



# **Standards for Communications Infrastructure**

Computing & Information Technology  
Wayne State University  
5925 Woodward  
Detroit, Michigan 48202

Revised: 29 July 2019

<https://tech.wayne.edu/docs/wsu-communications-standards.pdf>

## Revision History

<b>29 July 2019</b>	Changed CSI (Construction Specification Institute) section numbers to 27000 series. All sections renumbered. Added installation and system requirements for VOIP, wireless, security cameras. Also clarified building renovation project requirements, changed tester model, updated test specifications, revised format.
<b>13 March 2015</b>	Updated to add additional installation and system requirements for VOIP, Wireless access points, security cameras. Added Digital Signage, clarify renovated space requirements, revised tester requirements, test specifications, removed Multi Mode fiber requirements between buildings, etc.
<b>13 February 2014</b>	Updated to add new systems requirements, specifications, clarify wording, revised tester to be used, test specifications, numbers, bullets, etc.
<b>31 October 2012</b>	Updated to add and clarify systems requirements, specifications, clarify wording, remove redundant specifications, numbers, bullets, etc.
<b>31 October 2010</b>	Updated to include additional manufacturers of approved structure cabling systems, clarify wording, Add page numbers, fix table of contents page numbers, etc.
<b>15 June 2009</b>	Updated to include additional manufacturers of approved structure cabling systems.
<b>29 April 2005</b>	Updated to include exact manufacturer product names for approved Category 6e (cat6e) structured cabling system components. Add URL for online copy of this document in Adobe Acrobat (.pdf) format.
<b>1 December 2004</b>	First publication of completely revised document. All sections rewritten.
<b>24 March 2003</b>	Changed CSI section numbers to 17000. All sections renumbered.
<b>12 July 2000</b>	2nd publication of complete document. All sections complete.
<b>30 April 1999</b>	1st publication of complete document. CSI format sections in 16000 number series.
<b>13 August 1998</b>	Partial publication of standards document.

## Contents

<b>Revision History .....</b>	<b>2</b>
<b>Acknowledgements.....</b>	<b>6</b>
<b>WSU Telecommunications Design Requirements.....</b>	<b>7</b>
1. <i>Applicable Standards .....</i>	<i>7</i>
<b>Specific WSU Requirements .....</b>	<b>8</b>
1. <i>Drawing Requirements/Deliverables .....</i>	<i>8</i>
2. <i>Renovated Area IT Requirements .....</i>	<i>8</i>
4. <i>Tenants in WSU Retail Spaces .....</i>	<i>9</i>
5. <i>Construction Administration.....</i>	<i>9</i>
6. <i>Systems and Performance .....</i>	<i>9</i>
7. <i>Outside Plant and Entrance Facilities .....</i>	<i>9</i>
8. <i>Grounding.....</i>	<i>10</i>
9. <i>Telecommunications Rooms (MDF, IDF) .....</i>	<i>10</i>
10. <i>Pathways.....</i>	<i>12</i>
11. <i>Fiber Backbone Cabling.....</i>	<i>13</i>
12. <i>Copper Horizontal Cabling.....</i>	<i>13</i>
13. <i>Security Cameras.....</i>	<i>13</i>
14. <i>Building Access Standards.....</i>	<i>15</i>
15. <i>Wireless access points.....</i>	<i>16</i>
16. <i>Emergency Phones .....</i>	<i>18</i>
Blue Light Phones .....	18
Blue Light phone with camera - wall mount.....	18
Blue Light phones - Existing .....	18
Blue Light Components:.....	18
Elevators .....	19
“Area of Rescue” Elevator Lobby Phones .....	19

Analog Gateways .....	19
Emergency Power .....	19
Cable Infrastructure .....	19
Estimated Equipment Lead Times .....	20
17. IPTV in student lounges.....	20
18. OneCard Infrastructure Installation.....	20
19. Workstation Outlets .....	20
20. Jack Labeling .....	21
21. Testing and documentation .....	22
<b>Section 27010 - Telecommunications general requirements .....</b>	<b>23</b>
1. General .....	23
2. Execution .....	26
<b>Section 27110 - Telecommunications interior pathways .....</b>	<b>30</b>
1. General .....	30
2. Products.....	31
3. Execution .....	31
<b>Section 27130 - Communication equipment spaces support hardware .....</b>	<b>33</b>
1. General .....	33
2. Products.....	33
3. Execution .....	36
<b>Section 27150 - Telecommunications cabling .....</b>	<b>38</b>
1. General .....	38
2. Products.....	41
3. Execution .....	46
<b>Section 27170 - Cable plant administration and testing .....</b>	<b>48</b>
1. General .....	48
2. Products.....	48

3. Execution .....	48
<b>Section 27600 – C&amp;IT digital signage specifications.....</b>	<b>52</b>

## Acknowledgements

Pete Garabedian  
Computing & Information Technology  
5925 Woodward  
Detroit, Michigan 48202-3555  
Tel: 313-577-1955  
<https://tech.wayne.edu>

## C&IT Infrastructure and Operations

**Laura Hendrick**, Senior Director, Infrastructure and Operations  
**Juan Richardson**, Interim Director, Network Engineering  
**Kathy Guarano**, Director, Telecommunications

**Clint Guethlein**, Network Engineering & Security  
**Mark Hamel**, Network Engineering & Security  
**David Fleig**, Network Engineering  
**Matt Lessins**, Network Engineering  
**Gary Morris**, Network Engineering & Security  
**Tim Muir**, Network Engineering  
**Carlo Musante**, Network Engineering  
**Steve Wassef**, Senior Systems Administrator, Desk Tech  
**Chuck Zuber**, Network Engineering

## Facilities Planning & Management (WSU)

**Fran Ahern**, Director III  
**Mark Gibbons**  
**Matt Walker**

Facilities Planning & Management  
5454 Cass  
Detroit, Michigan 48202  
Tel: 313-577-4310  
Fax: 313-577-1817  
<https://www.facilities.wayne.edu>

### Other sources

**BICSI** (Building Industry Consulting Service International)  
**Tim Bloch**, RCDD - Structured Innovations  
**Kevin Davis**, RCDD - Western TelCom  
**Paul Creamer**, RCDD - Compass Technologies  
**Tom Hilla**, RCDD - Parallel Solutions, LLC

# WSU Telecommunications Design Requirements

## 1. Applicable Standards

- 1.1. Unless specifically indicated otherwise in this document, all telecommunications infrastructure shall be design in accordance with the following standards including all appropriate addendums and revisions:

<b>ANSI/TIA-568-C</b>	Commercial Building Telecommunications Cabling Standard
<b>ANSI/TIA-606-B</b>	Administration Standard for Commercial Telecommunications Infrastructure
<b>ANSI J-STD-607-B</b>	Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
<b>ANSI/TIA-758</b>	Customer Owned Outside Plant Telecommunications Cabling Standard
<b>BICSI</b>	Telecommunications Distribution Methods Manual (TDMM)
<b>BICSI</b>	Telecommunications Cabling Installation Manual (TCIM)
<b>ANSI/TIA 569-C</b>	Commercial Building Standards for Telecommunications Pathways and Spaces

## Specific WSU Requirements

### 1. Drawing Requirements/Deliverables

1. All drawings for cable, connectors, and hardware must be reviewed and approved by C&IT for compliance with project specifications and **WSU Standards for Communication Infrastructure**.
2. The IT components must be shown in their entirety on one drawing.
3. At project completion, provide as-built IT discipline component CAD drawings with each IT discipline on their own layer.
4. Drawing must show in footnote **CSI format (Division 27-Communications)** specifications for cable, connectors, and cable management hardware as well as compliance to WSU standards for communication infrastructure.
5. Drawings must show:
  - 5.1. Telecommunications room locations, dimensions, and zone plan indicating areas served by each room.
  - 5.2. Backbone riser diagrams indicating connectivity relationships between communications rooms.
  - 5.3. "J" hook and cable tray pathways for backbone and horizontal cabling
  - 5.4. IDF communication room grounding riser.
  - 5.5. Details of all grounding within the MDF communication room.
  - 5.6. Communication fiber cabling backbone riser. In the case of a building renovation where existing riser cabling exists, the last 4 strands of any fiber cannot be used for the renovation project. If this condition exists, FP&M and C&IT must negotiate if 2 of the last 4 strands can be used or the project will install a new riser cable.
  - 5.7. Main cable tray size and pathway layouts.
  - 5.8. Identify all communication component placement for typical spaces.
  - 5.9. Details of backboard elevations indicating space allocated for wall fields, equipment, etc.
  - 5.10. Details of rack elevations indicating all patch panels placement, cable management, structural supports, ground connections and space allocated for owner provided network electronics and any UPS/power conditioners.
  - 5.11. Details of telecommunications room plans indicating placement of racks, cable runway, and wall mounted systems and ground bus locations.
  - 5.12. Details of all intended pathways and raceways for horizontal and backbone cable. This includes outside conduits to blue light phones.
  - 5.13. Details of outlet configurations by unique symbol and/or schedule
  - 5.14. Identify all non-communication component locations. These items must be clearly shown on the IT component drawings. This is not debatable and must be identified.

### 2. Renovated Area IT Requirements

1. At project initiation, the assigned architect must audit and provide a report for C&IT review detailing all existing all low voltage communication infrastructure to be demolished prior to start of project to determine IT impacts.
2. Existing communication cabling which does not meet BICSI standards cannot be included in the project. New cable and or conduit must be installed.



3. At project initiation the assigned architect must audit and provide a design detailing existing IT communication room component and layout and proposed IT project impact including specific data counts to IT closets. This validation of existing IT room capacity and layout is required prior to project start.

#### 4. Tenants in WSU Retail Spaces

1. It is strongly recommended that lease tenants build their communication infrastructure adhering to the same WSU standards for communication infrastructure, but it isn't a mandatory requirement.
2. Lease tenants must provide their own IT communication interconnection between their communication room and the WSU building main communication room.
3. If lease tenant is a WSU affiliate, WSU will provide ISP network connectivity. There cannot be any P.O.S. (point of sale) transactions on this connectivity provided.
4. If lease tenant is not a WSU affiliate, they will need to purchase their own ISP network connectivity.

#### 5. Construction Administration

1. The FP&M and C&IT staff will make periodic construction visits to observe the installation for conformance to project specifications, proper installation practices and the adherence to C&IT standards for communication infrastructure. Any out of compliance items shall be noted to the project team.
2. The FP&M and C&IT project managers will perform final punch list of all communication systems installed.

#### 6. Systems and Performance

1. Designed to support 1Gbps Ethernet to the desktop over CAT6E copper cabling.
2. Intra-building backbone shall support 10Gbps Ethernet on 50-micron multi-mode fiber cabling between communication rooms.
3. Specific IT design and services to be coordinated with C&IT.
4. Final design must be approved by C&IT.

#### 7. Outside Plant and Entrance Facilities

1. Incoming Service Requirements
  - 1.1. Provide a minimum of four 4" conduits from nearest telecommunications manhole, tunnel, etc. to the service entrance facility: two for WSU, one for AT&T and one as an emergency maintenance spare.
    - 1.1.1. Conduits shall be HDPE if buried underground. Steel conduit when cast in concrete. PVC conduit is only allowed overhead in parking structure decks.
    - 1.1.2. Coordinate all third party entities pathway route from building/property to their respective manhole locations.

- 1.1.3. Coordinate with C&IT for further definition of design requirements for WSU data or external service provider connectivity.
  - 1.1.4. In the 4" conduit a #6 tracer wire must be installed.
  - 1.1.5. The 4" conduit must be built to the property line. No third party will not install any manholes or conduits on private property.
- 1.2. Provide three 1 ¼" inner ducts in all of the service entrance conduits.
  - 1.2.1. A pull string must be installed In each inner duct.
  - 1.2.2. The inner ducts installed must extend 6 to 8 inches past the conduit at both ends.
- 2. Manholes, Handholes
  - 2.1. Provide additional manholes and/or handholes to minimize cable pulls to 400', with a maximum of two 90-degree bends.
    - 2.1.1. In streets and driveways, provide 5'x5'x5' concrete manhole with round cast iron cover.
    - 2.1.2. In sidewalks, provide 5'x5'x5' concrete handhole with a round cast iron cover.
    - 2.1.3. In Green Areas, provide "Quazite" handholes that are 24" W x 42" D x 36" L.
    - 2.1.4. Locate Quazite handholes in green space only.
  - 2.2. Provide a #6 gauge solid copper tracer wire in all exterior conduits for future conduit locating usage.
  - 2.3. Upon completion, before final payment, the following must be provided:
  - 2.4. Provide a site plan of installed conduit showing conduit location, quantities and depth.
  - 2.5. No exception to this will be allowed.

## 8. Grounding

- 1. Ground Bus
  - 1.1. Provide ¼" x 2" x 2' ground bus in each telecommunications room.
  - 1.2. Provide ¼" x 2" x 4' ground bus in the main telecommunications room.
- 2. Bonding Backbone
  - 2.1. Provide a #4/0 AWG insulated copper bonding backbone from the main ground bus in the service entrance facility (MDF) to the intermediate rooms (IDF) with #6 jumper to TGB's.
  - 2.2. Do not route bonding backbone within 18" of electrical feeders.
- 3. Equipment
  - 3.1. Bond all racks, cabinets, etc., to ground bus in each telecommunications room with #6 AWG insulated green jacket ground conductor.
- 4. Performance
  - 4.1. Maximum 2 ohms DC resistance.

## 9. Telecommunications Rooms (MDF, IDF)

- 1. Spacing Criteria
  - 1.1. Stack communication rooms wherever possible.
  - 1.2. Provide one communication room for every 10 to 20,000 sq.ft. Verify communication cable is less than 250 ft. in length to the farthest device.

- 1.3. Cable length from communication room to any device shall not exceed 250'. If this is the case, additional closets will need to be built to serve the area.
- 1.4. Centrally locate communication rooms on a floor to minimize horizontal cable lengths and maximize the service area of the communication room.
- 1.5. Any room built within a structure or within a room with C&IT supported network equipment is considered an IDF, and must adhere to all C&IT requirements outlined in this document.
2. Security
  - 2.1. If the communication rooms are a shared space with any other building infrastructure, the room must have WSU OneCard electronics installed to control room access.
  - 2.2. All shared space new communication rooms will be fitted with the new WSU/Best lock key series # 88672 as an emergency bypass key only.
  - 2.3. If the communication rooms are not a shared space and they only contain C&IT network equipment in the room and budget is of concern, the room may be fitted with the legacy WSU / Best lock key series # 25299 to secure the room.
  - 2.4. The final design layout must be coordinated with at least one person from WSU FP&M, WSU C&IT and WSU OneCard office and approval from C&IT.
  - 2.5. Key Distribution to WSU employees only.
3. Room Sizes
  - 3.1. Provide a minimum of one (10'x12') MDF communications per building.
  - 3.2. Provide a minimum of one IDF communications room per floor to meet the CAT6E 250-foot limit. (exceptions could be multi-story buildings with small floor plate.)
  - 3.3. 8' x 10' for rooms serving (175) outlets or 3 racks, and 10 x12' for rooms serving between (176) and (325) outlets, or 6 racks.
  - 3.4. Adjust room sizes accordingly for additional systems (video, security, access control, etc.)
4. Layout
  - 4.1. Final room design must be approved by WSU/C&IT.
  - 4.2. Provide Fire Rated ¾" grade plywood. Do not paint.
  - 4.3. Communication rooms must have either tile floors or sealed concrete
  - 4.4. Provide minimum 2 racks per telecommunications room.
    - 4.4.1. Allow minimum of 24" deep for rack equipment, 36" clearance behind racks and 36" in front of racks.
    - 4.4.2. Allow minimum of 36" deep for equipment cabinets, 36" clearance behind racks and 36" in front of racks.
    - 4.4.3. Allow for 12" deep equipment on wall fields when calculating clearances.
    - 4.4.4. Provide 12" ladder rack around 3 sides of room and to each equipment rack.
    - 4.4.5. Ladder tray shall be secured to the top of the equipment racks.
  - 4.5. Doors shall always swing out and must be fitted with a door closer.
5. Lighting
  - 5.1. Locate lighting in front of and behind racks, not above, at minimum height of 7'-6" AFF.
  - 5.2. Provide 50fc minimum at floor level.

6. Power
  - 6.1. Provide dedicated 12 circuit panel board in the MDF telecommunication room for 120-volt 20-amp and 208-volt 30-amp single-phase circuits. This panel will supply service to the MDF and all IDF telecommunication rooms.
  - 6.2. Connect the above dedicated 12 circuit panel board to the building generator and/or building UPS. Design for full panel capacity.
  - 6.3. Provide dedicated feeder/riser for all telecommunications room dedicated panel boards. No other loads shall be served by this feeder.
  - 6.4. Provide a minimum of one 120-volt 20-amp dedicated circuit for each equipment rack.
  - 6.5. Provide a 120-volt, 20-amp, single phase "Metered" PDU/ Power Strip for the 120-volt circuit.
  - 6.6. Provide one additional 120-volt, 20-amp circuit for service outlets, one on each wall.
  - 6.7. Provide a minimum of one 208-volt 30-amp single phase dedicated circuit for each equipment rack. An additional circuit may be required pre-rack depending on the type and quantity of equipment installed. Terminate this circuit on a L6-30 Receptacle at the top of the equipment rack. Coordinate final location with WSU/C&IT.
  - 6.8. Provide a 208-volt 30-amp single phase "Metered" PDU/Power Strip for each 208 volt circuit.
  - 6.9. Provide 8" space at the bottom of each rack for owner provided rack mounted UPS and/or power conditioner.
7. Environmental
  - 7.1. Provide cooling based on a coordinated room by room design with C&IT.
  - 7.2. Utilize building cooling systems whenever possible.

## 10. Pathways

1. Backbone
  - 1.1. Provide minimum four 4" sleeves through floors in stacked rooms. These sleeves shall be sized progressively smaller or less of them as you move away from the serving closet. Size will accommodate 30% growth after cable is installed.
  - 1.2. Where rooms are not stacked, provide minimum two 4" conduits continuous between rooms.
  - 1.3. Connect Communications Rooms on same floor with minimum of one 4" conduit.
  - 1.4. Conduit between rooms shall have no more than two 90-degree bends and/or over 150' without pull box. Pull boxes shall be sized per the number of conduits.
  - 1.5. Sleeves shall consist of galvanized rigid steel conduit with bushings and stub above the floor a minimum of 4" .
2. Horizontal, accessible ceiling spaces
  - 2.1. Provide cable trays down corridors whenever possible. If cost prohibitive, J-hooks are acceptable. Provide J-Hooks for cable bundles of 24 and below.
  - 2.2. Route main cable runs through accessible corridor spaces and drop off into each room from the main runs.
  - 2.3. Do not route main cable trays or cable bundles through classrooms or offices.
  - 2.4. Maintain 12" minimum between cable tray fluorescent lighting.
  - 2.5. Terminate cable to the nearest communication room on the same floor. Only in special cases will the horizontal cable terminate in a communication room on a different floor. Coordinate this location with FP&M and / or C&IT project manager.

## 11. Fiber Backbone Cabling

1. Inter-building (Between building hubs)
  - 1.1. 96 strand single mode (glass fiber as manufactured by Corning) between hub buildings
  - 1.2. Provide 15' service slack loop in telecommunications room.
  - 1.3. Provide 30' service slack loop in manhole.
2. Inter-building (Between building hub to endpoint)
  - 2.1. 36 strand single mode (glass fiber as manufactured by Corning) between hub and endpoint buildings.
  - 2.2. Provide 15' service slack loop in each telecommunications room.
3. Intra-building
  - 3.1. Minimum 12 multi-mode and 12 single mode fiber riser cable between MDFs and IDFs.
  - 3.2. Provide 15' of service slack loop at each communication room end.

## 12. Copper Horizontal Cabling

1. Provide cable and connectors only from WSU preferred manufacturers list.
2. Always install Category "6E (enhanced)" UTP cable.
3. Terminate on its own patch panel in equipment rack.
4. Cable shall be Green.
5. Data Outlet
  - 5.1. Jacks shall be orange located in the outlet bottom position (vertical) or the outlet right position (horizontal)
  - 5.2. Provide two gray patch cords per data outlet.

## 13. Security Cameras

1. All security camera installations must be reviewed and approved by WSU Police and C&IT.
2. Installing contractor and their technicians must be trained and certified in the camera product they are installing to guarantee proper configuration, installation and warranty.
3. All security camera systems, new, modified or inherited must function with WSU camera management system for WSU Police access.
4. Final design must be approved by WSU Police and C&IT. Any inherited or remodeled camera systems with camera models or equipment older than five years old (At the time the construction commences) must be updated and replaced with newer camera models.
5. All security cameras make and model specified in the design installation must be one listed on the WSU VMS (video management system) compatibility list. The current list is available for design upon request from C&IT Network Engineering. Final design must be approved by WSU Police and C&IT.
6. If any alterations are made after the original approval to the design they must also be approved by WSU Police and C&IT. Any changes in original approved camera models must be approved again by C&IT. Any permanent deletions of approved camera locations must have WSUPD and C&IT input before final decisions can be made. All of this must be time and date stamped and submitted in writing.
7. Any security camera design or device being enacted on must be designed in conjunction with and approved by WSU Police and C&ITs Network Engineering.
8. Any exterior mounted camera or pole mounted camera must be designed and mounted to minimize image movement. This design must be designed in conjunction with and approved by WSU Police, WSU FP&M and C&ITs Network Engineering.
9. Always install Category "6E (enhanced)" UTP cable.

10. Terminate camera, wireless, time clock and other “Internet of Things” connections auxiliary equipment patch panel in the equipment rack. Do not install auxiliary data ports in the data patch panel. If the installation is using the last 2 available patch panel ports, the project must provide an additional (new) patch panel capable to hold your installation plus 20% future growth.
11. Cable and patch cords shall be purple and the jacks orange. A jack must be installed at the camera end and jack must be the proper color and labeled.
12. Any inline cable devices (POE extenders, lightning arrestors, power injectors, etc.) used in a video camera installation must not limit the cable’s data throughput capabilities and must be labeled to match the camera location. The product make and model must be approved by WSU Police and C&IT Network Engineering.
13. Final finished camera view position, placement and image quality must be approved by WSU Police and C&ITs Network Engineering.
14. All cameras – including cameras that are required to be in an outdoor housing – must be labeled to allow viewing from ground level. Example (CAM-108.199). At the patch panel, label the camera # only.
15. All junction boxes containing a cable run with an inline device must also be labeled to match the camera cable patch panel side.
16. When installing outdoor cameras, access points or any type of network device, you must use Hi-impact jacks and patch cords.
17. All cameras are to be mounted in a location and manner that doesn’t require special equipment to access and service. All cameras mounted to a drop ceiling infrastructure are to be secured to a solid support within or above the tile system using a BICSI or NEC approved method. No direct mounting to ceiling tiles will be permitted. All outdoor camera locations and any locations exposed to extreme temperature changes and weather elements consisting of underground conduit and above ground conduits shall have outdoor rated cable and outdoor rated inline accessories installed (as needed). This includes semi enclosed outdoor spaces (parking structures, overhangs, blue light, etc.). Any exceptions must be in writing and approved by WSU Police and C&IT.
18. When installing outdoor cameras, access points or any type of network device, you must use CAT6E POE compatible lightning surge protection devices as part of the communication room termination. These devices must be grounded per grounding standards.
19. Before a request for IP address can be given out, the installing vendor must submit a spreadsheet with the following: camera name, location, jack ID, label ID, make, model, and serial number and MAC address.
20. All outdoor above ground junction boxes (including ones in Parking Structures) that contain networking components (e.g. POE extenders, baluns, power injectors), must have climate control compensation inside the box. A 120V power circuit may be required to support this requirement or a suitable extreme weather rated device preapproved by C&IT prior to installation.
21. All indoor and outdoor power injectors, Ethernet extenders, and lightning protectors must be clearly labeled to match the corresponding camera location patch panel cable label. Any junction boxes that house this equipment must also be clearly labeled from the outside to show what locations are inside the box. Provide cable and connectors only from WSU preferred manufacturers list.
22. Provide two (2) dark purple or violet patch cords per indoor camera outlet installed. Provide one (1) dark purple or violet patch cord and one (1) outdoor rated patch cord for outdoor or wet camera locations. The outdoor patch cords shall coincide with the camera manufacturer’s recommendations or better. Any camera located outside must have an outdoor rated patch cord

and must route through POE capable lightning protection before connecting to any network equipment.

23. Two patch cords shall be provided.
24. Cord lengths shall be 1 foot and 3 foot per camera outlet jack installed unless otherwise noted or stated.
25. Current AXIS cameras (supported by Video Management System)
  - 25.1. AXIS Q Series
    - 25.1.1. Q6155-e PTZ - used for roof height and Blue Light Stanchion installations
    - 25.1.2. Q6000-e MKii 360-degree with PTZ - used on building corners and Blue Light Stanchions.
  - 25.2. AXIS P series
    - 25.2.1. P3717-pve – 360-degree camera without PTZ, used for building corner coverage.
    - 25.2.2. P3807-pve - 180-degree camera used for sidewalks and large room coverage.
    - 25.2.3. P3225-lve – used for exterior/entry door coverage
    - 25.2.4. P3227-lve - Used for wide angle viewing.
  - 25.3. AXIS M series
    - 25.3.1. M3046-v – for stairwells and interior office/door views

## 14. Building Access Standards

1. Building access controls – WSUPD/ESS, Pegasys
  - 1.1. WSUPD owns all building access controls using the Pegasys system. All requests from entering campus buildings that are usually locked from the exterior of a building must be approved by WSUPD's Chief of Police.
2. Approved Intercom Door Station with Video
  - 2.1. C&IT supports new construction or renovations. These devices provide customers two-way communication, identification, and remote entry control. There are 2 intercom options:
  - 2.2. External – [AXIS A8004-VE Network Video Door Station](#). Features:
    - 2.2.1. 2-way communication
    - 2.2.2. 24/7 video identification
    - 2.2.3. Remote entry control
    - 2.2.4. SIP support for IP phone integration
  - 2.3. Internal - [AXIS A8105-E Network Video Door Station](#). Features:
    - 2.3.1. High quality audio and video
    - 2.3.2. AXIS's Digital Corridor Format
    - 2.3.3. Remote entry control
    - 2.3.4. SIP support for IP phone integration
  - 2.4. Approved IP Video Phone – Grandstream GXV3370
    - 2.4.1. Required to receive video from Axis intercom
    - 2.4.2. Single line phone - shared lines are not supported
3. Approved Intercom Door Station without Video
  - 3.1. VOIP (new) Intercom System
    - 3.1.1. ALGO 8028-3201 - Two-way VOIP intercom
    - 3.1.2. Chamberlain Liftmaster - Cloud based system with directory access
  - 3.2. Analog (legacy) Intercom System
    - 3.2.1. Viking G30-EWP - Connecting via analog phone line (18-20 units on campus)
    - 3.2.2. Sentex Horizon - Gate access via analog phone line (6 units on campus)

## 15. Wireless access points

1. When planning for wireless, C&IT plans for density first and coverage second.
2. Preferred installations shall be in classrooms or study areas and not corridors, when designing for density.
3. All wireless designs shall meet 802.11ac requirements and meet an overall specification for minimal signal overlap value of -62 dBm everywhere density and coverage is needed. Density calculations will be used for the following types of areas:

Type of area	Devices per person
Student	3-4
Conference space	2
Staff	2
Research intensive	3
Housing	4-5

4. Within the base design, locations including storage areas maintenance/mechanical rooms, restrooms, stairwells or some outdoor spaces will not be covered by C&IT initial design unless requested by the customer.
5. Depending upon where there is line of sight from the AP, intrusions of signals within the frequency, degradation of signal strength due to building architecture or other building materials, placement of APs will deviate, by C&IT Wireless Engineering authorized exception, from this standard by increasing in AP density.
6. Wireless access points shall be placed a minimum distance of 12 feet and maximum of approximately 75 feet away from each other, the closer the better for density. 30-40 feet preferred for all installs.
7. All APs shall be, when possible, surface mounted below ceiling grid. Exception to this is only authorized by C&IT Wireless Engineering.
8. All APs shall be below ceiling, mounted in a downward-facing orientation. Exception to this is only authorized by C&IT Wireless Engineering
9. All APs will be mounted with product mounting brackets approved by the wireless vendor.
10. Typical AP height APs shall be mounted between 8 to 10 ft AFF. Exception to this is only authorized by C&IT Wireless Engineering or if it is not possible due to an extended height ceiling.
11. If APs are authorized for mounting above ceiling, the AP location(s) shall be labeled on the ceiling grid. The data jack servicing the AP shall be orange and also must be mounted (if at all possible) and labeled.
12. Terminate the access point jack on the auxiliary systems patch panel in the rack, not in the data panel.
13. All wireless horizontal cabling shall be labeled by access point location naming convention, not by jack number. (EX: WAP-H#### or WAP-Rm#### or Outdoor EX: WAP-O-location)
14. Any outdoor wireless bridge installed as a temporary solution must be approved by C&IT network engineering as an authorized exception. This must happen prior to the start of the project. Outdoor wireless bridges have minimum and maximum distance limitations and line of sight concerns that **must** be determined and approved by C&IT prior to approval of installation.
15. The permanent solution must be reviewed and approved by C&IT Network Engineering as a final installation solution before the temporary solution is allowed to be implemented.
16. Any outside wireless design or device being enacted on campus shall be designed by C&IT Wireless Engineering to prevent wireless interference of WSU devices already in place.
17. All final area designations within a design must be approved and agreed upon by C&IT Wireless Engineering.



18. Provide cable and connectors only from WSU-preferred manufacturers list.
19. Cables installed in the walls shall be green and jacks shall be orange, located in the ceiling above the AP location.
20. Provide 2 green patch cords per wireless outlet installed.
21. Patch cord length shall be consistent with installed wired network installation and design per wireless outlet jack installed.
22. Provide a 15-foot cable slack loop in the ceiling or as close as possible to the access point jack location end.
23. All cable installed, patch cords, jacks and patch panels must be same manufacturer and product series.
24. Access point mounting and patch cord security will be identified on a case-by-case basis in the C&IT Wireless Engineering access point design.
25. Access point procurement, configuration and labeling will be done by C&IT Wireless Engineering. This ensures inventory control, and prevents duplicate location deployment.
26. Installation of access points will be in the low voltage communications cabling contractors' scope of work.
27. Data activations for the access points (patch panel cross connect to the network switch) will be done by C&IT Network Engineering.
28. No exception to any of these bullets will be allowed.
29. Any non-WSU approved wireless access point installed onto the WSU network may be subject to de-authentication, and removed by C&IT Wireless Engineering, if said device causes any interference with Wayne State wireless.
30. Outdoor Wireless Access Points
  - 30.1. All outdoor wireless installations require Outdoor CAT6e infrastructure cabling, ruggedized network connectors, and **OUTDOOR-RATED ACCESS POINTS**.
  - 30.2. **The use of indoor rated access points housed in a NEMA rated type enclosure is no longer permitted, as these access points are not rated for this use, and void the vendor warranty. THIS REQUIREMENT IS NOT DEBATABLE.**
  - 30.3. NEMA enclosures cannot dissipate the heat generated from the access point held within, and over time condensation builds causing hardware failure.
  - 30.4. Sub-par installation of NEMA enclosures have also allowed water to seep in, and cause hardware failures.
  - 30.5. No indoor-rated access point shall be installed in an outdoor environment, Indoor access points are not rated for the extreme temperatures, and have caused hardware failures, not debatable.
  - 30.6. Any outdoor wireless device, mounted outside the recognized Lightning Cone of Protection, shall be terminated with grounded Lightning Protection equipment.
  - 30.7. ALL outdoor wireless installations will require silicone sealant for all fittings and wall penetrations.
  - 30.8. Outdoor wireless wall mounted installations require the following parts, per each instance:
    - 30.8.1. Qty. 1 = Carlon 15005-100 ½" L/T FLEX PVC Conduit. This is the flexible conduit used to weather protect the cabling from the elements
    - 30.8.2. Qty. 1 = Appropriate wall penetration flange, to be installed and silicone sealed to prevent water leakage.
    - 30.8.3. Qty. 2 = Bridgeport 430-NMLT ½" STR L/T connector. This is the connector to the ends of the flexible conduit. Used to connect the wall plate to the conduit end.
    - 30.8.4. Qty. 1 = Thread Adapter M20 to ½" NPT. This adapter allows proper sealed connection from the flexible conduit to the access point.

## 16. Emergency Phones

- Emergency phones include elevator, elevator lobby (“Area of Rescue”), and Blue Light phones.
- Current emergency phones on campus are analog, Ramtel model 733.
- Emergency phones will be upgraded when new construction or renovation project occurs.
  - Blue Light phone will upgrade to TalkAPhone (VOIP) device.
  - Elevator phone will remain analog and be supported by analog gateway.
  - 4-hour minimum power backup (UPS) is required, per City of Detroit Building Code.
- FP&M will continue to supply the emergency phone equipment and installation via contractor.

### Blue Light Phones

- New Blue Light phones will be VOIP technology, with Talkaphone as the approved manufacturer. Existing emergency phones without impacting renovation plans will continue to be supported by Centrex. These locations will be converted as time and budget allow.

### Blue Light phone with camera - wall mount

- Our current wall mount product is from Ramtel without a camera. For new sites that require building wall mounted Blue Light phones, the Talkaphone enclosure part number is ETP-WMS-OP2-OP31P.

### Blue Light phones - Existing

- When a renovation project impacts an existing Blue Light, this phone must remain operational at all times, unless a different plan is negotiated with C&IT and WSU Police Department prior to de-activation or removal. The legacy Ramtel blue light phones is to be retired and replaced with a VOIP-500E Talkaphone Blue Light phone. An adapter is required if reusing Ramtel stanchion.

### Blue Light Components:

- Approved Talkaphone components:

Item	Part Number	Description
SIP Phone	VOIP-500E	VOIP-500 Series Call Station with EMERGENCY Signage
Stanchion enclosure	ETP-MT/R-OP4P-PCS- <b>001</b> *	ETP-MT/R Series <b>Tower Mount</b> with LED Blue Light, LED panel light, and camera arm with provision for a dome camera (camera not included) and built-in 2.5-inch O.D. post (located at the top of the camera arm) for pole mounting other devices.(e.g. wireless radios) Includes internal shelf and mounting panel. <i>Emergency Phone is purchased separately</i>
Wall Mount enclosure	ETP-WMS-OP2-OP31P	ETP-WMS Series brushed stainless steel <b>wall mounted</b> call station enclosure with integrated Blue Light and LED panel light for use with fixed CCTV (Axis M1025 Camera included, OP31P). <i>Emergency Phone is purchased separately</i>
Ramtel Adapter	ADAPT-56-GA-RM	Required if mounting Talkaphone VOIP-500E in existing Ramtel Tower

\*ETP-MT/R-OP4P-PCS-**001** - must include “**001**” for Ramtel Mounting Pattern

9. WSU specific information required when ordering stanchion from vendor:
  - 9.1.1. PMS 281 Midnight Blue
  - 9.1.2. White EMERGENCY lettering
  - 9.1.3. 120v

## Elevators

1. Analog gateways will be installed to support analog elevator phones in future FP&M construction or renovation projects. Once elevator technology matures enough to support VOIP phones, C&IT will update standards to include IP based elevator phones.

## “Area of Rescue” Elevator Lobby Phones

1. These devices are supplied by FP&M and require an analog line. Until FP&M upgrades or selects newer technology, these systems will be supported by analog gateway or Centrex line.

## Analog Gateways

1. Audiocodes analog gateways will be installed to support analog elevator phones.
2. All analog gateway systems - new, modified or inherited - must function with WSU analog gateway infrastructure.
3. Final design must be approved by WSU Police Department and C&IT.
4. C&IT Network Engineers will install Audiocodes MPXXX series to support analog phones.
5. Maintenance and support of gateways provided by Mitel (AT&T) and C&IT.
6. Audiocodes product specification cut sheet can be found at:  
<https://www.audiocodes.com/media/2373/mp-1xx-and-mp-124-datasheet.pdf>.
7. Analog Gateways will be physically located in the building’s MDF, or closest buildings MDF.
8. Analog Gateways in IDFs are considered an exception and non-standard configuration.
9. Additional copper tie cable infrastructure may require to interconnect IDF where analog gateway phone is to the MDF where the analog gateway equipment is.

## Emergency Power

C&IT will install TrippLite UPS to support continuity of service.

1. Buildings with generator power shall include:
  - 1.1. Connectivity from device to analog gateways (MDF)
  - 1.2. **10-minute** UPS battery backup to support analog gateway and network switch power.
  - 1.3. Dedicated 208v circuit
2. Buildings without generator power shall include:
  - 2.1. Connectivity from device to analog gateways (MDF)
  - 2.2. **Four hour** UPS battery backup to support analog gateway and network switch power
  - 2.3. Dedicated 208v 20A circuit

## Cable Infrastructure

1. Cabling for emergency phones shall:

- 1.1. Three appropriately rated network lines required: one for voice, one for video surveillance camera and one for optional camera or wireless technology.
- 1.2. Cabling is to be home run from the stanchion to the building's MDF or closest buildings MDF within the 100-meter cable limit. If distance exceeds this limit, copper riser cabling will need to be installed between emergency phone jack termination and MDF where analog gateway is located.
  - 1.2.1. Method 1 – 3 CAT6E outdoor cables from MDF to stanchion less than 100 meters
  - 1.2.2. Method 2 – 4 strand hybrid cable from MDF to stanchion
    - 1.2.2.1. NOTE: Method 2 does not require 120 volt AC service to the Blue Light Phone stanchion.
- 1.3. Terminate on patch panel designated "Emergency phones"
- 1.4. Cable Jacket for out of CAT6 specification will be black.
- 1.5. Terminate with 568B connections

### Estimated Equipment Lead Times

1. Tripplite UPS - 4 weeks
2. Blue Light Stanchion – 4 weeks
3. Blue Light phone – 4 weeks
4. Hybrid fiber cable – 6 weeks
5. Analog Gateway - 4 weeks

### 17. IPTV in student lounges

1. Roku device permanently mounted behind the TV.
2. Mount on the wall, next to the TV, a 7" touch screen Crestron user interface which will control TV off/on, volume, and channel changes.
  - 2.1. Supported device 7-inch touch screen Crestron control system TSCW-730

### 18. OneCard Infrastructure Installation

1. All OneCard design, hardware, software and installations must be coordinated and approved by Business and Auxiliary Operations – IT Business Operations Department and Computing & Information Technology – Network Services Department.
2. OneCard equipment will be located in its own enclosure(s) in C&IT communication rooms whenever possible.
3. OneCard equipment is never to be co-located in enclosures with any other equipment and must be clearly labeled.
4. OneCard equipment will require its own dedicated 120volt 20-amp circuit.
5. Any One Card network connections outside the communication room requires its own data jack to be installed. No long-extended patch cords are allowed.
6. No exception to any of these bullets will be allowed.

### 19. Workstation Outlets

1. General
  - 1.1. Unless noted otherwise, a typical outlet shall consist of one (1) data outlet.
  - 1.2. Every enclosed space 8 feet by 10 feet shall be provided with a minimum of one (1) Data outlet.

- 1.3. The data cable installed in the wall shall be green and jacks shall be orange.
2. Classrooms
  - 2.1. Provide (1) D at each FSR box in the front of the room.
  - 2.2. Provide (1) VOIP Wall phone near door.
3. Offices
  - 3.1. Provide (1) D at each desk location. For an office with one desk, typical corner opposite door unless furniture layout or program statement Indicates otherwise.
4. Conference Room
  - 4.1. A conference room table of 10 seats or more, provide (1) 2" sleeve through the floor to the table for multimedia connectivity. Determine in the design if this is needed.
5. Public Spaces
  - 5.1. Provide (1) D for each vending, copier, ATM machine or any other network device.
6. Engineering Buildings
  - 6.1. Provide (1) D for a typical outlet unless otherwise noted
7. Research Buildings
  - 7.1. Provide (2) D at selected locations. This will provide the ability to provide 2 different types of network connectivity's. This must be verified with the customer, coordinated with the FP&M project manager and the C&IT project manager.
8. Dorms and Apartments
  - 8.1. Provide (1) data in each bedroom and (1) data in the common Room. This will provide data network connectivity only.
9. Labs
  - 9.1. Use specific user requirements or outfit as a typical classroom.
10. Furniture Coordination
  - 10.1. Provide (1) D per cubicle. Outlets must be mounted in the furniture provided raceway or on the wall. Double stick for mounting or outlets lying on the floor are not acceptable.
  - 10.2. Voice/Data jacks mounted on the wall will require voice/data patch cords installed through systems furniture cable raceways, or they can be wired permanently with a cable whip from the wall, ceiling or floor to the systems furniture.
  - 10.3. Patch cords routed through furniture must be the correct length. No couplers putting two patch cords together are allowed. No field-built patch cords allowed.
  - 10.4. This installation must comply with NEC code specifying low voltage and high voltage cables must be separated by a divider channel.
  - 10.5. It is the responsibility of the communications cabling contractor to meet this standard and install correctly.
  - 10.6. WSU / C&IT / IT Customer Services / Telecommunication cabling vendors and or technicians will not fish any wire or patch cord through systems furniture raceway. They will NOT cut any holes, remove knock outs, provide or install jacks and face in the systems furniture. The furniture layout must not block the outlet on the wall. If this condition exists, the furniture must have an access panel or the outlet must be wired into the furniture.

## 20. Jack Labeling

1. Workstation Data Jack
  - 1.1. [Room Number] or [Cubicle Number]- [Function + multiple jack in room number].
    - 1.1.1. Ex: 222-V01, 222-D01, 222-V02, 222-D02, 223-V01, 223-D01, etc.
2. Security Cameras
  - 2.1. Security camera jacks labeling scheme is [CAM] - [Last 2 octets of the IP Number].
3. Wireless Access Points
  - 3.1. WAP-[room number]. If in the corridor, use the closest room number.

- 3.2. Access points shall be labeled at the access point and the patch panel by location/jack number, not with just a jack number.
- 3.3. Example of labeling = WAP-H#### or WAP-Rm#### or Outdoor
  - 3.3.1.Ex: WAP-O-location
- 3.4. Do not use room numbers that appear on construction documents that are construction, temporary or pending room numbers.
4. Fiber LIU Panels
  - 4.1. For backbone cables between hub buildings, [cable type]-[WSU Building Number]. Example: BC-193 = hub to hub inter-building backbone cable for building 193.
  - 4.2. C-062 = hub to endpoint inter- building backbone cable for building 062.
  - 4.3. RC-193 = inter- building redundant backbone cable for building 193.
  - 4.4. BRC-027=building riser cables between communication rooms, [cable type]-[WSU Building Number]-[floor number]- [communication room number].
    - 4.4.1.Ex: BRC-027.03.315.
  - 4.5. In the case of a building renovation where existing riser cabling exists, the last 4 strands of any fiber cannot be used for the renovation project. If this condition exists, FP&M and C&IT must negotiate if 2 of the last 4 strands can be used or the project will install a new riser cable.

## 21. Testing and documentation

1. Testing Criteria
  - 1.1. Comply with TIA testing requirements.
  - 1.2. To be done by the cabling installation contractor. They must be certified to install the product line chosen. No exception to this will be allowed.
  - 1.3. All items tested must comply with manufacturer testing requirements and specifications.
  - 1.4. Test results will demonstrate compliance with all parameters of manufacturer's stated performance.
2. Documentation
  - 2.1. Upon completion, before final payment the following must be provided.
    - 2.1.1. Provide the manufacturer warranty certificate upon completion.
    - 2.1.2. Provide (1) electronic copy of test results in PDF file format.
    - 2.1.3. No exception to this will be allowed

## Section 27010 - Telecommunications general requirements

### 1. General

#### 1. Drawings

- 1.1. The drawings must show the location of equipment racks and elevations, ladder rack on 3 walls, power outlet locations, general arrangement of equipment, electrical systems and related items. The installation will follow as closely as elements of the construction will permit.
- 1.2. The drawings must show a conduit and cabling riser diagram from MDF and related IDFs. Copper pair and fiber strand counts will be detailed showing the distribution of riser cabling between the MDF and related IDFs.
- 1.3. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the architect/engineer and WSU C&IT.

#### 2. Inspection of Site

- 2.1. Visit the site, examine and verify existing communications infrastructure conditions under which the work must be conducted before submitting proposal.
- 2.2. The submitting of a proposal implies that the Contractor has visited the site and understands the conditions under which the work must be conducted.

#### 3. Contract Breakdown

- 3.1. WSU Facilities Department retains the installation and coordination for all projects initiated by that department. WSU C&IT retains the design review, installation and coordination for all other voice, data and video projects not initiated by WSU Facilities.

#### 4. Guarantee

- 4.1. Contractor guarantees that the installation is free from defects and agrees to replace or repair, any part of this installation which becomes defective within a period of two year following final acceptance, provided that such failure is due to defects in the equipment, material or installation or to follow the specifications and drawings. File with the owner any and all guarantees from the equipment manufacturers and warranty certificates. FP&M will notify C&IT of substantial completion and deliver all warranty certificates, as-builts and test results. This warranty will coincide with the project warranty.

## **5. Codes, permits and fees**

- 5.1. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for telecommunications work shall be secured and paid for by the contractor. All work shall conform to all applicable codes, rules and regulations.
- 5.2. All work shall be executed in accordance with the rules and regulations set forth in local and state codes. Prepare any detailed drawings or diagrams which may be required by the governing authorities. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.

## **6. Standards of materials and workmanship**

- 6.1. All materials shall be new, never used, reused, reconditioned, or refurbished components. The electrical and physical properties of all materials, and the design, performance characteristics, and methods of construction of all items of equipment, shall be in accordance with the latest issue of the various, applicable Standard Specifications of the following recognized authorities:

A.N.S.I.	American National Standards Institute
A.S.T.M.	American Society for Testing Materials
BICSI	Building Industry Consulting Services International
I.C.E.A.	Insulated Cable Engineer's Association
I.E.E.E.	Institute of Electrical and Electronics Engineers
N.E.C.	National Electrical Code
N.E.M.A.	National Electrical Manufacturer's Association
TIA	Telecommunications Industry Association
U.L.	Underwriters Laboratories, Inc. NFPA    National Fire Protection Agency

- 6.2. All equipment of the same or similar systems shall be by the same manufacturer.

## **7. Record drawings**

- 7.1. Provide revised telecommunications working drawings indicating "as-built" conditions. Drawings shall indicate all changes that have occurred during construction. Properly and identify backbone and horizontal wiring pathways.
- 7.2. Locate all network and workstation devices. Identify all devices on plan with proper labeling. Identify outside plant backbone conduits, man holes and fiber cables installed on a site plan. "As-built" drawings shall be submitted on AutoCAD 2018 or newer electronic DWG file format.
- 7.3. Provide a site plan with elevations showing any manholes, handholes or conduit installed outside.



## 8. Shop drawings/submittals

- 9.1 All shop drawings shall be submitted in groupings of similar and/or related items (cable and connectors, equipment cabinets and racks, etc.). Incomplete submittal groupings will be returned unchecked.
- 9.2 Provide detailed layout shop drawings (on transparent media) of backbone and horizontal cabling distribution, pathways, equipment room layouts, details and related information necessary of installation and maintenance. After review by the Engineer and WSU C&IT, a copy of Drawings will be stamped and returned to the Contractor.
- 9.3 Submit for approval all telecommunications systems or equipment but not limited to the items listed below. Where items are referred to by symbolic designation on the Drawings and Specifications, all submittals shall bear the same designation. Refer to other sections of the Specifications for additional requirements.
- Structured cabling system components
  - Structured cable system raceways and supports
  - Outside plant cabling and components
  - Outside plant ducts manholes, hand holes and conduit systems on a site plan with elevations.
  - Equipment racks and cabinets including management components
  - Labeling equipment
  - Telecommunications grounding components
  - Conduit, inner duct, junction and pullboxes
  - Surface raceway components
  - Manholes, hand holes and all accessories
  - Telephone system components
  - Data network system components
  - Audio/video system components
  - Access control system components
  - Security Camera system components

## 10. Contractor bid eligibility qualifications

- 10.1 The installing contractor for each communications system shall have a minimum of 5 years of experience with the types of systems specified. The company and employee must be certified to install, test and warranty the product specified. This certification must be produced at the WSU mandatory pre-bid meeting, prior to a bid submittal. **No exception to this will be allowed.**
- 10.2 The installing contractor may be asked to submit a reference list consisting of a minimum of **3 - 5** installations of equivalent size and complexity of this contract. The reference list shall contain the following information for each installation:
- 10.2.1 Name of project, square footage, location and brief description of systems.
  - 10.2.2 Date of completed installation.
  - 10.2.3 Contact name and phone number of facility representative.
  - 10.2.4 Total bid amount of each system installed.
  - 10.2.5 Final contract amount of each system installed, including all change orders and bulletins.

10.3 The installing contractor shall submit with the bid the names and registration numbers of members of the firm that have a valid membership and are certified with BICSI as Registered Communications Distribution Designers (RCDD). This Contractor shall identify at least one RCDD assigned to this project in the bid and must be an employee of that company.

## 2. Execution

### 1. Design validation

1.1 The bidding, shop drawing submittal, procurement of materials, the installation as-builts and record documents shall be reviewed and overseen by the RCDD(s) assigned to the project.

1.2 The Contractor's bid, shop drawing submittals, as-builts and record documents shall bear the valid seal of the RCDD(s) assigned to this project.

1.3 All calculations, shop drawings, testing, certification and as-built documents shall be directly supervised by the licensed technician/engineer assigned to the project.

1.4 The sub-contractor must provide the general contractor a copy of the manufacturer's certification that the sub-contractor is currently certified to install, test and warranty the proposed system prior to a bid submittal. See Section 27110, 7.5A and section 27010, 1.16A. The owner reserves the right to have the non-certified sub-contractor removed from the job.

### 2. Installation of equipment

2.1 Install all equipment in strict accordance with all installation specifications set by the equipment manufacturer. Where such directions are in conflict with the drawings and specifications, report such conflicts to the architect/engineer and WSU C&IT for resolution.

### 3. Work performed by others

3.1 Electrical contractor shall install 4" sq. sheet steel wall boxes, minimum 1" trade size conduit (or as indicated on drawings) stubbed 12" above ceiling with 6" radius (or as required by ANSI/TIA-569 C), with a 90-degree bend at top in the direction towards route destination, and plastic bushing for recessed locations.

3.2 Electrical contractor shall install 4" sq. cast boxes. Minimum 1" trade size conduit (or as indicated on drawings) stubbed up to 10' AFF (or as indicated on drawings), with 6" radius (or as required by ANSI/TIA-569 C) for surface mounted locations.

### 4. Demolition work

4.1 All demolition of existing telecommunications cable, equipment and materials shall be specified by C&IT and done by this contractor unless otherwise indicated. Include all items

such as, but not limited to, cable, patch panels, devices, and wiring back to the source, called out on the drawings and as necessary whether such items are actually indicated on the drawings or not in order to meet NFPA requirements.

4.2 In general, demolition of old low voltage communications cabling work is indicated on the drawings, however, the contractor shall visit the job site to determine the full extent and character of this work. All existing voice and data jacks demolished need to be documented. A room number, jack number (if still there), approximate location in the room and the communication room where it terminated need to be identified. This information must be returned to C&IT IOPS Networking Engineering Group.

4.3 None of the recovered material shall be reused in the new work.

4.4 Where new walls and/or floors are installed which interfere with existing telecommunications outlets, devices, etc., this contractor shall adjust, extend and reconnect such items as required to maintain continuity of same.

4.5 All electrical work in altered and unaltered areas shall be run concealed wherever possible. Use of surface metal raceway or exposed conduits will be permitted only where approved by the architect/engineer and as specifically indicated on the drawings.

## **5. Work in existing buildings**

5.1 Adequately protect and preserve all existing and newly installed work. Promptly repair any damage to same at this contractor's expense.

5.2 Consult with the owner's Project Coordinator and C&IT Project Coordinator as to the methods of carrying on the work so as not to interfere with the owner's operation any more than absolutely necessary. Accordingly, all telecommunications services shall be kept in operation as long as possible and the services shall only be interrupted at such time as will be designated by the owner's representative.

## **6. Coordination**

6.1 If there is a general contractor, the general contractor is responsible for the construction schedule. All work activities are to be coordinated with the general contractor.

## **7. Chases and recesses**

7.1 Chases and recesses shall be provided by the architectural trades, but this contractor shall be responsible for coordinating their accurate location and size.

## **8. Sleeves**

8.1 Provide and install Hilti Speed Sleeve model CP-630 or EZ path fire stop system wherever conduits or cabling pass through fire rated walls, floors or cables pass through openings in walls.

8.2 Sleeves are used in standard walls and floors with no fire rating. All sleeves through the floor are to extend 4 inches above floor, unless otherwise noted. Provide escutcheons at each sleeve in finished areas and adequate spacing between sleeves to accommodate escutcheons.

## **9. Access doors**

9.1 Provide access doors for installation by architectural trades. In the walls, provide Milcor No. "DW" or "M" as required to make all controls, electrical boxes and other equipment installed by the Contractor accessible. Minimum size 12 inches x 12 inches. In the ceiling, provide Milcor No. 3210, 3105 or 3206 for accessibility as mentioned above, 24 inches x 24 inches minimum size. The plaster or acoustical tile insert shall be by the architectural trades. Areas with accessible ceilings (ceilings where tiles are not fastened in place and can be individually removed without removal of adjacent tiles) will not require access doors.

9.2 When access doors are in fire resistant wall or ceilings, they must bear the Underwriters Laboratories, Inc., Label, with time design rating equal to or exceeding that of the wall or ceiling unless they were a part of the tested assembly.

## **10. Cleaning**

10.1 All debris shall be removed daily as required to maintain the work area in a neat, orderly condition.

10.2 Final cleanup shall include, but not be limited to, cleaning all telecommunications equipment spaces, devices, cover plates, and removing all scrap cable and debris from pathways.

## **11. Protection and handling of equipment and materials**

11.1 Newly installed network equipment shall be protected from theft, dust or damage while construction is going on.

11.2 Protect conduit openings with temporary plugs or caps.

11.3 Locks must be installed on communication room doors prior to any equipment installation.

## **12. Extra work**

12.1 For any extra telecommunications work must be forwarded to the general contractor, an itemized breakdown of the estimated cost of the materials and labor required to complete this work. This contractor shall proceed only after receiving an impact report from the university establishing the agreed price and describing the work to be done. This doesn't amend the language of the main construction contract.

## **13. Drawings and measurements**

13.1 Final as-built drawings must be delivered at project completion.

13.2

#### **14. Automation System Program Code**

- 14.1 All automation system uncompiled and compiled program codes, source codes, custom modules, graphical user interface screen shots and any other automation system programming data and material (Program Code) shall be provided to the university in hard copy and on CD-ROM in an unencrypted format acceptable to the university.
- 14.2 Copyright for the Program Code shall be assigned to the university for purposes of system maintenance.
- 14.3 Provision of and copyright assignment of the program code to the university by the vendor shall be conditions of the purchase order and contract acceptance by the vendor.
- 14.4 Provision of and copyright assignment of the program code to the university by the vendor shall be conditions of final system acceptance by the university.

END OF SECTION 27010

## Section 27110 - Telecommunications interior pathways

### 1. General

#### 1. References

- 1.1. ANSI/NFPA 70 - National Electrical Code
- 1.2. NFPA-297 - Guide on Principles and Practices for Communication Systems
- 1.3. ANSI/TIA 568-C - Commercial Building Telecommunications Cabling Standard
- 1.4. ANSI/TIA 569-C - Commercial Building Standard for Telecommunications Pathways and Spaces
- 1.5. ANSI JSTD- 607 B - Commercial Building Grounding and Bonding Requirements for Telecommunications
- 1.6. ANSI/IEEE-110-1992 - Powering and Grounding Sensitive Electronic Equipment
- 1.7. BICSI – Building Industry Consulting Services International

#### 2. Submittals

- 2.1. Submit all structured cabling system raceways and supports identified in this section under provisions of Section 27010.
- 2.2. Product data: Provide for products specified and required.
- 2.3. Shop drawings: Indicate project specific part numbers, dimensions, support points, fittings and finishes.

#### 3. Project record documents

- 3.1. Submit all structured cabling system raceways and supports identified in this section under provisions of Section 27010.
- 3.2. Accurately record equipment layout and cable layouts in all telecommunication spaces.

#### 4. Delivery, storage, and handling

- 4.1. Deliver, store, protect, and handle products to site under provisions of section 27010.
- 4.2. Protect products from corrosion and entrance of debris by storing above grade.
- 4.3. Provide appropriate covering.

## **5. Project conditions**

- 5.1. Verify that field measurements are as shown on drawings.
- 5.2. Verify routing and termination locations of conduits, and cable pathways prior to rough-in.

## **6. Installation of cable support systems**

- 6.1. Communications cabling systems pathways shall be installed in accordance with ANSI/TIA 569-C.
- 6.2. Intra-building backbone cabling shall be installed in conduit, cable tray or J-hook support system.
- 6.3. Horizontal cabling (cabling from the telecommunications room to the work area outlet) pathways shall consist of [conduit], [cable tray], [J-hooks], [under floor duct system], [raised access flooring system], [accessible ceiling space], [cellular flooring system] as indicated on drawings and as required.
- 6.4. Where the accessible ceiling systems [raised access flooring systems] are used as the primary pathway, cabling shall be installed [in main cable tray runs] as indicated on the drawings, with individual work area cables routed exposed [in conduit] and supported as specified herein.

## **2. Products**

### **1. J-hooks**

#### **1.1. Manufacturers:**

- 1.1.1. Erico-Caddy.
- 1.1.2. B-Line.

### **2. Horizontal cable routed exposed through ceiling space shall be supported from J-hooks.**

- 2.1. J-hooks shall be a minimum of 5/8" wide and shall have a bearing surface that complies with required bend radii of the specified cables to be supported.

### **3. Inner duct**

- 3.1. Install inner duct through conduits and sleeves for optical fiber cabling installations.
- 3.2. Description: UL listed, non-metallic, corrugated flexible conduit for use in plenum or riser installations as applicable. Provide each inner duct with one 1/4" W pull tape with a tensile rating of 900 lbs.

## **3. Execution**

### **General**

- 1. Where cables pass through fire rated walls, the contractor shall provide and install Hilti Speed Sleeve model CP-630 or EZ path fire stop system. This penetration sleeve must match the fire rating of the wall. The penetration shall be sized per ANSI/TIA-569-C.

2. Any other wall or floor penetrations that aren't fire rated, the contractor shall fire-stop the penetrations, after final cable installation, using engineer-approved materials. Fire-stopping materials shall be installed per manufacturer's recommendations and shall maintain partition rating and integrity. All fireproofing shall be applied in a neat manner with all excess material cleaned from all walls and surfaces. Contractor shall replace and re-install all fireproofing materials removed during cable installation.
  - 2.1. Contractor shall patch and repair any holes or other damage to walls or partitions and paint to match original, as applicable.
  - 2.2. The communication cabling contractor shall provide plastic and/or grounding bushings, as applicable, on all conduit sleeves, stubs and conduit terminations that may have been missed by the electrical contractor.
  - 2.3. All cutting, patching and restoration to the original condition of walls, ceilings, floors, etc., shall be the responsibility of the contractor.
  - 2.4. All ceiling removal and restoration required for the execution of this work shall be the responsibility of the contractor.
  - 2.5. Any additional existing voice and data jacks demolished need to be documented. A room number, jack number (if still there), approximate location in the room and the communication room where it terminated need to be identified. This information must be returned to C&IT Customer Services Telecommunications department.
  - 2.6. All cabling installed exposed in accessible ceiling systems shall be supported by cable tray or J-hooks.
  - 2.7. All J-hooks shall be supported directly from the structure above or wall mounted, as applicable, independent of ceiling framing, electrical conduit, mechanical piping and ductwork. Provide all-thread rod with ¼" diameter or equivalent supporting means with suitable fasteners when attaching to structure or structural members. Increase size of support as required when multiple J-hooks (stacked or tree configuration) are attached to single support based on maximum loading capacity of J-hooks.
  - 2.8. J-hooks shall be spaced 48" minimum or 60" maximum on center.
  - 2.9. Telecommunications cabling shall be routed in continuous conduit above hard ceilings or between floors in any kind of offset condition.
  - 2.10. Communications cable pathway routing shall be coordinated with above ceiling work of other contractors to avoid conflicts and potential sources of EMI.
  - 2.11. Do not route exposed communications pathway within 12" of lighting fixtures and electrical power feeders.
  - 2.12. Route inner duct for all fiber optic backbone cabling, in cable tray, conduit, and sleeves. Coordinate routings and quantities with drawings.

END OF SECTION 27110



## Section 27130 - Communication equipment spaces support hardware

### 1. General

#### 1. References

- 1.1. ANSI/NFPA 70 - National Electrical Code.
- 1.2. NFPA-75 - Protection of Electronic Computer Data Processing Equipment.
- 1.3. NFPA-297 - Guide on Principles and Practices for communication

#### 2. Systems

- 2.1. ANSI/TIA 568-C - Commercial Building Telecommunications Cabling Standard.
- 2.2. ANSI/TIA 569-C - Commercial Building Standard for Telecommunications Pathways and Spaces.
- 2.3. ANSI/TIA 607-B - Commercial Building Grounding and Bonding Requirements for Telecommunications.
- 2.4. ANSI/IEEE-110-1992 - Powering and Grounding Sensitive Electronic Equipment.
- 2.5. BICSI – Building Industry Consulting Services International.

### 2. Products

#### 1. Equipment racks

- 1.1. Manufacturers:
  - Chatsworth Products (CPI)
  - Homaco
  - Hubbell
- 1.2. Description: Nominal 19" x 84"H equipment rack, with universal EIA hole spacing for mounting equipment and accessories.
- 1.3. Material: 6061-T6 heavy-duty aluminum or equivalent.
- 1.4. Provide all hardware for floor mounting and anchoring.
- 1.5. Provide one (1) equipment shelf and all mounting hardware.

## **2. Power strips equipment racks**

### **2.1. Manufacturers:**

- APC – Model APC 8841
- Tripplite – Model PDUMNV30HV2

2.2. Provide one 208-volt, 30-amp, single phase power strip for each rack installed.

2.3. Install one 208-volt, 30-amp, single phase power strip on each equipment rack.

2.4. Mount vertical on side of rack.

2.5. No Velcro mounting allowed.

2.6. Plug mates with a L6-30 receptacle.

2.7. Install the power strip with a 6 to 10-foot cord.

2.8. Include a temperature and humidity Sensor

2.9. Provide one 120-volt 20-amp dedicated power circuit for each equipment rack.

2.10. Provide one 120-volt 20-amp “metered” PDU for each 120-volt circuit.

2.11. Provide four additional 120-volt 20-amp service outlets, one on each wall.

2.12. Use factory mounting hardware on the equipment rack whenever possible.

## **3. Vertical cable management**

### **3.1. Manufacturers:**

- Same as equipment rack.

### **3.2. Description:**

3.2.1. Duct style cable management panel for mounting on equipment racks with slotted construction to allow multiple cable exits, [double sided for front and rear management] and fluted to allow cables to pass from front to rear.

3.2.2. Removable solid cover.

3.2.3. Material: ASTM A569 steel or 5052-H32 aluminum.

- 3.2.4. Provide two 3" W cable management units between racks and one 6" W at ends. Cable management unit shall be [84"H] [96"H] by nominal 6" D
- 3.2.5. Finish: Electrostatic powder coat, post-fab painted in black.
- 3.2.6. Provide all hardware required for securely mounting panel to equipment rack.

#### **4. Horizontal cable management**

##### **4.1. Manufacturers:**

- Chatsworth
- Homaco

#### **5. Equipment cabinets**

##### **5.1. Manufacturers:**

- Chatsworth Products (CPI)
- Hubbell.
- Great Lakes Cabinets.

5.2. Standard equipment cabinet, floor mounted, will be nominal 24" W x 30" D x 84" H, fully welded steel construction, lockable front and rear doors (roof fans) cable management, 19" EIA mounting racks and adjustable, fixed shelves as required.

5.3. The top cover shall accept the mounting of a 250 CFM cooling fan.

5.4. The cabinet shall be pre-configured for 19" mounting with universal hole spacing per the EIA 310 standard requirements.

5.5. The cabinet shall feature three sets of rails, front, center, and rear. The front set of rails shall be 20 rack positions high, from the bottom of the cabinet. The rear and center rails shall be the full internal height. The recess of all three sets of rails shall be adjustable forward and back. The rails shall be tapped for a #10-32 screw. The center rails shall be formed in a 'C' profile, 3" deep, tapped on both the front and rear flanges so as to provide the functionality of an open frame rack. The front and rear rails shall be of an L shape.

#### **6. Wall-mounted equipment cabinets**

##### **6.1. Manufacturers:**

- Chatsworth Products (CPI)
- Hubbell.
- Great Lakes Cabinets.

6.2. Wall mount equipment cabinets shall only be installed where floor space for equipment racks is not available.

6.3. Equipment cabinet, wall mounted will be nominal 24" W x 48" H x 24" D, with equivalent construction as standard floor mounted cabinet except with double hinged center section.

6.4. Load capacity of the cabinet shall be 150 lbs.

6.5. Provide dedicated 120V circuit installed in cabinet.

## **7. Backboards**

7.1. AC-grade fire rated or better plywood backboard in sheets measuring 4' W x 8' H x 3/4"D. Plywood sheets shall be flat and free of all voids. Do not paint the plywood. This voids the fire rating.

## **8. Telecommunications cable runway**

8.1. Manufacturers:

- Chatsworth Products (CPI)
- Homaco.
- Hubbell.
- Cablofil.

8.2. Description: 16-gauge tubular steel stringer style, with rungs 9"-12" O.C.

8.3. Material: 3/8" x 1-1/2" tubular steel with 1/2" x 1" steel channel rungs, or equivalent.

8.4. Width: 12" or 18" indicated on drawings.

8.5. Cable runway must be mounted from the sides. It is not permissible to support the cable runway from the center. No exception to this will be allowed.

## **3. Execution**

### **1. Equipment racks**

1.1. Contractor shall furnish and install wall mounted and floor-mounted equipment racks per manufacturer's recommendation.

1.2. The racks shall be labeled according to the drawings and in accordance with specification 27170 "Cable Plant Administration and Testing."

1.3. Free standing equipment racks shall be bolted to the floor using anchors in concrete floor and toggle bolts through raised flooring.

1.4. All racks, cabinets and cable transport hardware shall be bonded to the communications system ground riser.

- 1.5. Mount the top of two post equipment racks to the bottom of cable runway for equipment rack support strength and cable flow into equipment rack.
- 1.6. All equipment racks and cable runway must be grounded and bonded per BICSI standards.

## **2. Cable management**

- 2.1. Install vertical cable management panels per communication room specifications.
- 2.2. Install vertical panels on each side of free-standing equipment racks.

## **3. Backboards**

- 3.1. Three walls in communication rooms shall be covered with plywood backboards. A minimum 8'-6" above finished floor.
- 3.2. Normally, no plywood is needed on the wall where the door is.

## **4. Telecommunications cable runway**

- 4.1. As a minimum, mount runway at each end to wall using appropriate hardware.
- 4.2. Where overall length is greater than 10 ft, provide supplemental support from structure above or from equipment racks and cabinets below.
- 4.3. Mount runway directly to top of racks unless noted otherwise on drawings for the cable runway to be higher.
- 4.4. Runway shall run around 3 sides of perimeter of room and an additional 4<sup>th</sup> section across the center of the room securing the top of the equipment racks to the cable runway. Normally no cable runway will be needed on the door side wall unless cable sleeves / cable tray entering the communication room are over the door header or noted otherwise on the drawings.

END OF SECTION 27130

## Section 27150 - Telecommunications cabling

### 1. General

#### 1. References

- 1.1. ANSI/TIA-568-C - Commercial Building Telecommunications Cabling Standard.
- 1.2. ANSI/NFPA 70 - National Electrical Code.
- 1.3. FCC Part 68 - Connection of Terminal Equipment to the Telephone Network.
- 1.4. FCC Part 15 - Radiation Limits
- 1.5. FCC Part 76 - Cable Television Service.
- 1.6. BICSI TDMM - Telecommunications Distribution Methods Manual, Latest Edition.
- 1.7. BICSI TCIM - Telecommunications Cabling Installation Manual, Latest Edition.

#### 2. Project conditions

- 2.1. Verify field measurements are as shown on drawings.
- 2.2. Verify suitability of all pathways prior to cable installation.

#### 3. Cabling system performance

##### 3.1. General:

- 3.1.1. Cabling system performance shall meet or exceed current industry standards and/or manufacturers' specifications as specified herein.
- 3.1.2. The cable installed in the walls, connectors, jack, patch panels, and patch cords must be the same manufacture and model that forms the complete cabling system channel. The total system shall meet the performance criteria described below.
- 3.1.3. The cable and connector devices shall be certified compatible by the manufacturer of each component to meet the performance criteria described below. Submit manufacturer's certification with submittals.
- 3.1.4. The referenced standards describing the performance below shall include all revisions, clarifications and bulletins to the original standard referenced as well as any standards cross-referenced.
- 3.1.5. The referenced standards describing the performance below shall apply to backbone cable, horizontal cabling and connecting hardware performance

requirements as well as installation standards and techniques and field testing and verification of performance.

- 3.1.6. A plenum category 5 (CAT5E) cabling in a 25 pair cable bundle is to be utilized for voice (Analog Gateway connected telephone) building backbone riser only. Category 5 performance is defined by ANSI/TIA 568-C for 100-ohm UTP cables and associated connecting hardware whose transmission characteristics are specified up to 100 MHz.
- 3.1.7. Category 6 enhanced (CAT6E) cabling shall be utilized for all voice, data, wireless access points and security camera horizontal wiring. For WSU projects, any one of the following five cat6e structured cabling system products are acceptable:
- Hubbell NEXTSPEED Cat 6 enhanced
  - Superior-Essex/Ortronics NextGain Cat6EX
  - Leviton-BerkTek Lanmark-2000
  - Beldon DataTwist 600e
  - CommScope Uniprise 7504 Cat6E
- 3.1.7.1. Category 6e performance is defined by the manufacturers of the above cabling products.
- 3.1.8. Fiber optic cabling shall be utilized for all data building backbone riser. Fiber optic performance is defined as follows:
- 3.1.8.1. Multimode: 50/125µm laser optimised fiber optic cable. The cable shall be dual rated for 850nm and 1300nm and meet all performance requirements of TIA/EIA 568-492aaac (om3) at each transmission wavelength.
- Maximum attenuation:
- 3.5dB/km @ 850nm
  - 1.5dB/km @ 1300nm
- Bandwidth:
- 1500 MHz\*km @ 850nm
  - 500 MHz\*km @ 1300nm
- 3.1.8.2. Singlemode: Provide nominal 9/125µm core/cladding, singlemode dispersion un-shifted fiber optic cable. The cable shall be rated for 1310nm and 1550nm and meet all performance requirements of ANSI/TIA 568-C at each transmission wavelength.
- Maximum Attenuation:
- 0.5dB/km @ 1310nm
  - 0.5dB/km @ 1550nm
- Bandwidth:
- 2GHz\*km @ 1310nm
  - 2GHz\*/km @ 1550nm

### **3.2. Contractor qualifications**

- 3.2.1. The installing contractor shall be certified by the cabling and connector manufacturer of the structured cabling system product selected. A letter of certification from the manufacturer must be included with the bid submittal. No exception to this will be allowed.

### **3.3. Submittals**

#### **3.3.1. Product Data Sheets**

- 3.3.1.1. Submittals can be sent electronically to WSU project managers.
- 3.3.1.2. The binders shall contain manufacturer's product data sheets for the specific items to be installed for this project.
- 3.3.1.3. The Contractor shall indicate specific color, style, configuration, etc., and all accessories specified and required for a complete installation.

### **3.4. Unit pricing**

- 3.4.1. Provide separate unit pricing included with bid for each of the following:
  - 3.4.1.1. A complete workstation drop of each type of outlet indicated (e.g. A, B, C, etc.) of length 100 feet, including all cabling, connectors, faceplate, labeling, installation, termination and testing.
  - 3.4.1.2. Complete schedule C of WSU's purchasing bid package.

### **3.5. UTP cabling system warranty**

#### **3.5.1. General**

- 3.5.1.1. The UTP voice and data cabling system is warranted by the manufacturer(s) "Application Warranty" of the components for a period of not less than 20 years from the time the installation is deemed complete, provided certified installation and testing is followed.
- 3.5.1.2. It shall be the sole responsibility of the low voltage cabling Contractor to register the project with the manufacturer(s) and meet all manufacturers' "Application Warranty" requirements.
- 3.5.1.3. It shall be the sole responsibility of the low voltage cabling Contractor shall provide Owner with test results, all manufacturers' warranty certificates with Record Documents including a site plan elevation with outside plant man holes, hand holes and conduit.

### **3.6. Warranty Coverage**

- 3.6.1. Product - all passive components of the cabling system shall be warranted to be free from defects in material and workmanship for the entire duration of the warranty.



- 3.6.2. Paint or any other material on the UTP cable voids the warranty. If this can't be removed during the installation, the effected cables will need to be replaced.
- 3.6.3. Any UTP CAT6 cable or component that has been painted and / or not satisfactorily passing tests or failing to meet quality installation standards as described in the standards will be repaired or replaced as directed by C&IT Network Engineering Group at the contractors expense.

### 3.7. Warranty Requirements

- 3.7.1. Provide a channel warranty for all data drops.
  - 3.7.2. Warranty shall cover repair or replacement of all defective components free of charge, including all labor performed by a manufacturer-certified installer. All new or replacement components shall be furnished new. Never used, reused, reconditioned, or refurbished components are allowed by the manufacture.
- 3.8. The installing contractor must be certified by the cabling and connector manufacturers as an approved and trained installer of their equipment.

## 2. Products

### 1. Inter-building fiber optic backbone

- 1.1. Singlemode fiber optic cabling
  - 1.1.1. Manufacturers:
    - Systimax
    - Corning
    - BerkTek
    - CommScope
  - 1.2. Description:
    - 1.2.1. Nominal 9/125  $\mu\text{m}$ , [6] [12] [18] [24] [36] [48] [96] strand or as indicated on drawings, loose tube, all-dielectric cable, rated **for outdoor use**. Cable shall have water-blocking properties to prevent water penetration and fiber damage. Cable shall have maximum 12 stands per tube, and an overall Polyethylene jacket.
    - 1.2.2. Nominal 9/125  $\mu\text{m}$ , [6] [12] [18] [24] [36] [48] [96] strand or as indicated on Drawings, loose tube, OFNR rated **for indoor/outdoor use**. Cable shall have water-blocking properties to prevent water penetration and fiber damage. Cable shall have maximum 12 stands per tube, and an overall UV resistant, flame retardant jacket.

### 2. Intra-building copper backbone (voice only)

- 2.1. Manufacturers:
  - Superior-Essex
  - BerkTek
  - Beldon
  - Hubbell
  - CommScope

## 2.2. Description:

- 2.2.1. Twisted pair copper conductors, 24 AWG, solid annealed copper.
- 2.2.2. Provide [25] [50] [100] pair cable bundles, as indicated on Drawings.
- 2.2.3. Cable rated CAT5E voice backbone cable, UL Listed CMR, CMP as required.
- 2.2.4. 25 pair binder groups color coded per industry standards.
- 2.2.5. Flame-retardant PVC insulation for riser rated applications, low- smoke PVC insulation for plenum applications, color-coded for each conductor per industry standards.
- 2.2.6. White, flame-retardant PVC outer jacket for riser rated applications, gray low-smoke PVC outer jacket for plenum applications.

## 3. Intra-building fiber optic backbone

### 3.1. Multimode fiber optic cabling

#### 3.1.1. Manufacturers:

- Systimax
- Corning
- BerkTek
- CommScope

3.1.2. Description: 50/125  $\mu\text{m}$ , [6] [12] [18] [24] [36] [48] strand or as indicated on Drawings, tight buffered, OFNP. Cable shall be comprised of individually jacketed, and uniquely identified fibers with an overall blue sheath.

3.1.3. Horizontal and Vertical fiber cable shall be furnished with performance requirements for the system served (voice, video or data) as indicated on the drawings riser diagram.

### 3.2. Singlemode fiber optic cabling

#### 3.2.1. Manufacturers:

- Systimax
- Corning
- BerkTek
- CommScope

3.2.2. Description: Nominal 9/125  $\mu\text{m}$ , [6] [12] [18] [24] [36] [48] strand or as indicated on Drawings, tight buffered, OFNP. Cable shall be comprised of individually jacketed, and uniquely identified fibers with an overall yellow sheath.

3.2.3. Horizontal and Vertical fiber cable shall be furnished with performance requirements for the system served (voice, video or data) as indicated on the drawings riser diagram.

## 4. Copper horizontal cabling

### 4.1. Manufacturers:

- CommScope
- BerkTek
- Superior-Essex
- Hubbell
- Belden

### 4.2. Description:

4.2.1. Horizontal cable shall be furnished with performance requirements for the system served (voice, video or data) as indicated on the drawings riser diagram.

- 4.2.2. Category 6 enhanced: 23 AWG, 4-pair, 100 ohm, UTP, [CMR] [CMP], with green jacket for data and wireless access points, yellow jacket for voice cabling, purple jacket for security camera cabling.
- 4.2.3. Workstation, server, printer etc. data jacks will terminate in their own group of patch panels. Wireless access point and security camera data jacks will terminate in their own separate group of patch panels. All patch panels are installed in the equipment racks.

## **5. UTP jacks and connectors**

### **5.1. Manufacturers:**

- CommScope UNJ600.
- Ortronics
- Leviton
- Hubbell
- Beldon

## **6. Modular jacks for UTP cables:**

- 6.1. 8 position, 8 conductor, non-keyed, universal modular jack, snap-in type, terminated with a 110 style pc board connector, color coded for T568A and T568B wiring.
- 6.2. Designed to terminate 22-26 AWG solid on insulation-displacement
- 6.3. 110-style connectors.
- 6.4. Contacts shall be minimum 50 micron gold-plated in the contact area.
- 6.5. Rated to match the performance of the cabling system they are installed on.
- 6.6. Color coded for system served as indicated on the Drawings.
- 6.7. Furnish keystones (icons) for jack identification. Keystones for voice, data, wireless access points and security cameras jacks shall be [orange].
- 6.8. When installing outdoor cameras, APs, or any type of network device, you must use one of the following Hi-Impact jacks and patch cords.
  - 6.8.1. Manufacturers:
    - CommScope UMP610-24P or UMP610-48P.
    - Ortronics
    - Leviton
    - Hubbell HI6Coupler and Jack. HI603AE Patch Cord
    - Beldon
- 6.9. When installing outdoor cameras, APs or any type of network device, you must use one of the following CAT6E POE compatible lightning, surge protection devices part of the communication room termination:
  - 6.9.1. Manufacturers:
    - ATLAN AT-2210
    - Phoenix Contact DT-LAN CAT.6+ 2281007
    - L-COM BT-CAT6-P1-HP

## **7. UTP patch panels**

### **7.1. Manufacturers:**

- CommScope UMP610-24P or UMP610-48P.
- Ortronics

- Leviton
- Hubbell
- Beldon

#### 7.2. UTP patch panel

- 7.2.1. Patch panel shall serve as data jack, voice jack, security camera and wireless access point system horizontal cross connect.
- 7.2.2. Wireless access point and security camera data jacks will be terminated on their own patch panel separate from the workstation data jack patch panels.
- 7.2.3. Patch panel shall be configured for standard 19" rack mounting.
- 7.2.4. High density type with snap in 24 modular jack ports for every standard rack mount unit (1.75" high).
- 7.2.5. Maximum 6 port groupings of replaceable modules.
- 7.2.6. Terminations for the "building side" cabling on 110-style insulation PC board connectors color-coded for T568B terminations.
- 7.2.7. Horizontal and vertical cable management hardware front and rear.
- 7.2.8. Performance shall meet the performance of the cabling system they are installed on.
- 7.2.9. Constructed of black anodized aluminum with adequate structural integrity so that panel will not deflect when center of panel is pushed with the hand.
- 7.2.10. Provisions for icons and labeling to comply with the labeling requirements in specification 27170, "Cable Plant Administration and Testing".

### 8. Cross-connect blocks

#### 8.1. Manufacturers:

- CommScope.
- Ortronics
- Leviton
- Hubbell
- Beldon

#### 8.2. Cross-connect blocks

- 8.2.1. Cross connect blocks shall be used for voice connectivity [backbone to] horizontal cross connects:
- 8.2.2. Wall-mount 110-type wiring blocks mounted in a modular frame if needed.

### 9. Face plates

- 9.1. Manufacturers: Same as jacks and connectors, unless otherwise noted. In almost all cases in labs, stainless steel plates will be called out in lieu of plastic. Reference construction drawings.
- 9.2. Face plates for wall mounted workstation outlets shall allow a minimum 2 and maximum of 6 positions and accept snap-in jacks, as specified.

### 10. UTP patch cords

#### 10.1. Manufacturers

- 10.1.1. Shall be the same manufacturer and type as the cable, jacks and patch panels installed in the building.

#### 10.2. Description

- 10.2.1. Provide one (1) 1' patch cord for each data port installed in the patch panel. Provide one (1) 1' patch cord for each data port installed at the workstation area.
- 10.2.2. For the workstation room side provide patch cords with stranded conductors and jacketing for greater flexibility.
- 10.2.3. Patch cords shall be gray color for the workstation, and communication room areas. Patch cords shall be green color for the access point. Patch cords shall be purple color for the security cameras. Coordinate possible different lengths with C&IT.

## **11. Fiber optic connectors for both inter–building and intra–building cables**

- 11.1. Manufacturers:
  - Corning Cable Systems.
- 11.2. Multimode fiber optic connectors shall be:
  - 11.2.1. Field installed [LC] type in 12/24 port panels for INTRA – BUILDING riser tie cabling between communication rooms. Provide [black] color connector.
  - 11.2.2. We don't install Multimode fiber between buildings.**
  - 11.2.3. Data rates have exceeded the ability to use of Multimode.
- 11.3. Single-mode fiber optic connectors shall be:
  - 11.3.1. Field installed [LC] type in 12/24 port panels for INTRA – BUILDING riser tie cabling between communication rooms. Provide [black] color connector.
  - 11.3.2. Field installed [LC] type in 144 port panels for INTER – BUILDING tie cabling between buildings. Provide [black] color connector.
- 11.4. Single-mode fiber optic connectors for video shall be:
  - 11.4.1. Field installed [LC/APC] type in 12/24 port panels for INTRA– BUILDING riser tie cabling between communication rooms. Provide [green] color connector.
  - 11.4.2. Field installed [LC] type in 12/24 port panels for INTER – BUILDING tie cabling between buildings. Provide [green] color connector.
- 11.5. Connectors shall be epoxy polish [LC/APC] type with ceramic ferrule with tool kit.
- 11.6. Connectors shall be fusion type. Compression type connectors shall not be allowed.
- 11.7. All [LC/APC] connectors and ferrules shall be green in color.
- 11.8. Field Install a Minimum of 2 strands (last 2) or coordinated exact quantities and requirements for [LC/APC] terminated fiber optic strands with C&IT-IT Customer Services- Telecommunications department prior to installation.

## **12. Fiber optic patch panels**

- 12.1. Manufacturers:
  - CommScope.
  - Corning
  - Leviton
  - Ortronics
- 12.2. Description
  - 12.2.1. Rack-mounted, minimum 12-port Maximum 96-port patch panel with modules or panels.
  - 12.2.2. Use factory terminated fusion splice LC pig tail type connectors.

### 3. Execution

#### 1. General

- 1.1. In addition to the notes contained on the Drawings, the following Contractor notes shall apply.

#### 2. Cable routing

- 2.1. Route all cables and cable raceways parallel to or perpendicular to building structure.
- 2.2. All cables shall be installed as single continuous "home-run" pulls from connector block to connector block, or from patch panel in the telecommunications room to the data workstation outlet in the work area.
- 2.3. Cable that is run above a suspended ceiling must be supported per NFPA code requirements. Three choices are, conduits, cable tray or by J-hooks.
- 2.4. No tie-raps or bundling allowed.
- 2.5. The maximum spacing of cable hangers, supports and the number of data cables per hanger shall not exceed BICSI specification.
- 2.6. The installation contractor shall be responsible to replace all fire-proofing materials required for the installation. Any missing fire-proofing materials shall be reported to WSU for repair to maintain required fire rating of structure.
- 2.7. Communication cable and infrastructure shall be independently supported.
- 2.8. Do not support or tie-wrap any cables to ductwork, plumbing lines, fire suppression, electrical conduits, mechanical systems, or ceiling system.
- 2.9. Do not route cables through block wall without a sleeve, directly lay data cables on ductwork, piping and plumbing systems or on top of the lay-in ceiling tile.
- 2.10. All cable must be free of tension at both ends as well as over the length of the run.
- 2.11. Only Velcro straps are permitted as cable bundle supports. Waterfalls from cable tray shall not pinch, bind, crimp or in any way deform or cause physical damage to the cable jacket, or alter the electrical characteristics of the data cables.
- 2.12. Contractor shall take care to assure that during and upon completion of the installation, all cables are free of kinks, sharp bends, twists, gouges, cuts or any other physical damage which may cause physical or electrical characteristic alterations to the cables. The cables must also be installed at the proper room temperature. Any of these conditions will constitute a replacement of the installed cable.
- 2.13. Contractor to observe all minimum bend radius and tension limitations, etc., as specified by the cable manufacturer when installing the cables.
- 2.14. Contractor shall supply neatly bundled slack loops of length 10 feet for all cabling in telecommunications spaces. Provide neatly bundled slack loop 1 foot above the ceiling at workstation end.
- 2.15. Provide Velcro cable ties periodically in all runs and within the telecommunications spaces provide slack loops per BICSI standards.
- 2.16. Route all optical fiber cabling in inner duct. Armored fiber cable doesn't need to be in innerduct. Support inner duct with j-hooks a maximum five feet on center when not routed in conduit or cable tray.

#### 3. Cable terminations

- 3.1. The contractor who installs the communications cabling must be the one who terminates the communications cabling and test the finished data channel. It is not allowed to

have a non-certified electrical contractor install the communications cable and have another certified contractor terminate, test and warranty it. No exceptions to this will be allowed. Terminate all wiring at both ends using the T568B convention. All voice and data cables shall be terminated in accordance with ANSI/TIA 568-C installation guidelines.

- 3.2. Terminate all wiring at both ends using the T568B convention. All voice and data cables shall be terminated in accordance with ANSI/TIA 568-C installation guidelines.
- 3.3. All data cables shall be terminated on rack mounted, high density, patch panels.
- 3.4. Wireless access points, security cameras and all other “internet of things” data jacks will be terminated on their own patch panel separate from the workstation data jack patch panels.
- 3.5. All data jacks above ceiling must be orange, securely mounted and labeled. No free floating or double stick mounted jacks are allowed.
- 3.6. All cable terminations shall be free of stress or tension when complete.

#### **4. Outlets**

- 4.1. Data jacks are installed in outlet boxes on the wall, approved raceways or directly wired and mounted cubical furniture.

#### **5. Face plates**

- 5.1. Contractor shall provide standard faceplate with blank inserts for all outlets indicated as "future".

#### **6. Patch panels**

- 6.1. Mount patch panel according to equipment rack elevations.

#### **7. Voice riser connecting blocks**

- 7.1. If needed, mount 110 style-connecting blocks on plywood backboard.
- 7.2. Provide “D rings” and cable management between blocks.

END OF SECTION 27150

## Section 27170 - Cable plant administration and testing

### 1. General

#### 1. References

- 1.1. ANSI/NFPA 70 - National Electrical Code.
- 1.2. NFPA-297 - Guide on Principles and Practices for Communication Systems.
- 1.3. ANSI/TIA 568-C - Commercial Building Telecommunications Cabling Standard
- 1.4. ANSI/TIA 569-C - Commercial Building Standard for Telecommunications Pathways and Spaces.
- 1.5. ANSI/ JSTD 607-B - Commercial Building Grounding and Bonding Requirements for Telecommunications.
- 1.6. ANSI/IEEE-110-1992 - Powering and Grounding Sensitive Electronic Equipment. G. BICSI – Building Industry Consulting Services International.

### 2. Products

#### 1. Labels

- 1.1. Manufacturers:
  - Brady.
  - Brother P-Touch.
  - Equivalent by Tester manufacturer.
  - Equivalent by UTP connectivity manufacturer.
2. Description
  - 2.1. Machine-printed permanent glossy polyester labels for racks, cabinets, faceplates, and panels. (Brady B-422).
3. Machine-printed, self-laminating vinyl for cabling and patch cords. (Brady B-427)

### 3. Execution

#### 1. Labeling

- 1.1. Contractor to install all faceplate and equipment labels in accordance with manufacturer's recommendations and the specifications. All labels shall be neatly installed and shall be level with the floor and properly aligned on the faceplate.
- 1.2. All pieces of voice and data equipment, including wires, cables, fibers and their respective terminations shall be labeled and identified in accordance with ANSI/TIA 606-B.
- 1.3. Labels shall meet the requirements of UL 969 as outlined in the ANSI/TIA 606-B.
- 1.4. All horizontal and backbone subsystem copper and fiber cables shall be labeled at each end. Labeling is required at intermediate points such as pullboxes and consolidation points (where appropriate).
- 1.5. Do not install labels closer than 3" to the termination point.



- 1.6. Patch panel labels shall be printed with the associated user data jack number.
- 1.7. Contractor shall submit a sample of patch panel label strips to the Engineer for approval prior to installation.
- 1.8. Numbering schemes for fiber panels, copper patch panels and voice wall 110 punch blocks will go in ascending order.
- 1.9. Intra-building fiber riser cable labeling scheme is for building riser cables between communication rooms, [cable type] - [WSU Building Number] - [floor number] - [communication room number]. Example: BRC-027.03.315
- 1.10. Voice and data jack labeling scheme is [Room Number] – [jack number + function]. Ex: 222-V01, 222-D01, 222-V02, 222-D02, 223-V01, 223-D01, etc
- 1.11. Labeling shall be consistent at each end of cabling and at workstation outlet and patch panel or connecting block. Data jacks shall be orange located in the outlet bottom position (vertical) or the outlet right position (horizontal). Voice jacks shall be White located in the outlet top position (vertical) or the outlet left position (horizontal). All voice terminates in their own patch panel.
- 1.12. Wireless access point jacks labeling scheme is [WAP] - [Room Number]. If the access point is in a corridor, use the closest room number. Labeling shall be consistent at each end of cabling and at WAP outlet and patch panel or connecting block. When a wireless access point is located above the ceiling a label must be placed on the ceiling grid which contains a small red dot and the wireless access point jack number.
- 1.13. Security camera jacks labeling scheme is [CAM] - [ Last 2 octets of the IP Number]. Elevated cameras must have labeling at the bottom which allows for viewing from ground level. Labeling shall be consistent at each end of cabling and at WAP outlet and patch panel or connecting block.
- 1.14. All access point and security camera jacks will be terminated together on their own patch panel separate from the workstation data patch panels.
- 1.15. Outdoor fiber cables must be labeled with WSU fiber ownership cable label and unique building or backbone fiber cable name.
- 1.16. All labels must be based on the final room numbers. Verify room numbering with Owner prior to installation of labels. Do not use room numbers that appear on construction drawings.

## **2. UTP system testing**

- 2.1. Upon completion of the cable installation, the Contractor shall perform complete copper cable certification tests, according to all manufacturer's requirements for application warranty, testing required by TIA/EIA, including, but not limited to:
  - 2.1.1. Continuity checks on each cable, checking for opens and shorts.
  - 2.1.2. Cable length (Channel and Permanent Link).
  - 2.1.3. Correct pair polarity.
  - 2.1.4. Correct cable labeling at both ends.
- 2.2. Tests shall be performed with connectors installed.
- 2.3. Any UTP CAT6 cable or component that has been painted and / or not satisfactorily passing tests or failing to meet quality installation standards as described in the specification, shall be repaired and/or replaced as directed by C&IT Network Engineer at the Contractor's expense.
- 2.4. The Contractor shall prepare complete cable test reports for all installed cables for review and acceptance by WSU C&IT Network Engineering prior to acceptance and / or use of the cabling system.

- 2.5. Category 6E UTP cable patch cords shall be manufacture made, fully tested and verified in accordance with product specifications. No field made patch cords.
- 2.6. All cable testing shall be conducted by a certified technician using a Level III minimum Fluke Networks DSX 8000, or C&IT Network Engineering approved equivalent certification tester.
- 2.7. The cable tester calibration must be up to date. Test results must have the operator with company name, WSU building project name and cable type field. The cable type field identifies the cable product type installed and tested.
- 2.8. The test results must be submitted in one file to C&IT for approval.
- 2.9. The Category 6E Horizontal Cable Certification reports shall have complete testing of channel for voice and data drops, at frequency increments up to 450MHz and set the cable length limit to 295' as indicated in ANSI/TIA-568-C and test results will show the following:
  - 2.9.1. Cable ID Number which matches faceplate numbers and patch panel numbers
  - 2.9.2. Tester Calibration Validation Date. Has to be calibrated every year.
  - 2.9.3. Building Project Name, Test Date, operator and company names.
  - 2.9.4. Cable Length
  - 2.9.5. Wire-Map
  - 2.9.6. Network Tests for 100BASE-TX and 1000BASE-T
  - 2.9.7. Attenuation
  - 2.9.8. Near End CrossTalk (NEXT)
  - 2.9.9. Power-sum NEXT (PS-NEXT)
  - 2.9.10. Attenuation to Cross Talk Ratio (ACR)
  - 2.9.11. Power-sum Attenuation to Cross Talk Ratio (PS-ACR)
  - 2.9.12. Equal Level Far End CrossTalk (ELFEXT)
  - 2.9.13. Power-sum Equal Level Far End CrossTalk (PS-ELFEXT)
  - 2.9.14. Return Loss
  - 2.9.15. Propagation Delay
  - 2.9.16. Delay Skew
  - 2.9.17. Signal to Noise Ratio
- 2.10. Upon completion, before final payment the following must be provided:
  - 2.10.1. Provide (1) electronic copy of test results in PDF file format.
  - 2.10.2. Provide the manufacture warranty certificate upon completion.
  - 2.10.3. Test date.
  - 2.10.4. Tester make, model and calibration date.
  - 2.10.5. No exception to this will be allowed.
- 2.11. After the horizontal cable tests have been performed, the Contractor shall install the faceplate labels and modular jack dust covers.

### **3. Optical fiber system testing**

- 3.1. Upon completion of the fiber cable installation, the Contractor shall perform complete fiber cable certification tests, according to all manufacturer's requirements for warranty and all testing required by ANSI/TIA 568-C.
- 3.2. Test all fiber (100%) using a power meter using the encircled flux testing criteria as stated in the TIA TSB-4979 specification or TIA 526-14-B standard, testing all cables in both directions.
- 3.3. Provide test report and include as a minimum the following information for all cables:

- 3.3.1. Fiber cable number
- 3.3.2. Fiber length.
- 3.3.3. Attenuation (loss in dB).
- 3.3.4. Test date
- 3.3.5. Tester make and model no.
- 3.3.6. Tester calibration date.

END OF SECTION 27170

## Section 27600 – C&IT digital signage specifications

1. All Digital Signage installations shall comply with the latest version of the **WSU Standards for Communications Infrastructure**
2. **Changes and Substitutions**
  - 2.1. Any proposed changes, deviations or substitutions of items, materials or methods specified below must be approved in advance by an authorized representative of WSU Computing & Information Technology (C&IT).
  - 2.2. Any items, materials or methods proposed as equivalent must be approved in advance by C&IT.
3. **Display**
  - 3.1. Make and Model
    - 3.1.1. [NEC P554 Flat Panel Display](#).
      - 3.1.1.1. Smaller NEC P-series displays may be used if space limitations exist.
      - 3.1.1.2. Provide minimum of 3-year depot warranty on display.
    - 3.1.2. Loudspeaker kit (optional) – **not recommended**
4. **Display Mount**
  - 4.1. Make and Model
    - 4.1.1. Chief Manufacturing LSA1U Fusion Fixed Wall Display Mount or equivalent.
  - 4.2. Wall reinforcement
    - 4.2.1. Securely anchor wall mount to existing studs/framing.
    - 4.2.2. Reinforce wall with 5/8" plywood back board if required.
    - 4.2.3. Field conditions shall determine mounting reinforcement requirements.
  - 4.3. Ventilation and installation clearance (recess mounting)
    - 4.3.1. Provide 3 inches clearance around perimeter of display for convection cooling and mounting access with recess-mounted displays.
5. **Player**
  - 5.1. Make and Model: Dell Optiplex 7060 Micro Digital Signage Player
    - 5.1.1. WSU Specifications
      - 5.1.1.1. i5 Processor
      - 5.1.1.2. INTEL-vPro
      - 5.1.1.3. 8 GB RAM
      - 5.1.1.4. 128 GB SSD storage
      - 5.1.1.5. Display Port Cable
      - 5.1.1.6. Dual VESA Mount
      - 5.1.1.7. 5 Year Basic Warranty
      - 5.1.1.8. No Microsoft Office
    - 5.1.2. Player Operating System
      - 5.1.2.1. Player must be provided with an installed, licensed version of Microsoft Windows 10 Enterprise 64 bit.
      - 5.1.2.2. Microsoft Windows Embedded (any version) is **not allowed**.

## **6. Audio/Video Transport**

- 6.1. Transmitter
  - 6.1.1. Make: Extron Electronics
  - 6.1.2. Model: DTP HDMI 4K 330 Tx HDMI Tx - 330 feet (100 m max run length)
    - 6.1.2.1. P/N 60-1331-12
  - 6.1.3. Transmitters to be mounted on shelf in MDF/IDF IT Closet.
- 6.2. Receiver
  - 6.2.1. Make: Extron Electronics
  - 6.2.2. Model: DTP HDMI 4K 330 Rx HDMI Rx - 330 feet (100 m max run length)
    - 6.2.2.1. P/N 60-1331-13
  - 6.2.3. Receivers to be securely mounted behind flat panel display.
  - 6.2.4. Receiver may be remote powered from Transmitter or locally powered using power supply and 120 VAC.
- 6.3. Cable
  - 6.3.1. Make: Extron Electronics
    - 6.3.1.1. P/N 22-235-03 XTP DTP 24P Plenum
  - 6.3.2. Cable runs not to exceed 100 meters end-to-end.
  - 6.3.3. All cable shall be plenum-rated.
  - 6.3.4. All connectors shall be shielded and installed per Extron specifications.
  - 6.3.5. Cable shall support full bandwidth and full resolution 1080P, 1080i and 720p HDMI transport.
- 6.4. Jumper cables – Digital Signage Player to HDMI Transmitter
  - 6.4.1. HDMI Micro to HDMI
- 6.5. Jumper cables - HDMI receiver to display
  - 6.5.1. HDMI to HDMI

## **7. Labeling**

- 7.1. All players, transmitters, receivers and cables shall be clearly labeled with the following information:
  - 7.1.1. Flat panel display locations.
  - 7.1.2. Display ID numbers.

## **8. Infrastructure**

- 8.1. Cable A/V (HDMI Transport)
  - 8.1.1. Provide separate J-box and outlet for AV cabling located behind the display
    - 8.1.1.1. Field coordinate exact location.
  - 8.1.2. Make: Extron Electronics
    - 8.1.2.1. P/N 22-235-03 XTP DTP 24P Plenum
  - 8.1.3. Cable runs not to exceed 100 meters end-to-end.
  - 8.1.4. All cable shall be plenum-rated.
  - 8.1.5. All cable shall be Shielded Twisted Pair (STP).
  - 8.1.6. All connectors shall be STP-compliant.
  - 8.1.7. All connectors shall be shielded and installed per Extron specifications.
- 8.2. Power
  - 8.2.1. Provide duplex 120 VAC, 20 ampere power outlets behind display
  - 8.2.2. Provide dedicated 120 VAC 20 Amp circuit.
  - 8.2.3. The dedicated circuit shall not be connected to other utility or corridor circuits that may be used by others.

- 8.2.4. Field coordinate exact location.
- 8.3. Data
  - 8.3.1. Provide single data jack behind display per WSU Standards for Communication Infrastructure.
  - 8.3.2. Field coordinate exact location.

## **9. MDF/IDF Requirements**

- 9.1. Rack mounting of players
  - 9.1.1. Players and transmitters to be securely rack-mounted on shelf in nearest MDF/IDF IT Closet.
  - 9.1.2. Players shall be mounted in a manner that will not obstruct chassis cooling fans, air flow or convection cooling.
  - 9.1.3. Mount shelf in existing space in MDF/IDF relay rack.
  - 9.1.4. Field coordinate mounting with other rack mounted IT equipment.
  - 9.1.5. Provide generic 19-inch EIA mounting shelf as required.
- 9.2. Power
  - 9.2.1. Players require 120 VAC outlets, per player.

## **10. Interior Design Requirements**

- 10.1. Coordinate interior design with Architect
  - 10.1.1. Recess mounting
    - 10.1.1.1. Coordinate design in advance with C&IT.
    - 10.1.1.2. Shop drawings must be approved in advance by C&IT.
  - 10.1.2. Millwork and cabinetry
    - 10.1.2.1. Coordinate design in advance with C&IT.
    - 10.1.2.2. Shop drawings must be approved in advance by C&IT.
  - 10.1.3. Aesthetics
    - 10.1.3.1. Coordinate design in advance with C&IT.
    - 10.1.3.2. Shop drawings must be approved in advance by C&IT.

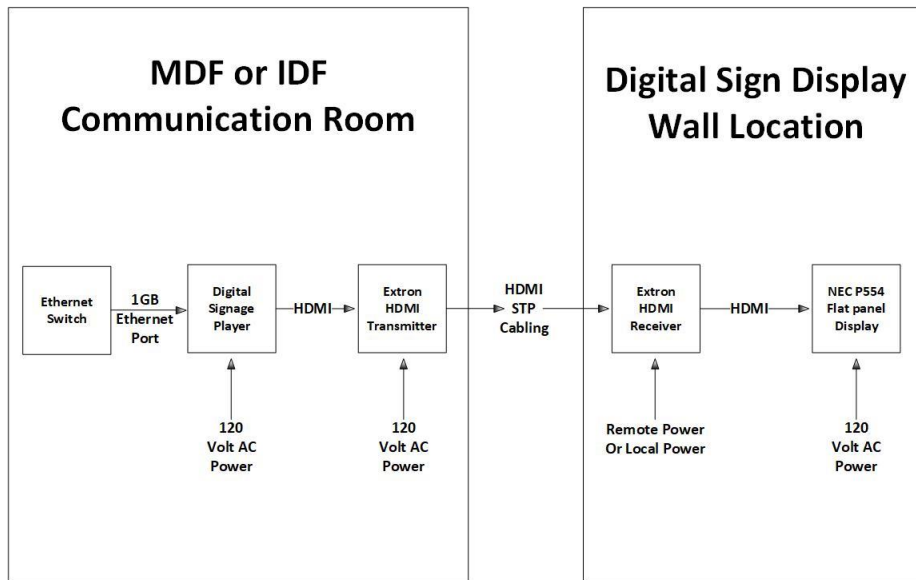
## **11. Service and Support Recommendations**

- 11.1. Ensure that digital signage players are ordered with 5-year depot warranty, as specified above.
- 11.2. Ensure that flat panel displays are ordered with 5-year depot warranty, as specified above.
- 11.3. Provide 5-year service and support plan covering labor, materials and shipping during 5-year warranty periods for digital signage players and displays.
- 11.4. Replace digital signage players every 5 years.
- 11.5. Replace digital signage displays as needed, typically every 5 to 10 years.
- 11.6. If location of signage is critical, ordering a spare player is recommended.

## **12. Block Diagram (next page)**

# WSU Campus Digital Signage system

## Block Diagram



END OF SECTION 27600