The standards listed here are to insure campus interoperability, comply with the Board of Governors Policies and state the minimums of what the campus expects from our maintenance personnel and outside vendors.
Questions, comments or suggestions should be made by email to: **wvsuit@wvstateu.edu**

TECHNICAL STANDARDS FOR TELECOMMUNICATIONS DISTRIBUTION FACILITIES
West Virginia State University

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I - GENERAL SPECIFICATIONS
The specifications contained in this document are meant to serve as minimum guidelines for new construction and all renovations. Special needs such as local data processing and energy management may require extensions to these minimums. All special needs should be considered in the actual designs of risers, conduits, cable trays and inter-building cabling.
Contractors are responsible for notifying before any renovation that may involve existing telephone, data, surveillance, access or control cabling. Minimum time frames are required to make sure that cables are disconnected before any conduit, cabling, fiber, equipment, mounting or physical structure changes are made. Contractors should contact the university project manager or coordinator for submission of electronic notifications to Information Technology.

All notifications by Service ticket request at
https://trackit.wvstateu.edu/TrackIt/SelfService/Account/LogIn

This version of the technical standard provides for voice, data, video and other low voltage signaling functions (such as for energy management and security systems) through twisted pair and coaxial cable media with a pathway to each outlet designed for future installations of fiber optical cable. The objective of these wiring standards is to provide acceptable outlets for any telecommunication device which requires connection to other devices, networks or information services serving general university needs.

Each building is likely to require special telecommunication services not specifically addressed in this standards document. West Virginia State University Information Technology should be contacted prior to establishing an architect's plan for all building renovations and new building construction projects. Campus standards in effect at the time of architect submittals containing communication outlet locations, type of terminations and network equipment provided will be used. Information Technology will only connect systems that meet these minimum guidelines and were previously approved by Information Technology.

All telecommunications work must comply with all Federal, State and local codes, regulations, and standards with variances adopted as standards by West Virginia State University and the State of West Virginia. Applicable state and national standards include: the latest National Electric Code; REA Standards for Engineering, Construction and Installation; FCC Rules and Regulations; National Electrical Safety Code; Joint Commission Accreditation of Hospitals Code; Life Safety Code; and other special codes that may apply.

All submittals and as built documentation will include at least floor plans, plot plans, conduit locations, cable vault locations, lengths, locations, finish room numbers and wire or fiber numbers. As Built drawings and all submittals will be made electronically.

Any questions, variances, contractor or vendor meetings, etc. should be arranged through the campus liaison or project manager. The project manager should submit a University Information Technology service request ticket
at https://trackit.wvstateu.edu/TrackIt/SelfService/Account/LogIn

II - DEFINITIONS

Communications Outlet - The standard telecommunication outlet provides access to all available twisted pair communication media. It will always contain a minimum of one modular CAT5e RJ45 receptacle in a double gang box using the Leviton QuickPort Snap in system of connectors and plates. There will be a minimum run of CAT5e cable to the IDF-1, IDF-2 or MDF for a maximum of 300 feet.

Entrance Cable - The bulk outside plant cable that enters the building from the campus communication distribution network.

IDF-1 (Intermediate Distribution Frame-1) - The IDF-1 is designated as that point where the outside plant cables connect to the riser cables throughout the building. It is possible to have more than one IDF-1 per building. No IDF will be located where access is through any other room. Direct access via corridor or exterior entrance.

IDF-2 (Intermediate Distribution Frame-2) - That point where the riser cables and the station wiring come together. In some situations, an IDF-1 may also serve this function. No IDF will be located where access is through any other room. Direct access must be from a corridor or exterior entrance.

MDF (Main Distribution Frame) - The MDF is designated as the point where the outside plant Single Mode fiber enters the building. The MDF usually serves as an IDF-1 for the building in which it is located. The MDF must be located on the main floor where conduit first enters the building. Direct access must be from a corridor or exterior entrance.

UPS (Uninterruptable Power Supply) - The type that the load is run off the inverter so that complete power isolation is provided. Runtime on the UPS should be determined using battery life near end of life at full load. UPS must be able to run the full load of the network, telephone, door access, wireless, and surveillance systems for 1 hour if the building has an automatic generator with switchgear or 72 hours if the build does not have a generator. (Kanawha Putnam Emergency Planning)

Outside Plant - All transmission facilities used in the distribution of voice, data, or video from the point it leaves one building and enters another. This includes copper, coax, fiber optics, and microwave.
Risers (Building) - The voice, data and coax cable between the IDF-1 and each floor IDF-2 and satellite IDF-2 (rising between floors).
Feeders (Building) - The voice, data and coax cable between the IDF-2 and each satellite IDF-2 (running horizontally on the same floor).
Station Wire - Those wires and cables with terminations at the voice, data or video stations.
Shelter in place phone - Telephone and paging equipment at a location in a building designed for an emergency gathering place that may be used in case of chemical leak, drill or other emergency. The Shelter in Place Telephone must be placed in a quiet area in the Shelter area enclosed in a campus standard lockable enclosure.
Elevator phone - An automatic calling device used to call for help in case of an elevator malfunction or other emergency. This device is usually in an elevator car. The phone places a call that is unique to that elevator car and includes location information in case the occupant can not speak or convey information.
Fire Alarm Interconnect - A network connection used to monitor and control a fire alarm in a building. The campus currently requires interface to Edwards Fireworks monitoring system.
Emergency phone - An automatic calling device used to call for help in case of an emergency. The phone places a call that is unique to that location and includes information in case the caller can not speak or convey information.
As Built Documentation - the plans and documentation showing the complete floor plans, wire numbering, locations and specifications of a project as of the date of completion and acceptance.

WAP (Wireless Access Point) - A device either ceiling mounted or wall mounted containing radios and antennas to provide connectivity to wireless devices via the current campus wireless system.

III - FACILITIES
Voice and Data Trunk and Access Facilities
Inter-Building Facilities
Conduit - two (2) four inch communication conduits are to be installed between each building Intermediate Distribution Frame 1 (IDF-1) and the nearest serving manhole with existing conduits to the campus fiber infrastructure. Conduits are to be encased in concrete. Conduits are to be sealed with pull-ropes installed. Manholes are to be a maximum of 100 yards in distance and Two (2) four foot radius sweeps of the conduits. Pull ropes are to be replaced as cables are placed in conduit for future expansion. Plastic or composite hand holds are not acceptable. Concrete vaults with proper steel forged covers are required.
Inter-Building Fiber Plant - should be a minimum of six (OC4) multimode fibers, and twenty four (24) 9 micron single mode fibers terminated with ST type connectors connected to rack mounted ST type patch panels.
Inter-Building Coaxial cable will be the type approved by the local cable provider.
No cable should be installed in any facilities other than those intended for that use. Gas pipe and water pipes must not be used for conduit under any circumstances.
All cables that are to be connected to or disconnected from the campus communication network must be recorded with the West Virginia State University Information Technology. Cable number, number of bundles, number of pairs, gauge, type, and termination points must be submitted electronically or in writing to be recorded by Information Technology.
Communications Equipment Room (IDF-1)
Space for connection of building circuits to the outside plant shall be provided as a separate room and not shared with other utility services, particularly the electrical service. When possible, it should not be adjacent to the electrical distribution room. Access to the room will be controlled with a proximity and code (2 factor) (controlled by the campus access system) access system commonly used by Information Technology. Environmental and security monitoring is required on all MDF's,

IDF's and any room designed to house more than 1 router, switch, server, or processor. Currently monitoring is done with network connected Netbotz 355 with door switches and included camera, temperature, and humidity sensors.
Minimum room size is 6 foot by 8 foot (48 square feet). Up to 400 square feet may be required for locations that house remote switching equipment or servers. The room needs to be large enough to accommodate the wall mounted racks including required equipment. These rooms require separate air conditioning with environmental controls to remove heat from electronic communications equipment. High lighting levels are needed. A minimum of two duplex outlets on one 120V, 20 amp circuit and 1 30 amp twist lock on a separate 30 amp circuit is required for UPS connection. Outlets should be placed where a 6 foot power cord from the UPS will reach without an extension cord. The feeds must be isolated from any motors, air conditioning, or lighting circuits. Additional circuits will be required if remote switching or servers are installed in the IDF. The electrical supply must be from an emergency generator backed up circuit. Additional 30 minutes of separate battery backup (UPS) will be provided for each circuit. The UPS must be sized to provide 60 minutes run time at 2KVa when powered from an emergency generator. The room must have a low humidity level and not be subject to a heat source such as steam lines. The room must have a vent for backup heat dissipation. The environmental conditions must be maintained within the specifications of all equipment.
A building earth ground bonded to the electric power ground must be provided by the building contractor. All communications equipment rooms must be connected to this ground by an independent #6 solid copper wire.
Special ventilation may be required for a battery backup system in some buildings. "Maintenance Free" batteries are recommended to avoid this problem.
A 3/4" plywood backboard of a minimum of 4' x 8' will be required in the telecommunications main entrance room. Mounting of each backboard shall be 3' above the finished floor if space permits. The backboard will be coated with fire resistive paint.

A lockable swing out rack with a full Plexiglas lockable door must be provided with enough space for all patch panels, switches, fiber trays, controllers, etc. and will be permanently mounted with enough room to open and work on the equipment from the rear. Rack must contain rear rails and deep enough to mount full sized servers if needed. MDF or IDF has to meet PCI 3.0, FERPA, HEOA, GLBA requirements. Racks must be keyed with a WVSU IT cabinet lock.
All station, communication outlet, feeder, fiber and riser cables are to be terminated on Leviton quick port rack mount patch panels or Leviton fiber splice trays. All 24 port patch panels are to be space at least 2 rack units apart to accommodate network switches while allowing access to repair individual keystones.

All station cable patch panels should be the 24 port type with mounting space immediately above for a POE+ Layer 2 type network switch. Only 1 ' patch cables are to be used between network switches and station cable jacks as to not require any horizontal cable management and status lights on the network switches to remain visible. Enough space between station cable jack fields shall be provided to allow easy replacement of jacks.

Building Distribution Systems

Horizontal Distribution System

Cable trays are to be used to facilitate present and future communication wiring distribution. A tray on each floor will feed directly back to the communication closet or closets.
The cable trays are to have a cross section of at least 4" by 8". The cable trays are to be installed as low as possible above the ceiling and secured to the side wall with an "L" shaped bracket. It is important for future use that at least 18" clearance be maintained on the free side of the trays and that at least 10" clearance is maintained above the trays. All 90 degree turns should be made by two 45 degree turns where possible. Cable trays are to be accessible with a standard 6 foot ladder.
Each communication outlet will be stubbed out near the cable tray using 3/4 inch conduit for single outlet and 1 inch conduit where two outlets are served by a single conduit. No conduit shall have

more than one 90 degree bend or any bend greater than 90 degrees. No bend shall have less than a 12 inch radius.
The installer of any new conduit or cable tray for audio-visual or communications wiring shall also provide a pull-line. This shall include cable trays and conduit in walls leading to communication outlets.

Horizontal Cable

CMP Type cable must be used in any air plenum installation where conduit is not available. The cable must meet the requirements of the fire marshal or fire authority having jurisdiction over that building.
Cable may be run exposed above ceilings, provided the cabling is supported independent of other utilities, such as conduits, pipes, ceiling support systems.
All wiring inside of rooms should be protected by conduit or other means such as wire mold. All remodel or new construction will provide conduit to all communications outlets as specified above. Communication outlets should be installed at standard outlet heights depending on room use. No outlets may be placed behind furniture that does not allow for complete and easy access to the communications outlet. At least 1 outlet with 1 data connection is installed every 10 foot of wall at standard outlet height. At least 1 data outlet installed high on the wall, 10" below finished ceiling, for wireless access points should be provided for 300 square foot of floor space or where appropriate as determined by RF site survey. The RF site survey is the responsibility of the architect and an electronic copy will be provided to the appropriate Information Technology personnel for approval before the job is accepted by the University. Conduit and wiring will also be provided to locations needed for card entry, wireless (PIMs), fire alarm, building HVAC, messaging displays, emergency phone, elevator phone, shelter in place phone, video surveillance, and door lock systems. All station cable terminations and interface boxes will be mounted in secure locations at comfortable working height. Locations of interface boxes, Fire Alarm Panels, HVAC interfaces and controls, and lighting controls are required to be in network rooms/MDF/IDF.

Floor Distribution System

Floor communication closets, IDF-2's, should be located centrally in an area such that the total distance from the closet to any communication outlets on the floor is no greater than 300 feet. One centrally located communication closet is desirable on each floor if the 300 foot distance limitation can be met. Communication closets should be stacked vertically one above the other with at least two (2) four inch sleeves between closets. Station cables are not to be run between floors.
Floor communication closets, IDF-2's, must be at least 6 foot by 6 foot (36 square feet). When the minimum size space is provided it should have door opening to permit maximum work space.
Floor communication closets, IDF-2's, may need separate air conditioning with environmental controls to remove heat from electronic communications equipment. High lighting levels are needed.
At least two duplex outlets served by one 120V, 20 amp circuit with isolated ground whose feed is from a UPS with 30 minutes run time for a 2KVa load supplied by an emergency generator isolated from any motors, air conditioning, or lighting circuits must be provided.
Twisted pair cable from the communication outlets shall be terminated in the IDF located as close to the outlet as possible, rather than at the single (or major) communications room for the building if the total cable length would be more than 300 feet. These terminations are in turn connected to the building's communications equipment room (IDF-1) by 6 fiber multimode (OC4).
Data station jacks are to be terminated on Leviton Quickport RJ45 connections on rack mounted patch panels.
Data circuits run in the risers must be clearly labeled to assure they will not be disturbed.

Data Riser

Data riser cable shall be made by multimode OC4 fibers. Enough fibers to include 2 for each 24 data outlets plus 10% are required as a home run from the MDF.

Standards for Communication Outlet Installation

All station wiring from the IDF to a communication outlet shall meet the AT&T (568B) wiring standard for category 5e cable specification.

All station wiring will be connected or punched down in numerical order in each MDF, IDF-1 or IDF-2.
All network or data connections will use blue jacks under the data or voice. F type coax jacks will be used for coaxial cable connections.
Specification for Category 5e Cable Pair Type:
Pair No. Color Combination
1 Blue/White & White/Blue
2 Orange/White & White/Orange
3 Green/White & White/Green
4 Brown/White & White/Brown
The four unshielded pairs (1 through 4) will be terminated on a Leviton Quickport RJ45 in a faceplate or leviton surface mount receptacle at the station and on a Leviton Quickport RJ45 in a leviton rack mount patch panel using AT&T (568B) wiring standard.
RJ45 terminations must be made to campus standard patch panels. Wire jack connections shall be permanently marked on both ends of the wire, room jack, and RJ45 patch panel with the same non-duplicated number.
All station wire must be home run from the station to the nearest serving IDF on the same floor. All station wire and cables must be permanently marked on the cable and the face plate, jack or jack field with the same number on both ends.
The standard telecommunication outlet provides access to all available communication media. It will always contain at least two modular RJ45 receptacles.
Each communication outlet (equipped or wired for) shall require one duplex outlet in addition to present design requirements just to accommodate the need to "plug in" electronic equipment.
Communications outlets will be spaced no further than 10 foot apart around the perimeter of each room where possible. All outlets will have conduit from a single gang box to an accessible ceiling or wire tray.
Communication outlets for campus wireless access points will be provided for a minimum of one in each classroom, conference room or room designed for meeting with more than 2 people.
Communications outlets for campus wireless access will also be provided at a minimum of one every 1000 square foot of floor space. Communications outlets for access points will be provided at a standard height on walls normally used for emergency lighting.
Any new or room renovations will include all infrastructure needed to add the new CAT 5e station cables, access points, switch and fiber infrastructure to existing campus managed systems. This additional equipment and infrastructure will be part of any renovation or construction project.
In any renovation and new construction projects where the IDFs are not stacked, the contract for electrical work shall include requirements for installation of two (2) riser conduits (4" minimum diameter) from the IDF-1 to each IDF-2. Junction or "pull" boxes shall be provided in each conduit run having more than two (2) 90 degree turns. Pull-lines are to be installed in all new conduits to facilitate future installation of cable(s). To facilitate future cable installations, a new pull string shall be installed in conduit simultaneously with the pull-in of cable.
All feeder and riser cables are to be terminated on Leviton fiber trays.

Fiber Optic Cable System

Minimum number fiber count when installing a fiber bundle, consisting of twenty four (24) 9 micron single mode in a tight tube outdoor type cable, between each major building. All splices to be fusion type and mechanically secure in an indoor accessible secure area.
Fiber Optic Standards
Multimode Optical Fiber Specifications:
OC4 specifications
Single mode Optical Fiber Specifications:
Cladding diameter- 125.0 + 2.0 micron Core diameter- 9 micron Core concentricity- 7.5% maximum Core circularity- 20% maximum Refractive index delta- 2.0% Numerical aperture- 0.29 Attenuation range- 3.6 - 4.6 dB/km @ 825 nm Mean deviation- 0.15 dB Bandwidth range- 1600 MHz-Km, min. Typical splice loss- 0.15 dB (array); 0.28 dB (fusion) Coating diameter- 245 + 19 micron

All fiber terminations shall be the ST connector with a bayonet style coupling.
All fiber field splices will be by fusion method and splice loss measured with an OTDR. Typical end to end loss should not exceed 0.35 dB as measured from both directions on each fiber and average overall loss. In no case shall the end to end exceed (n x 1.25 x .28) where n is the number of splices. The loss budget for any section should include provision for at least two repair splices during the life of the cable.

IV - LABELING CONVENTIONS

It is important that all receptacles, cables, and IDF terminations be labeled with the standard identification tag. The receptacles are to be identified using the following conventions:
V - CABLE ID
At least four (4) digits used on any fiber bundle connecting two buildings. Numbering to be coordinated and recorded with Information Technology. 9999 ->Sequential cable number.
Building designation and room numbering
Building designation letters must be registered and approved by University IT. Letters may not be added to or changed for existing buildings for renovation purposes. Building designations must be entered in the HEVIS and WVSU Banner system before being accepted. Rooms numbers must be sequential and in an intuitive pattern.
Station cable numbering
The same sequential number must be placed on each end of the cable. The number is to be permanently placed on both ends of the cable jacket and on the Faceplate and punch down.
Patch Panel and cable standard labeling: The number shall be composed of the patch panel letter and a number beginning with 1 and up to 24 matching the patch panel and jack position. The station outlet number will coincide with the IDF jack field. "As Built" drawings including the "finished room number" station cable, feeder and riser numbers is to be provided to the appropriate Information Technology personnel before the work is accepted.

VI - MATERIAL and TESTING SPECIFICATIONS

General
The University will accept approved equivalent materials to model numbers listed as long as submittals have been pre-approved in writing by Information Technology staff.

All vendors and contractors are responsible for the re installation and replacement of any equipment taken out of service, temporary or permanent, demolition, remodel or new project.
All equipment, cable, wire, hardware, labor and materials including but not limited to the following items will be supplied by vendor as part of the project.

- All switches, routers, optics, wireless access points, controllers, switch modules, core modules for a live connection from the campus core switch to the station outlet or required equipment.
- All surveillance cameras, network video recorders, licenses, and viewing stations to add appropriate capacity for the project.
- All gateways, routers and interfaces for complete control of all HVAC systems and monitoring.
- All compatible fire alarms, voice notification and monitoring to existing systems.
- All locks, doors hardware, PIMs, controllers site survey, interconnections, licenses for access control on all doors external and internal to the existing door access system as required by the campus locksmith.
- All telephone sets, ShIP sets, emergency stations, elevator interfaces, licenses for complete integration into existing campus telephone system.
- All connecting blocks
- All mounting brackets
- All station cable
- All feeder cable and fiber
- All modular station receptacles
- All cross connect cable

- All station blocks
- All interconnect cables and jack fields when required
- All cable end termination devices
- All relay frames, mounting ladders and ladder end caps
- All wall mounted lockable swing out racks and Plexiglas lockable doors
- All conduit
- All cable trays, hangers, and mounting hardware
- All tie wraps, bushings, and miscellaneous
- All installation tools, other materials and equipment necessary to complete a turnkey installation
- All labor necessary for a turnkey installation
- All Fire Retardant plywood backboards

  Vendor will be responsible for the installation and the securing of the fiber from main distribution frame (MDF) and/or the wire center to each building IDF-1 in consideration.
  Vendor will be responsible for the mounting of all connecting blocks, relay frames, jack fields, circuit protectors, etc.
  Vendor will be responsible for the appropriate termination of all coaxial, data and fiber optic cables.
  Vendor shall be responsible for the installation of all racks and distribution panels.
  Voice and Data Cable
  Vendor will be responsible for verifying pair validity in all feeder and riser cables through toning or an equivalent method as approved by appropriate University representative.
  Vendor shall test every pair in every cable and on an end-to-end basis after splicing and terminating. Test record forms shall be agreed upon by vendor and the University prior to testing. There shall be no defective pairs in any cables.
  All cable will be marked clearly and legibly at both ends.

  All network and power outlets will be labeled with Patch and Jack number, Power with panel and breaker number
  Station locations will be marked on connecting blocks and distribution panels at all IDF's.
  Fiber Optic Cable
  There shall be no defective optical fiber in any cable. All fiber in a bundle shall be tested on an end-to-end basis. Typical end to end loss should not exceed 0.35 dB as measured from both directions on each fiber and averaged for overall loss.

  Current applications used on campus
  Door Access - Lenel -All doors with 2 factor access, proximity and keypad. Any doors without considered emergency exit only - all exterior doors to have position switches
  Fire Alarm - Edwards EST3 with voice and paging, monitored by campus fireworks server via campus network
  HVAC - ALC currently monitored and controlled via WebCtrl via campus network
  Surveillance - Avigilon Enterprise Avigilon cameras via campus network
  Elevators - Elevator phone must be VOIP compatible with Mitel/ShoreTel - In car cameras are required.
  Campus Network - Switches etc. D-Link

  Document History:

  -Original November 2006

  -April 2008, Additions for the requirement of relay frames, locking wall mounted racks and patch panels

-December 7, 2008, Additions of emergency generator power, environment, Uninterruptable Power Supply (UPS), network equipment and other requirements for emergency communications during an emergency and the campus plan to move to Voice over Internet Protocol (VOIP)

-Updated June 2010, jack colors and order. Punch downs specified in numerical order.

-Updated October 2010 to add under general meetings etc. requested by service request through the campus project manager.

-Updated November 2010, "As Built" definition added.

-Updated April 2012, removed requirement for copper wiring between buildings and added requirements for station cabling to HVAC, Fire Alarm panels, Video surveillance, message displays and door locks.

-Updated July 2013, changed Computer Services to Information Technology or University Information Technology.
-Updated January 2014, included room numbering, Access point locations.

-Updated October 2015 to include all equipment for turnkey operations.

-Updated May 2016 to new patch panel numbering method, location of all access, lock, fire alarm, lighting and HVAC controls in MDF/IDF.

-Updated September 2021 - All Notifications via TrackIt!
https://trackit.wvstateu.edu/TrackIt/SelfService/Account/LogIn