitating the education process and reducing operating costs. By providing communications and applications compatibility between acquired communications systems and related services, the University will meet its goal of achieving a totally integrated information systems environment.

15.3 FUTURE

The University of Cincinnati will continue to grow. The demand for more advanced technological capability; greater access to information databases, dial-up video conferencing, distance learning, high-speed data networks, electronic messaging, enhanced facsimile and voice processing, to support the diverse communications requirements of a research-oriented university environment will increase.

UCit will continue to maintain a sophisticated and comprehensive communications infrastructure through which the University community can share access to costly technology resources, and therefore minimize expensive and unnecessary duplication. UCit 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.

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Vice President & CIO of Information Technologies

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513-556-1933

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CINCINNATI, OH 45219-0181
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Renovation, Architecture and Engineering: 513-556-5200
Capital Finance: 513-556-3152

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Maintenance East Campus: 513-558-2500

Utilities and Technical Support: 513-556-4828

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CINCINNATI, OH 45221-0215
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Fire Alarm Service: 513-556-1111

ENVIRONMENTAL HEALTH AND SAFETY OPERATIONS
51 W. CORRY BLVD.
CINCINNATI, OH 45221-0215
Information: 513-556-4968

MAPS

Detailed maps and floor plans for the University can be obtained from the Division of the University Architect. Refer any questions specifically not addressed in this document to The Office of Information Technologies (UCit).