Office of Information Technology
Communications Group

Satellite Equipment Room and Structured Cabling Requirements

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**Appendices**
- Appendix A – Approved Cabling Parts List
- Appendix B – Approved Connectors Parts List
- Appendix C – Approved Cross-Connects Parts List
- Appendix D – Approved Cable Management Parts List
- Appendix E – Approved Miscellaneous Materials and Parts List
1.0 Introduction

This document shall serve to list the requirements of the Office of Information Technology (OIT) at the University of Tennessee, Knoxville (UTK) for the design and installation of the Information and Communications Technology (ICT) infrastructure.

While some OIT requirements may be unique to UTK, the majority are based on current industry standards and best practices and will adhere to any applicable code or regulation.

OIT will have final review and be the acceptance authority for all telecommunications infrastructure, designs, installations, materials, and methods, in all phases. The coordination of the requirements of this document with the specifications and drawing sets of the telecommunications design is vital for control of change orders. OIT will clarify any parts of this document as needed.
2.0 Certified Contractors Requirements

OIT requires the use of certified contractors, who have been trained on the latest networking standards and installation practices, and have made a commitment to use quality copper, fiber, and AV products representing the latest in structured cabling technologies. This is to ensure proper installation, compliance to TIA and ISO Cabling, and allows for easier, less costly moves, adds and changes.

Selected structured cabling contractor is to be:
- BICSI Certified
- Product Certified

and
- Minimum of one Registered Communications Distribution Designer (RCDD) or LAN Specialist on staff
- Training and certifications are kept current to ensure they are installing the cable infrastructure with the latest tools and materials and adhering to any and all applicable electrical codes installation standards.

Warranty
UTK OIT requires all cabling infrastructure installations to have a 25-year warranty on its cabling infrastructure. This manufacturer’s warranty shall insure support of all types of telecommunications infrastructure applications such as Power over Ethernet (PoE), Voice over IP (VoIP), LAN Security Cameras, Wireless LAN, Fiber applications, and any future services that meet CAT6 ANSI/TIA/EIA and or IEEE specifications.
3.0 Communication Flow

OIT may assign one or more personnel to a project. These person(s) will communicate by way of a primary OIT Project Coordinator – most frequently assigned from the Telephone Services team. This OIT Project Coordinator will work through the Facilities Services Project Manager to communicate with designers and contractors.

Inspections and Walk Through
- All work is subject to inspection and approval at any time by designated OIT personnel.
- All rough in work shall be inspected and approved by OIT project personnel.
- The preliminary documentation will be made available for review during walk through inspections.
- Cables with visible defects and deformations such as, kinks, twists or crushed will need to be replaced regardless of test results.
- Installer must take reasonable steps to protect their installation in a construction environment (free of dirt, defects and debris).
- Final walk through inspections must be done prior to turning in final documentation and test results.
4.0 T-Drawings

Telecommunications drawings shall be identified as “T” series (Telecommunications) drawings in the approved construction drawings, separated from “E” (Electrical) drawings. The T-series drawings shall include:

- Floor layout, showing work outlets, cable path (j-hooks or cable tray, horizontal and riser), sleeves, conduits.
- Legends using industry standard symbols
- Satellite Equipment Room (SER) layout / elevations
- Equipment rack layout
- Detailed Work Area Outlet (WAO) with labeling
- Riser diagram and cabling for voice, data and cable television (CATV)
- Outside plant, cabling, methods and paths, with footages and bends
- Schedule of jacks and rooms
- Pull Box detail

Figure 1: Floor Layout
5.0 Design and Construction Engineering Variance

If these requirements cannot be met during the design or installation phases, then a “OIT Standards Variance Form” must be completed and sent to the UTK Facilities Services Project Manager. A copy must also be sent to the OIT Project coordinator.

OIT Standards Variance Form

UTK OIT Standards Variance Request Form
Complete this form and submit to the UTK Facilities Services Project Manager and the OIT Project Coordinator. UTK OIT will review the request and either accept, modify or deny the variance and will notify the requestor.

Project Name: _________________________  Date: _________________
Requester: ___________________________________________
Company: ____________________________________________
Title: ________________________________________________
UTK Facility Service Project Manager: ______________________________
UTK OIT Project Coordinator: ______________________________
Reason for Variance:_________________________________________________________________
________________________________________________________________________________
____________________________________________________________________________________
________________________________________________________________________________
The variance requested is due to (check all that applies):
Cost____ Amount $_______
Schedule Impact_____ Days impacted _______
Suggested Remedy(s):
____________________________________________________________________________________
________________________________________________________________________________
__________________________________________________________________________________
To be completed by UTK OIT

Comments and or suggestions:
____________________________________________________________________________________
________________________________________________________________________________
__________________________________________________________________________________
This request has been (circle): Approved Modified Denied
Signature _______________________________  Date:________________
6.0 Satellite Equipment Room (SER) Requirements

OIT typically refers to the Satellite Equipment Room as an SER. It may also be referred to as a Telecommunications Room (TR), Intermediate Distribution Frame (IDF), Main Distribution Frame (MDF), or Uplink Room. The SER houses the terminations of horizontal and backbone cabling and its interconnects to the necessary hardware. The SER provides a controlled environment to data networks. Due to the sensitivity of the data contents and the availability requirements of the connected devices on the university network:

- All SERs must be secured at all time.
- Unauthorized port activations are NOT PERMITTED
- Equipment must remain powered on once installed.
- If equipment is to be turned off, notification must be given prior to interruption to OIT Network Operations, University of Tennessee Police Department, and Facilities Services.

Use and Restrictions

- No SER shall be used as passageways to other equipment rooms, power transformers, custodial equipment, or any other function that would require access for reasons other than service and maintenance of the communication equipment and cabling they house.
- SERs shall be dedicated to telecommunications functions and related support facilities.
- SERs shall not be shared with electrical equipment, building services, or other equipment.
- SERs should not contain systems such as audio-visual (AV) equipment, fire alarm panels, building management systems, cable TV, or computer servers.
- If the SER is to contain other systems, including but not limited to audio-visual (AV) equipment, fire alarm panels, building management systems, cable TV, camera systems, or computer servers, usage shall be approved by the OIT Chief Information Officer or his/her delegate prior to construction.

Location within a facility

There are a number of factors that need to be considered when placing SERs within new or remodeled facilities. Site selection factors for the various rooms are addressed below. Of these factors, the two most important are “stacking” of the spaces and providing a location that would allow the spaces to be expanded, if required, in the future.

- Horizontal location(s): The SER shall be centrally within the floor area it serves in order to maximize the number of horizontal cable plant WAO connections it can service. The maximum cable length allowed from the SER termination to that cable’s WAO termination is 295 feet (90 meters).
- Vertical Location(s): In multi-story buildings requiring multiple SER rooms, the SER rooms shall be in vertical stack alignment.
- Avoid locations that limit expansion such as structural steel, stairwells and elevator shafts, outside walls, or other fixed building walls.
- SERs should be easily accessible and accessed directly from public hallways. Access should not be through offices, bathrooms, other utility spaces or janitorial spaces.
- SERs should not service WAOs on more than one floor.
- SERs and the cabling they support shall be separated from sources of electromagnetic interference such as induction devices, transformers, ballasts, power supplies, elevator equipment, generators, motors, X-ray generators, photo copiers, microwave ovens, and similar equipment nor be located near sources of mechanical vibration.
• The location of SERs shall allow easy access to cable distribution pathways.
• SERs shall not be located in any place that may be subject to water or steam infiltration, humidity from nearby water or steam, heat, and any other corrosive atmospheric or environmental conditions.

Environmental Requirements

Space Allocation
SER must be a rectangular room with no obstructions or protrusions (beams, columns, etc.) that decrease the usable square footage available in the room. There shall be, at minimum, one SER per building.
• If the floor serving area is 8,000ft$^2$ or less, size the room 10'X10'
• If the floor serving area is 8000ft$^2$ to 10,000ft$^2$, size the room 10'X12'
• If the floor serving area is 10,000ft$^2$ to 20,000ft$^2$, size the room 10'X16'
• It is not recommended by UTK OIT to house other services in the SER, due to network security.
• If other systems, as noted in the Use and Restrictions section, are installed then space requirements must be increased by at least 20% as determined by OIT.
• Equipment not related to the support of the SER (e.g., piping, ductwork, pneumatic tubing, etc.) shall not be installed in, pass through, or enter the SER.

Enclosing Walls
• SER walls shall extend to the structural ceiling above.

Ceiling
• No false (lay-in tile) or hard lid ceiling shall be installed over any SER floor space.
• Minimum clear ceiling height shall be 10 feet (10').

Floor
• SER floors should be floor slab, no raised or false floor.
• Floor finish shall be smooth, dust-free, and not susceptible to static electricity build-up.
• Acceptable finishes are low static composition tile, static dissipating tile (SDT), or sealed concrete.
• Floors are to be light in color and be either vinyl composition tile (VCT) or treated / painted concrete to prevent dust and enhance lighting.

Door
• Doors shall be a minimum of 36" wide and 7'6" tall.
• Doors must swing out of room or increase room size 3’.
• SER doors shall be secured using card access/readers. The rooms must be accessible during power outages.

Windows
• SERs shall not have windows.

HVAC
• Design for a minimum of 8,000 BTU’s from equipment, for up to 144 data outlets, add 1,000 BTU’s for every 48 additional outlets served.
• A stand-alone wall-mount unit is preferred to avoid any water damage to electrical equipment.
• It is required that the SER’s HVAC be tied into the backup power.
• The ambient temperature and humidity shall be measured at a distance of 5 ft. above floor level, after equipment is in operation, at any point along an equipment aisle centerline.
• A SER’s HVAC must be designed for 24 hours per day, 365 days per year operation.
• Each SER shall have its own thermostat.
• HVAC systems shall not use the same electrical panel that is used to support the outlets servicing the electronics housed within a SER.
• The temperature in a SER shall be maintained in the range of 68°F to 77°F.
• The humidity range should be maintained at 40% to 55% relative humidity.
• A SER shall ventilate at the rate of one air change per hour.
• If other systems, as noted in the Use and Restrictions section, are installed HVAC requirements must be provided for those systems.

**Electrical Power**

• It is required that the electrical feed to the SER be backed up by a generator, including all convenience outlets to conform with current National Fire Protection Association (NFPA) code.
• Outlets and faceplates with a generator feed shall be red and labeled with the panel designation and breaker position of the servicing electrical panel.
• A separate supply circuit serving the SER shall be provided and terminated in its own electrical panel inside the SER.
• A minimum of two dedicated non-switched 3 wire 12 gauge single phase 120V ac 20amp duplex electrical outlets for equipment power, each on separate branch circuits. These outlets shall be mounted one each above each rack. **Note: A twist lock receptacle may be required.**
• Racks will be appropriately grounded.
• In addition, OIT requires a ground lug on the rack capable of being used as a splicer.
  o There must be at least one unused connector hole that can accept #6 - #14 wire.
  o This lug should be on the back side of the rack (same side as the copper termination) and, where possible, on the vertical support farthest from the copper termination.
  o This can be the same lug that is used for rack grounding.
• Separate quad 120v ac convenience outlets for tools, test equipment etc., are to be placed at maximum of 6’ (wall space) intervals around perimeter of room and below the plywood.
• All power, including power to all mechanical systems, in the SER shall be installed to the buildings generator.
• If other systems, as noted in the Use and Restrictions section, are installed electrical requirements must be provided for those systems.
• In SERs that contain more than 150 WAOs, additional power may be required as determined by the OIT.

**Lighting**

• Provide a minimum of 500 lux measured 3’ above finished floor.
• Locate light(s) at a minimum of 8.5’ above finished floor.
• Power for lighting should not come from the power panel located inside the SER.
• All lighting shall be connected to backup power.
• The walls and ceiling of the SER shall be painted in light colored paint to enhance lighting.
• Coordinate the lighting layout with equipment layout, especially cable trays.
• SER should be equipped with an on/off switch inside the room.

Water Infiltration
• Measures must be taken to prevent water intrusion.
• Water, sewer, chemical, or drain piping of any kind shall not be routed through/within a SER.
• Drainage systems for HVAC units shall not pass above equipment and shall tie in to the building drainage system.
• If a pump is needed to drain HVAC, it must be powered by emergency power.

Sprinkler Systems
• Do not install sprinklers directly above the equipment racks.

Wall Plywood Sheeting
• All walls shall be covered with ¾” Fire Rated Plywood
• Plywood shall be above electrical outlets (17” above finished floor typical) and extend to above cable tray.
• Layouts vary for analog/traditional phones and VoIP:
  o VoIP circuits should be treated like any other data circuit. They will be terminated with the data circuits in the same patch panels.
  o Terminate riser cables for traditional/analog phones in the fiber rack with an RJ-45 panel
• The contractor shall be responsible for getting the plywood approved by the fire marshal before painting.
7.0 Outside Plant (OSP) Pathway

Before designing any OSP, the designer and or consultants will need to meet with UTK OIT for system requirements and methods. Most OSP at UTK is underground and in conduit. Aerial and direct bury cables must receive prior approval by the UTK OIT Project Coordinator.

Underground requirements:

- 5" PVC Schedule 40 conduit only between Handholes (HH) and into buildings.
- 5" PVC Schedule 80 conduit under parking lots, streets, and driveways encased in concrete with warning tape on top of encasement.
- A minimum of 30" from top of conduit to finished grade.
- Minimum of 12" separation from electrical power, 24" from steam lines.
- Minimum of four 5" conduits from Handholes (HH) to HH with 2 of the four conduits to have 4 3X3 DETECTABLE MaxCell installed.
- Minimum of three 4" conduits from HH to Building. UTK OIT will determine if more are required.
  - At least one of the 4" conduits is to have 3 3X3 DETECTABLE MaxCell installed.
  - Each MaxCell is to have different color ID markings and be locatable.
  - Plastic flexible inner duct not allowed.
- All conduits (including when filled with MaxCell) are to have a pull rope (no strings) installed.
- Conduits entering the buildings must be sloped away from building.
- HH’s are to be manufactured by Quazite, open bottom (on top of 4" of rock), and with a minimum size of 30"X 48", cover labeled “Communications”.
- Cover to have pull slot with center pin.
- HH covers are to be heavy duty and be traffic/drive over rated.
  - Manholes shall a minimum of 7’X7’X7” inside dimensions and should be manufactured in top and bottom halves.
  - Each manhole shall be equipped with steps and ladders.
  - They shall have racks in all 4 corners mounted to corner brackets and 2 racks equally spaced on each side wall which are mounted on S brackets.
- HH’s are to be installed at a maximum distance of 150’ intervals for straight runs. This distance could be shorter after calculating bends and cable pulling tensions.
- No 90° bends in conduit. Communications sweeps are to be used.
- No “elbows or LB’s” (Smart LB allowed, see figure below), terminate conduit in an appropriate sized pull box (PB).
Figure 3: Front View of Racks LayoSmart Conduit Body – Telecommunications LB

- When tying into an existing HH, first consult with UTK OIT to determine if a HH needs to be replaced with a larger size.
- When entering a HH, enter at bottom, do not drill or punch holes in sides of HH.
  - Any exceptions to this must be cleared with UTK Telecommunications.
  - A HH is not to be used in lieu of a bend.

Figure 4: Pull Box Configurations
Conduits are to be free of debris and water.
Seal conduits with pliable / non-hardening duct seal to keep out rodents and moisture (Ideal 31-605 or Gardner Bender GB-DS-110N or equivalent).
Cabling is to be neat and professional inside HH & PB’s.
Route and secure cables around edges to free up room for future cabling.
All cables are to be labeled inside HH or PB. Consult UTK OIT.
Every other HH is to have a 25’ maintenance loop for fiber optics. Secure loop to side of HH.
Install “Caution Telecommunication” detectable Orange tape, along the cable pathway 12” below the final grade.
When splicing is necessary; use approved splicing methods and enclosures.
All coax connectors are to be enclosed with heat shrink, with at least 2” of shrink tube covering outer jacket.
Use flame spread head to avoid scorching and melting center dielectric.
Consult with UTK OIT before any splicing is designed or requested.
Before backfill, all underground installations must pass UTK OIT inspections.
8.0 Satellite Equipment Room (SER) Layout

A SER houses the terminations of horizontal and backbone cables to connecting hardware including any jumpers or patch cords. It may also contain the interconnect (IC) or main cross-connect (MC) for different portions of the backbone cabling system. The SER also provides a controlled environment to house telecommunications equipment, connecting hardware and splice closures serving a portion of the building. The use of a telecommunications enclosure (TE) is for a specific implementation and not a general case. It is intended to serve a smaller floor area than a SER and may be used in addition to the minimum "one SER per floor" rule.

- There will be a minimum of two network racks with 6 inch deep vertical wire management per SER, each rack has a footprint of 2'X2' and shall be bolted and bonded together.
- If the size of the room is 10'X10', there shall be 2 racks.
- If the size of the room is 10'X12' or greater, there shall be a minimum of 3 racks.
- In a 2 rack configuration, the left most rack is for cabling. In configurations with more than 2 racks, the network electronics will be in the middle.

Figure 5: Front View of Racks Layout
• All fiber patch panels are to be mounted in the top of the rack with the network electronics.
• No patch panels should be installed below 24 inches from the floor.
• There shall be a minimum of 3 ft. clearance around all sides of the connected racks, measured from equipment mounted on wall, not the wall itself. Install appropriate 48-port patch panels in the cabling rack and the fiber optic patch panel in the network electronics rack.

Figure 6: Side View of Rack Layout
• There shall be horizontal wire management for patch panels, one installed above and the other underneath the patch panel. When determining the port quantities add 25% for future growth.

![Image of patch panel management configuration view](image)

**Figure 7: Patch Panel Management Configuration View**

• A minimum of 18” wide ladder or basket cable tray shall be installed around room and to each rack.
• Copper riser cables for analog telephone service should be terminated in an RJ-45 patch panel below the fiber.
9.0 Cabling Pathway

The backbone cabling provides interconnection between telecommunications rooms, equipment rooms, access provider (AP) spaces and entrance facilities. The pathway is design to route and manage copper data cables, fiber optic cables, and power cables within connected buildings

- These primary horizontal cabling pathways should be routed following building lines and major floor access routes such as corridors and hallways.
- They should never cross over end user work areas such as offices, conference rooms, or work cube areas.
- Access for cabling personnel and technicians that is sufficient for easy cable placement yet causes minimal disruption to floor occupants is an important design consideration when laying out the routing of primary horizontal cabling pathway.

Backbone Cabling

It’s the inter-building and intra-building cable connections in structured cabling between entrance facilities, equipment rooms and telecommunications closets. Backbone cabling consists of the transmission media, main and intermediate cross-connects and terminations at these locations.

- **Copper Riser Cables**
  - Copper riser cable sizes shall be determined on a per building basis.
  - Copper riser cables shall be ARMM cable.
  - The cables shall be bonded.
  - These cables shall terminate on the backboard beside the entrance protectors in the SER.
  - Cables are to terminate on rack mounted 110 panels in the SER.

- **Fiber Optic Riser Cables**
  - Fiber optic riser cables shall be riser rated single mode manufactured by Corning.
  - Cables shall be terminated with Corning LC unicam connectors.

Horizontal Cabling

The horizontal cabling system extends from the work area’s telecommunications information outlet to the SER. It includes horizontal cable, mechanical terminations, jumpers and patch cords located in the SER and may incorporate multiuser telecommunications outlet assemblies (MUTOAs) and consolidation points (CPs).

Prior to design, the designer and or consultant must meet with UTK OIT to determine applications, methods and material.

- All new construction and full remodels are required to use Cat6 cabling (100 ohm UTP CAT6) for both voice and data.
- All terminations shall be done to T-568A scheme.
- Cable slack in the SER, minimum of 3m (10’). Above WAO (in the ceiling), 1m (3.28’), and at the WAO for termination 8”.
  - Cable slack should not be stored in bundled loops. Cable loops have a degrading effect on cabling performance.
Cable slack should be stored in an extended loop or in a figure-eight configuration.

- J-Hooks allowed only when cable tray cannot be used.
  - Regardless of the J-Hook’s manufacturer’s specifications, no more than the maximum of 40 cables is allowed in any J-Hook.
  - When there are more than 40 cables, then cable tray, wire basket or multiple J-Hook paths are required.
  - Space J-Hooks 4’ to 5’ and anchor J-hooks to studs.
- No splices in telecommunications cabling.
- Flexible metallic conduit or plastic tubing not allowed.
- The use of ty-wraps is to be avoided. Hook and loop ties are preferred.
- If ty-wraps are required, their use must be pre-approved by the OIT Project Coordinator.

![Figure 8: T568A Scheme](image)

CATV cable must be RG-6 and terminated with snap and seal connectors. Amplifiers will be required for each floor. See the OIT Project Coordinator for current specifications and models.
10.0 Work Area Outlets Layout

Work Area (WA) components extend from the telecommunications outlet/connector end of the horizontal cabling system to the WA equipment. A minimum of two telecommunications outlets (permanent links) should be provided for each work area.

Wireless Access Point (WAP) Junction Boxes
- Each WAP location shall have 2 horizontal cables
- Do not place the WAP junction boxes within 3’ of a protection sprinklers head.
- WAP junction boxes shall be at ceiling level and opening shall face downward.

Administration, Classroom, Mechanical, and Building Automation Spaces
- Standard 4 ports faceplate are used.
- The use of other type or color faceplates will be determined on a case by case basis and shall have prior approval from OIT.
- UTK has standardized on the colors of the jacks
  - All Cat6 data jacks are to be yellow.
  - Special circuits jacks must not be yellow, blue, or orange.

Office Space
- Each office space is to have a minimum of two WAO’s, each with 3 cables as specified by UTK OIT fed within a 1” conduit.
- Cable offices by, routing cable to center of office before installing to WAO so the cables can be used in either WAO.
- Department Heads that will actually occupy the space will need to be consulted with to insure their needs are met (ex. network printers and fax machine locations often get overlooked).

Figure 9: Quad Outlets
Classroom / Labs
- The designer will need to consult with UTK OIT’s Engineering Services (ITES) for design specifications for Classrooms and Computer Labs.
- The designer will need to consult with UTK OIT’s Project Coordinator for special design specifications related to wireless, especially in high density applications, for Classrooms and Computer Labs.

Conference Rooms
- The designer will need to consult with UTK OIT’s Engineering Services (ITES) for design specifications for Conference Rooms.
- Each conference room shall have a minimum of two WAO on opposite walls consisting of three CAT6 and one CATV cable.
- Consideration should be given to floor mounted WAO under conference table for data, voice and multi-media to projector or screen.

Break Rooms, Lobby / Others
- As a general rule, each break room area should have one wall mounted WAO (ADA compliant).
- The Department Head should be consulted with for specific needs in their space.
- Lobbies and corridors may have wall mounted courtesy phones.
- Locate courtesy phones near elevators and or near main entrances / exits.

Modular Furniture
- Telecommunications and Power distribution planning should be coordinated to avoid conflicting pathway assignments.
- Untried distribution or terminations strategies should be avoided.
- Permanent cables shall be installed only in or on permanent walls.
- All modular furniture shall be fed from a “Consolidation Point” (CP).
- No direct horizontal cabling.
- Locate CP in an accessible area free from workstations and heavy file cabinets.
- Cabling from CP to modular furniture shall be through a power pole or through the wall if not blocked from furniture.
- Do not block access to horizontal cabling pathways or outlets.
- No cabling or WAO allowed behind modular furniture.
- Label “Consolidation Point” with adhesive label on ceiling grid where the CP is installed.
- Designer must calculate the maximum cable capacity allowed in the modular furniture’s raceway and feed with multiple power poles if necessary.

**Residence Life (Housing)**
- A 2 port flat faceplates should be used when appropriate
- Each student bed is to have one data cable. Each living room and bedroom shall have a minimum of one CATV outlet. All CATV outlets shall be coordinated with UTK Telephone Services. All RA and Hall Director housing units shall have in additional voice data outlets. These shall be coordinated with UTK Telephone Services. When there is more than one CATV drop in a Housing unit, residential wiring scheme is permitted for CATV. Run one CATV drop to unit and split signal to other outlets in unit through 1” conduits. Locate in wall box near electrical panel, secure splitter to back of box and bond to electrical panel with #14 AWG green insulated wire. The main entrances to a housing building shall be equipped with an outside weatherproof wall or pedestal mounted phone and located near card reader door access.

**Other Areas**
- Requirements may vary for all other areas including those that support services such as elevators, life safety (Code Blue Phones, etc.), security (cameras, NVRs), distributed antenna systems (DAS), and other multimedia.
11.0 Cabling Certification & Documentation

UTK OIT requires the newly installed infrastructure to be tested and certified. Follow the Standards of ANSI/TIA/EIA-568-C.1,2,3,4 for testing criteria of the permanent link.

- Testing shall commence only after all materials are permanently installed, adjusted, bonded and labeled.
- Installer must retest and save both the original and retested results when any of the above occurs.
- Testing shall commence only in a clean environment, free of moisture, dirt, dust, and debris.
- Terminations exposed to such environments after testing will require retesting.
- Installers shall be certified by the manufacturer of the system(s) they are installing and be able to certify the installation for the manufacturer’s warranty.
- During testing, WAO and patch panel labeling must be verified.

In addition to the cabling being commissioned and certified, the electrical grounding and bonding systems must also be tested and certified.

- The electrical contractor is responsible for testing the Alternating Current (AC) Grounding Electrode System.
- The telecommunications installer is responsible for testing the Equipment Grounding (Bonding) System.
- Refer to the TIA-607-B standard and the BICSI TDMM current edition for approved test equipment and acceptable results.

Testing Results

Follow the manufacturer’s warranty submittals and submit a copy of all results (including CATV, Fiber Optics, and Grounding/Bonding) to UTK OIT before final certification (see below).

- All UTP cable test results must be submitted in their original format from tester in electronic format.
- CATV signal loss and attenuation, length, signal leakage report and documentation via spreadsheet.
- Fiber lengths, attenuation, OTDR trace, submit in their original format from tester.
- Tests must pass manufacturer’s specifications as well as industry standards.
- Cables with visible defects and deformations such as, kinks, twists or crushed will need to be replaced regardless of test results.

Results and As-Builts Drawings

- Provide all test results and As-Built drawings at the time of project completion, both in hard and electronic versions to Facilities Services.
- Electronic copies of test results should be in PDF format.
- Drawings should be in a Visio compatible format.
- A courtesy copy of all documents should be provided directly to OIT.
12.0 Installation Labeling Requirements

Network cable labeling is similar to ensuring everyone involved in your network speaks the same language and anyone who comes in to augment or service your network can easily understand the architecture. It has become more important to accurately document every outlet and every port, so the information can assist in a 911 database. All WAO’s, patch panels, 110 blocks, conduits, trays, backbone cables, grounding, and racks shall be labeled with specific labeling scheme of UTK OIT.

The key factor of a good administration system is the component labelling. Records cannot be established and maintained without good labelling during and after installation.

Work Area Outlet Labeling Schematic

The label shall contain a unique identification, as outlined in the documentation and/or drawing, and must be indelible and placed behind a transparent cover.

Circuit Labeling Instructions
Sample Circuit Name: OEE230053

Figure 11: Data Circuit Labeling Schematic
Rack Labeling

The label shall contain only the first 6 characters of the circuit labeling schematic for that SER, and printed or generated by a mechanical device.

![Figure 12: Samples of Equipment Rack Label](image)

Patch Panel Labeling

Each RJ45 socket must be individually labeled. The label shall contain a unique identification, as outlined in the documentation and/or drawing, must be indelible and placed behind a transparent cover, and printed or generated by a mechanical device.

![Figure 13: Samples of Patch Panel Labeling](image)
Work Area Outlet Labeling

Each RJ45 socket must be individually labeled. The label shall contain a unique identification, as outlined in the documentation and/or drawing, must be indelible and placed behind a transparent cover, and printed or generated by a mechanical device.

- All WAO labeling must be completed and verified before the installation of the furniture.
- If the contractor is providing and installing the station patch cable in accordance to the contract, they must remember that both ends of the station patch are to be labeled with the WAO in which it is connected.

Figure 14: Samples of WAO Labeling
Appendices
Appendix A
Cabling Parts List

The following materials are to be used unless a timely submitted substitute is approved by UT OIT.

CABLES

- CAT5E Cable
  - Mohawk or
  - General or
  - Commscope or
  - Berk-Tek or
  - Comtran

- CAT6 Cable
  - Mohawk or
  - General or
  - Commscope or
  - Berk-Tek or
  - Comtran

- Fiber Optic OSP Cable
  - Fiber and connectors shall be single mode manufactured by Corning

- Fiber Optic Riser Cable
  - Fiber and connectors shall be single mode manufactured by Corning

- Fiber Optic Horizontal Cable
  - Fiber and connectors shall be manufactured by Corning

- Coax Horizontal
  - to be determined on a per project basis.

- Coax
  - to be determined on a per project basis.

- OSP Coax, Flooded
  - to be determined on a per project basis.

- OSP Phone CAT3 Buried Service Wire (BSW)
  - Essex Cable PE89 and/or PE22 as determined by UTK OIT or
  - General Cable PE89 and/or PE22 as determined by UTK OIT

- Riser Phone CAT3 - Copper riser shall be ARMM manufactured by:
  - General or
  - Superior/Essex

- Inner Duct
  - MaxCell 3X3, (Locatable for OSP), color ID
Appendix B
Connectors Parts List

The following materials are to be used unless a timely submitted substitute is approved by UT OIT.

CONNECTORS
- **CAT5E Jacks**
  - Hubbell HXJ5EB or
  - PANDUIT CJ5E88TGBU

- **CAT3 Jacks**
  - Hubbell HXJ3B or
  - Panduit CJ66BUY

- **CAT6 Jacks**
  - Hubbell HXJ6Y or
  - Panduit CJ688TGYL

- **Coax RG6 F-Fittings**
  - Thomas and Betts SNS1P6U or
  - Thomas and Betts plenum SNS6PLA or
  - Ideal 92-660

- **Coax RG11 Fitting**
  - Thomas and Betts SNS11AS

- **Coax F-81 Jack** - (office only, not student rooms)
  - Hubbell SFFEX or
  - Panduit CMFEI

- **Fiber Optic Connectors**
  - Corning Unicam LC connectors
Appendix C
Cross Connect Parts List

The following materials are to be used unless a timely submitted substitute is approved by UT OIT.

CROSS CONNECTS

- **CAT6 Patch Panel**
  - 48 port Hubbell Nextspeed Black HP6 48E or
  - Panduit CP48WSBLY with CJ688TGYL jacks or
  - Panduit DP48688TGY Punchdown Patch Panel

- **110 Blocks Rack Mount**
  - 100 pair with wire management Hubbell 110RM series or
  - Panduit P110B100R2Y 23

- **66 Blocks Wall Mount** (50 pair Cat.5e with cover)
  - Hubbell HPW66M150C5 or
  - Siemon M1-50

- **Fiber Optic Connector Housing**
  - Corning or
  - Panduit or
  - Hubbell

- **Fiber Optic Wall Mount**
  - Corning or
  - Panduit or
  - Hubbell

- **UTP Protectors** (CAT3)
  - Circa 1890 BC1 series
Appendix D
Cable Management Parts List

The following materials are to be used unless a timely submitted substitute is approved by UT OIT.

CABLE MANAGEMENT

- **Network Rack with 6” Z-Channels (Black)**
  - Hubbell Nextframe CS-1976 or
  - PANDUIT CS1976 to our R2P 2 POST RACK, PLUS WMPVHC45E (NetRunner Vertical Cable Manager Front and Rear 45 RU)

- **Horizontal Management Rack Mount**
  - Hubbell HS23C or
  - PANDUIT CMHPF2 and cover CMHP2C.

- **Cable Management Rings**
  - Hubbell MCCPSR4
  - PANDUIT CMHP1

- **Cable Management Troughs Wall Mount (110 blocks)**
  - Hubbell 110TR series or
  - Panduit equivalent

- **Cable Tray (for ER/TR)**
  - Hubbell Next Frame, 18”, “HL” Series or
  - Cooper B-Line SB17U18B

- **Cable Tray (for corridors)**
  - Hubbell, 18”, “HPW” Series or
  - Cooper B-Line SB17U18B

- **J-Hooks, (up to 40 cables),**
  - Cooper B-Line BCH32 or
  - Panduit JP2W-L20

- **J-Hooks, (up to 10 cables),**
  - Cooper B-Line BCH12 or
  - Panduit JP75W-L20

- **Equipment Shelf**
  - Hubbell MCCCS series or
  - Panduit equivalent

- **Work Area Outlet (WAO)**
  - Coordinate faceplate color with electrical faceplates

- **Office/Classroom Faceplate (4 port)**
  - Hubbell IFP14W (WHITE) or
- Panduit CBEIWy (uses CHF2IW-X mini-com inserts) or
  - Panduit CFPL4WHY MINICOM Faceplate

- **Office/Classroom Faceplate (6 port)**
  - Hubbell IFP16W or
  - Panduit CFPL6WHY

- **Office/Classroom Faceplate (9 port)**
  - Hubbell IFP212W or
  - Panduit CFPF12WH-2G

- **Student Room Faceplate (2 port)**
  - Hubbell IFP12W or
  - Panduit CFPL2WHY

- **HON Furniture Faceplate (2 port)**
  - Hubbell FP2BK (black)
  - Hubbell FP2GY (gray)
  - Panduit CFFPA2BL (black)
  - Panduit CFFPA2IG (gray)

- **Blank Faceplate inserts (White)**
  - Hubbell SFB series or
  - Panduit CMBWH-X

- **Blank Faceplate inserts (Black)**
  - Hubbell SFB series or
  - Panduit CMBBL-X

- **Blank Faceplate inserts (Gray)**
  - Hubbell SFB series or
  - Panduit CMBIG-X
Appendix E
Miscellaneous Material and Parts List

The following materials are to be used unless a timely submitted substitute is approved by UT OIT.

**Miscellaneous**
- **Firestop**
  - 3M “Moldable Pliable Putty” CP-618 or
  - Hilti “Moldable Pliable Putty” CP-618.
    - Tube putty and caulk that cures to an elastomeric solid is not approved in conduit.
  - Hilti FS-ONE around the conduit.
  - For wall pass through, EZ-Path product shall be used.
- **Fire Retardant Paint**
  - Benjamin Moore M59-220(white)
    - up to 2 oz. of tint allowed per gallon.
- **Telecommunications Grounding Busbar**
  - Hubbell HBBBHR19KT (Rack Mount)
  - Panduit RGRB19Y (Threaded)
  - Panduit RGRB19CN (CAGE NUT RAILS)
  - Hubbell HBBB14210A (TGB)
  - Panduit GB2B0304TPI-1
  - Hubbell HBBB14416G (MTGB)
  - Panduit GB4B0612TPI-1
- **Power strip (for network rack)**
  - Hubbell HPWPWR,
  - Panduit CMRPSH15
- **Code Blue Emergency Phone**
  - with keypad and directory plate.
  - CB1D-PAS, with IA4100 / FP2-K for pedestal.
  - Use the CB2E-PAS for wall phones with a IA4100/ FP2-K phone.
- **Handhole (HH) Pull Box**
  - as manufactured by Quazite
  - to be determined on a per project basis.
- **Splice Box Quazite**
  - Lids are to be identified with “Communications” and have pull slots center pins.
- **Splice Enclosures**
  - 3M 505 series (for Copper)
  - 3M (for Fiber Optics)
- **Duct Seal,**
- Ideal 31-605 or
- Gardner Bender GB-DS-110N or
- Panduit DS5 Duct Seal

Please note: All crosses are functional equivalents and may not be exact.***
*** All crosses are based upon description and may not be exact***