SECTION 27 00 00 – COMMON WORK RESULTS FOR TELECOMMUNICATIONS

PART 1 - GENERAL

1. The following standards are intended to provide design guidelines for new installations. Facility renovations where the existing systems are only being extended or modified based on architectural changes, the general guidance shall be to follow the existing building system criteria to avoid mixing incompatible system components.

PART 2 - DEFINITIONS

1. ER - Equipment Room (Telecommunications):

    A. An environmentally controlled centralized space for telecommunications equipment that usually houses a main or intermediate cross-connect.

2. TR - Telecommunications Room:

    A. An enclosed architectural space for housing telecommunications equipment, cable terminations, and cross-connect cabling.

3. TE – Telecommunications Enclosure:

    A. This is specifically where wall-mounted equipment cabinets are provided in computer labs and where dedicated and secured ER/TR cannot be provided.

4. TO – Telecommunications Outlet/Connector:

    A. Per the current standards, this is defined as a connecting device in the work area on which horizontal cable or outlet cable terminates.

5. UTP - Unshielded Twisted Pair

6. MC – Main Cross-connect (This was formally called the MDF – Main Distribution Frame. Although the standards bodies changed this many years ago, some clients still use the older terms.)

    A. The MC is located in the ER.

7. HC – Horizontal Cross-Connect: (This was formally called the IDF – Intermediate Distribution Frame. Although the standards bodies changed this many years ago, some clients still use the older terms.)

    A. HCs are located in a TR. Exceptions are where Telecommunications Enclosures (TE) are utilized and secured/locked ER/TRs are not provided.

PART 3 - COMPLIANCE WITH THE FOLLOWING IS REQUIRED UNLESS OTHERWISE INDICATED:

1. ANSI/TIA/EIA 568-C.0 Generic Telecommunications Cabling for Customer Premises.
2. ANSI/TIA/EIA 568-C.1 Commercial Building Telecommunications Standards Part 1: General Requirements.
3. ANSI/TIA/EIA 568-C.2 Balanced Twisted Pair Cabling and Components Standards.
4. ANSI/TIA/EIA 568-C.3 Optical Fiber Cabling Systems.
5. ANSI/TIA/EIA 569B Commercial Building Standard for Telecommunications Pathways and Spaces.
6. ANSI/TIA/EIA 606-B Administrative Standard for Commercial Telecommunications Infrastructure.
7. TIA-607-C Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.
8. TIA-758-B Customer-Owned Outside Plant Telecommunications Infrastructure Standard.
9. TIA-526-7 Measurement of Optical Power Loss of Installed Single-mode Fiber Cable Plant.
10. TIA-526-14-B Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant.
11. BICSI – Telecommunications Distribution Methods Manual (TDMM).
12. NEC - National Electric Code.
13. NFPA - National Fire Protection Association.
14. IEEE - Institute of Electrical and Electronics Engineers.
15. ISO - International Standards Organization.
16. UL - Underwriters Laboratories.

PART 4 - CABLING CONTRACTOR REQUIREMENTS

1. The Contractor responsible for this section shall have a Registered Communications Distribution Designer (RCDD) on staff who will oversee and be responsible for this project. The Contractor shall have been in business for a minimum of five years. The Contractor shall provide a minimum of two references supporting past experience in similar projects.
2. The lead technician(s) on the project shall carry a current BICSI Technician Certificate or have a minimum of five years related experience in projects of similar scope and shall have a thorough understanding of all referenced standards.
3. The Contractor provides all IT racks.

Low Voltage Responsibility Matrix	Ivy Tech	General Contractor and Subcontractor	Design Team
General Low Voltage Items			
Site Conduits		F, I	D
Low Voltage Racks	S	F, I	D
Rack Cable Management		F, I	D
Conduit Sleeves		F, I	D
Grounding and Bonding (ground bars, conductors, terminations, etc.)	S	F, I	D
Cable Pathways, Cable Tray, and Ladder Tray		F, I	D
Firestopping for Low Voltage Systems		F, I	D
Fire Rated Pathways, Core Drilling Floor/Wall Sleeves		F, I	D
Equipment, Cable, and Outlet Faceplate Labeling		F, I	D
Coordinate Service and Required Interface Equipment at Demarc		D, F, I	
Interface with Internet Service Provider to Provide Service	S, D		
Telecommunication Systems			
Fiber Distribution (between telecom rooms)	S	F, I	D
Fiber Switch and Terminations Equipment (servers, switches, UPS, PDU, etc.)	S	F, I	D
ER & TR Room Plywood on Walls		F, I	D
ER & TR Room Ladder		F, I	D
Rack Patch Panels	S	F, I	D
Patch Cables	S	F, I	D
Horizontal Cabling	S	F, I	D
Backboxes and Conduits		F, I	D
Faceplates	S	F, I	D
VOIP PC “Soft” Telephones	S, F, I, D		
Blue Light Emergency Phone and Camera	S	F, I	D
Wireless Access Points	S, F	I	D
Access Control			
Head-End Equipment, Programming, and Credential Cards	S	F, I	D
Backboxes and Conduits		F, I	D
Devices (card readers, keypads, etc.)		F, I	D
Interconnection Wiring and Terminations	S	F, I	D
System Programming	S	F, I	D
System Training		F, I	D
Enterprise Access Control Software	S, F, I, D		
Video Surveillance			
Head-End Equipment (hardware, software, displays, etc.)	S, D	F, I	
Cameras and Mounts	S	F, I	D
Horizontal Wiring and Terminations	S	F, I	D
Backboxes and Conduits		F, I	D
Enterprise Video Surveillance Software	S, F, I, D		
Blue Light Emergency Phone and Camera	S	F, I	D
Instructional Video System			
AV Infrastructure (conduit, back boxes, floor boxes, poke-through devices)		F, I	D

Displays/Projectors/Screens	S	F, I	D
Control Systems including interfaces to Lighting and BMS Systems	S		
Annotation Devices	S	F, I	D
AV Support including DSP, amplifiers, matrix switchers, streaming interfaces, microphones & speakers, loud speakers	S	F, I	D
Computers for AV Systems	S	F, I	D
Video Cameras	S	F, I	D
Assisted Listening System		F, I	D

Legend:
D: Designed
F: Furnished
I: Installed
S: System Standards

Note:
The party responsible for installing the respective equipment shall also be responsible for all terminations, programming, documentation, owner training, and testing of the system, unless otherwise specifically noted.

PART 5 - COORDINATION REQUIREMENTS

1. Coordinate electrical requirements for power at outlet locations and Equipment/Telecommunications Rooms (ER/TR) with Electrical Engineer and College.

2. Coordinate pathway requirements with Electrical Engineer and College.

3. Coordinate HVAC requirements for ER/TRs with Mechanical Engineer and College.

4. Coordinate space requirements for outlet locations and ER/TRs with Architect and College.

5. Clearly show locations of the intercom and sound system cabinets in the office, cafeteria, and stage areas. Provide two wireless microphones with each cafeteria system. Clearly indicate locations of microphone jacks/inputs also.

PART 6 - WARRANTY

1. The structured cabling system shall include at a minimum a 15-year performance and applications warranty from the manufacturer. The warranty shall warrant that all links have been permanent link tested bi-directionally end-to-end.

PART 7 - EXTRA MATERIALS

1. Provide one box of each wire color

2. Provide at least 25 extra patch cables to serve work area outlets and 25 to serve patch panels.

PART 8 - CELLULAR SYSTEM DISTRIBUTED ANTENNA SYSTEM (DAS)

1. Where indoor cellular telephone reception is unavailable, provisions for a DAS are strongly encouraged.

Provide structured cabling to support a DAS. DASs can cover a wide range of carrier frequencies. Carrier frequencies are a utility similar to power and internet services.

2. The DAS should be designed to support and fully connect Cellular Carriers and Service Providers such as Verizon Wireless, AT&T, Sprint/Nextel, T-Mobile, and other local Cellular Carriers.

3. Location of any equipment including antennas, cable, and electronics shall be coordinated with Owner, Architect, Engineer, General Contractor, and other construction trades to ensure neat and functioning installation.

4. All antenna points and cable routing shall be coordinated by the Contractor with the Owner and Architect prior to installation to maintain the highest-level aesthetics sought on this project. Position antennas discreetly. Contractor shall provide mockups for each unique mounting and routing condition for Owner and Architect approval including associated shop drawings and references for each location.

5. The installation of the DAS system shall comply with all local building codes, and applicable rules and regulations of the AHJ, FCC, EIA, IEEE, NEC, TIA, UL, BICSI, and other industry standards, codes, and methods.

6. Any DAS distribution through exposed public areas shall be routed in continuous conduit painted (or stealth) to match surrounding background or conditions. All such conditions shall be approved by Owner, Architect, and Engineer prior to initiating any work.

7. Fiber serving distributed antenna systems DAS may have special fiber connectivity requirements. Coordinate fiber connectivity type with specific DAS.

PART 9 - POWER CONDITIONING AND BACKUP

1. For systems that have been deemed critical by the College, uninterruptible power supplies (UPS) shall be provided in conjunction with a generator. Where a backup generator is provided, these critical systems shall be included on the generator. The UPS shall provide a carry-over time of not less than ten minutes where generator support is present. Where a generator is not extant or provided, the UPS battery system shall be sufficient to support the designated telecommunications load for a time limit as directed by the College.

2. Consideration will be given to a centralized UPS system for new facilities.

SECTION 27 05 28 – PATHWAYS FOR COMMUNICATION SYSTEMS

1. Primary pathways are those supporting the cabling infrastructure from the Equipment Rooms/Telecommunications Rooms through the corridors and chases to the secondary pathways.

3. Secondary pathways are those supporting the cabling infrastructure from the primary pathway to telecommunications outlets.

    A. Provide a complete telecommunications cabling support system. The system shall be completely independently supported to the building structure and placed at heights that it is easily accessible from an 8' step ladder (i.e. do not route cabling through or above structural support beams located at the deck or roof level).

        1. Provide cable tray for primary pathways.

        2. Provide standards-compliant "J-hooks" for secondary pathways.

    B. All pathway penetrations require EMT conduit sleeves. Provide quantity of sleeves as necessary to accommodate the cabling while maintaining 50% spare space capacity in each sleeve for future cables. All sleeves are to have bushings installed and be firestopped per ANSI/NFPA-70. Primary pathways and ER/TR entrances require 4" sleeves. Provide ER/TR spaces with a minimum of four 4" sleeved penetrations from the corridor ceiling space for premise cabling. Secondary pathways require a minimum of 2" sleeves. Larger sleeves should be considered for larger quantity of cables.

    C. TOs are to be provided with a 2½" deep, double-gang outlet box. Provide each outlet box with one 1" conduit has been desired as of late terminated with bushings in the nearest accessible ceiling space.

    D. Campus backbone UG conduit shall consist of one 4" UG conduit with three 1¼" innerducts. Additional conduits for spare capacity may be specified at the discretion of the College.

    E. Where new Local Exchange Carrier (LEC) services are required, provide three 4" conduits from the property line into the ER. Coordinate with LEC.

SECTION 27 11 00 – COMMUNICATION EQUIPMENT ROOM

PART 1 - TELECOMMUNICATIONS CENTER

1. The ER shall serve as the central telecommunications center for the facility.

2. The ER will include an area to serve as the main connection for cabling and house the electrical equipment for the telephone system, paging interface, file servers, LAN electronics, security system, and WAN electronics.

3. At least one TR per floor should be provided to ease future maintenance and repair as well as reduce the amount of cabling suspended between floors. If a TR per floor cannot be achieved, then at the very least, ER/TRs may serve TOs that are on adjacent floors.

4. ER/TRs shall be located to limit distance to all TOs to a maximum of 90 meters.

5. TRs to be stacked.

6. Provide Panduit for standard cabinets and racks. Specialty cabinets and racks not offered by Panduit must be approved by Ivy Tech.

PART 2 - EQUIPMENT CABINET/RACKS

1. Where dedicated and secured telecommunications spaces are provided, all equipment and cable terminations shall be housed in 19” equipment cabinets/racks. Cabinets/racks shall be 84” in height providing 77” of rack mounting space. Provide quantity as required plus future expansion as reviewed with the College. Provide vertical and horizontal wire management as directed by the College.

2. Where dedicated and secured telecommunications spaces cannot be provided, all equipment and cable terminations shall be housed in 19” equipment cabinets (TE) with locking doors. Cabinets shall be a minimum of 36” deep. Provide 4” conduits into the top of each cabinet from the nearest accessible ceiling space to house all cabling.

3. Where indicated for instructional spaces provide Hubbell RE4 wall-mount enclosures (or equal) (TE) to house all cable terminations and network electronics when indicated. Include a minimum of one quadruplex receptacle in the top rear of each enclosure. Provide two 2” conduits into the top of each enclosure from the nearest accessible ceiling space to house all cabling.

4. Provide covered horizontal wire management in all cabinets and racks.

5. Provide covered vertical wire management in all floor mount cabinets, 2-post open relay racks, and 4-post open relay racks. Vertical wire management not required in wall-mount cabinets.

6. Provide each equipment cabinet with a vertical busbar for the purpose of bonding to the TGB/TMGB. Bond each rack independently.

7. Provide ladder around the interior perimeter of each for cable support. Ladder rack shall support cabling from where the cabling enters the room to the top of each equipment cabinet. Ladder shall extend from plywood backboard to top of each equipment cabinet. Provide vertical ladder rack where LEC conduits enter the space.

8. Provide ER/TR with fully opening lockable doors that are at least 36" wide by 84" tall.

9. ER/TR doors shall open outward for utilization of space.

10. Finished floors should be provided to avoid dust and prevent static electricity.

11. All walls of each ER/TR shall be lined with ¾" AC-grade (4' x 8' sheets minimum) plywood backboard treated with FF88 fire-resistant paint bright white in color for installation of any miscellaneous wall-mount interfaces. Install bottom of plywood at +1" A.F.F. extend top to +97" A.F.F.

12. To permit maximum flexibility and accessibility of cabling pathways, false ceilings are not permitted in telecommunications rooms. Minimum ceiling height shall be +8'-6" A.F.F.

13. The ER and TRs shall be dedicated to Telecommunications functions and house no other type of equipment or services.

14. ERs should be sized according to equipment to be installed plus future expansion capabilities. Minimum size shall be 15' x 30'. See attached detail for room layout.

15. All TRs shall be a minimum of 9' x 11' inside clear exclusive of any protrusions column wraps etc.

16. Temperature shall be maintained between 64 and 75 degrees Farenheit. Evening and off-hour setbacks are acceptable to a maximum of 80 degrees Farenheit for short durations.

17. Humidity range should be 30% to 55% relative humidity.

18. Air handlers serving TR and ER spaces to provide 24/7 monitored service.

19. Maintain positive pressure with a minimum of one air change per hour.

20. Continuous (24 hours per day, 365 days per year) and dedicated environmental control.

21. In each ER/TR, consideration should be given to heat dissipation per cabinet/rack in BTU/h.

22. Provide a minimum equivalent of 500 lux (50 Footcandles) measured 3.3 feet above the finished floor.

23. TRs should have a minimum of six dedicated 3-wire 120V AC 20 amp (non-switchable) electrical circuits. Place above the ceiling in junction box. Final location of electrical outlets will be determined after placement of telecommunications equipment. Include a minimum of one quadruplex receptacle in the top rear of each cabinet/rack. Provide one 20-amp PDU on each rack with NEMA-5-15 receptacles. Quantity of electrical circuits for each ER should be as required for equipment to be installed. Coordinate ER power requirements with College including consideration of UPS power back-up.

24. Supply equipment circuits from backup emergency power source with automatic switch-over capability

where generator power is provided.

25. Provide separate duplex 120V AC convenience outlets (for tools, test sets, etc.), placed at 6’ intervals around perimeter walls.

26. All electrical outlets provided for equipment in the ER/TRs shall have surge protection devices installed at panelboard.

27. Provide card access on ER/TRs if applicable.

28. Refer to Ivy Tech Space Standards for Space Layouts.

SECTION 27 13 00 – COMMUNICATIONS BACKBONE CABLING

1. Provide optical fiber backbone cabling from the ER to each TR and TE.

2. Provide Panduit connectivity and Panduit approved fiber.

3. Cable shall be plenum rated 12-strand (minimum) laser optimized 50/125 micron diameter multi-mode fiber cable with dual window of 850/1300 nm and industry standard color-coding. Fiber shall be housed in spirally wrapped aluminum armor with a plenum rated jacket. In addition, cable shall include a minimum of 6 strands of single-mode fiber. Specific fiber strand quantity is determined by the quantity and types of required services. Discuss with Owner.

    A. Transmission performance for multi-mode fiber shall be as follows:

        1. Maximum attenuation – (dB/km) 3.0 @ 850 nm and 1.5 @ 1300 nm.

        2. Minimum LED bandwidth – (MHz·km) 1500@ 850 nm and 500 @ 1300 nm.

        3. Minimum Effective Modal bandwidth – (MHz·km) 2000 @850 nm up to 10 Gb/s.

        4. Serial Ethernet Gigabit Distance – 1000m @850 nm and 600m @ 1300 nm.

        5. Serial Ethernet 10 Gigabit Distance – 300m @850 nm.

    B. Where cabling is exposed to public view, provide a warning label attached to the fiber sheath at 25’ intervals identifying the cable as “Optical Fiber”. In addition, provide a label at all fiber breakouts that reads, “Do not look into the end of a fiber optic cable or connector. May cause permanent eye damage.”

    C. Provide rack-mount optical fiber patch panels for all optical fiber cable terminations. Utilize LC-type connectors for all terminations. Include all manufacturer-recommended panels, adaptors, coupler plates, wire management, and accessories.

    D. Provide patch cables necessary to connect fiber system as indicated. All patch cables shall be fully compliant optical fiber cable specifications. Patch cables shall be orange in color and utilize LC–type connectors. Provide patch cables as indicated.

    E. Fiber serving distributed antenna systems DAS may have special fiber connectivity requirements. Coordinate fiber connectivity type with specific DAS.

    F. When required for voice services, provide twisted pair copper backbone cable from the ER to each TR. Cable shall be the latest industry-standard network cable with Category 6A/Class Ea compliant at a minimum and provided under one sheath in increments of 25-, 50-, and 100-pair. Cabling sheath shall be plenum rated. Size as required for quantity of services.

    G. Where legacy coaxial cabling infrastructures are still being utilized by the College, provide RG11 coax from the ER to each TR for video services. Provide ½ inch hard-line coax backbone cable for distances that exceed 500’. Varying video applications are typically provided within

each premise (i.e. CATV, video surveillance, Internet streaming, VOD, etc.) and each application may allow for different technologies. Discuss each application with the College in detail to determine the best approach.

SECTION 27 15 00 – COMMUNICATIONS HORIZONTAL CABLING

1. All horizontal UTP cabling shall be the latest industry-standard network cable with 4-pair UTP Category 6A/Class Ea compliant at a minimum. Cabling sheath shall be plenum-rated.

2. Basis of Design is Panduit Netkey cabling and connectivity. Panduit-certified partners are acceptable for cabling.

3. Utilize T568B pin/pair assignment.

4. Provide quantity of horizontal UTP cabling and terminations as required to support telecommunications services where indicated. Typical telecommunications services can include the following types of devices: Desktop and laptop computers, networked printers/copiers, telephones, network scanners, wireless access points, video surveillance cameras, electronic access control (card access) components, alarm beacons, displays, AV controllers, video projectors, etc. As technology continues to converge to IP, this list of applications continues to grow. Discuss each application with the College in detail to determine the best approach.

5. In ER/TR, terminate all horizontal UTP cabling on rack-mount 48-port patch panels. Do not install patch panels lower than +24" A.F.F.

6. Provide 1U blank space above and below each patch panel in the telecommunications rooms.

7. PoE devices such as Cameras, APs, and other wireless devices must not be grouped at patch panels – spread evenly across patch panels and switches.

8. Where legacy coaxial cabling infrastructures are still being utilized by the College, provide RG6 coax from the nearest assigned ER/TR to each TV location for CATV services. Cable sheath shall be plenum-rated.

9. Provide patch cables in the ER/TR as necessary to activate services at TOs. All patch cables shall be Category 6 compliant. Provide patch cables in ER/TR/TE and at workstations as indicated.

10. Provide lengths as necessary to properly connect system as specified. Generally, provide 12" lengths in the ER, TRs, and TE's. Provide 10' lengths at the workstations.

11. Provide 15% spare patch panel capacity.

PART 1 - TELECOMMUNICATIONS OUTLETS (TO) FOR STRUCTURED CABLING SYSTEMS

1. TOs will be located throughout the building for connectivity of LAN, WLAN, AV, Electronic Security, and Telephone System equipment. Coordinate with College to determine quantities and locations needed for desired connectivity.

2. Cabling will terminate on faceplates at the user end. The ER/TR termination will be on Patch Panels.

3. Where TOs are located in surface raceway, provide mounting plates and all required hardware to accommodate installation of TOs.

4. Where TOs are locating in industrial or potentially wet areas (i.e. kitchen area, science labs, boiler rooms, mechanical/electrical rooms, etc.) provide industrial-rated hardware to accommodate installation of TOs.

5. Confirm jack color coding, if any, with College.

6. Where all the ports in a TO faceplate are not populated with jacks, provide blanks to fill unused ports.

7. At all workstation outlets provide a minimum of one port for voice services and one port for data services.

8. Confirm faceplate color with College.

PART 2 - CABLING ADMINISTRATION

1. Label all horizontal cabling specifically corresponding to where the cable terminates in the ER/TR. Label both ends of each horizontal cabling as follows:

Exhibit 5a: Picture of Patch Panel Labeling

2. ER/TR Number-Rack Number-Patch Panel Number-Patch Panel Port Number

    A. ER is always ER.

    B. TRs are number 01, 02, etc.

C. Racks are number 01, 02, etc. within each ER/TR.

D. Patch panels are numbered A, B, etc. top-to-bottom.

E. Patch panel ports are numbered with work area space numbers on each patch panel.

3. Label faceplates at the TOs specifically corresponding to the horizontal cable labeling scheme. Provide snap-in colored icons as directed by the Owner.

4. Label backbone cabling identifying origination and destination and cable type/service.

5. Label patch panel port position corresponding to the workstation space identifier.

SECTION 27 17 00 – TELECOMMUNICATIONS GROUNDING AND BONDING

1. Provide each ER with a TMGB (Telecommunications Main Ground Busbar).

2. Provide each TR with a TGB (Telecommunications Grounding Busbar).

3. Bond each TGB to the TMGB with a TBB (Telecommunications Bonding Backbone).

4. Bond all metallic items and equipment within each ER to the TMGB.

5. Bond all metallic items and equipment within each TR to the TGB.

6. Whenever two or more TBBs are used in a multi-story building, bond them together on the top floor and at every third floor, at a minimum, with a GE (grounding equalizer).

7. All bonding conductors shall be green insulated copper minimum No. 6 AWG. Provide larger conductors as required by the referenced standards.

8. Bond the TMGB to the ground node, typically located in the main electrical room, using the most direct route possible to minimize conductor length.

9. Label all TGBs and the TMGB with the following:

WARNING!!!
IF THIS CONNECTOR OR CABLE IS
LOOSE OR MUST BE REMOVED
PLEASE CALL IVY TECH MAINTENANCE

10. Bond the following to the TMGB and all TGBs:

    A. Telecommunications panelboard.

    B. Alternating current equipment ground bus (ACEG), if equipped, or its enclosure.

    C. Building structural steel, if exposed. (Steel rebars of reinforced concrete are not required to be bonded.)

    D. Metallic equipment racks.

    E. Cable shields.

    F. All metal raceways and cable trays for telecommunications cabling extending from the same room or space where the TMGB is located.

SECTION 27 31 11 – FIRE ALARM AND DETECTION SYSTEM

1. The complete installation is to conform to the applicable sections of NFPA-72 and National Electric Code with particular attention to Article 760.

2. Each and all items of the Fire Alarm System shall be listed under the appropriate category by Underwriter's Laboratories, Inc. (UL) label, and shall bear the "UL" label.

3. The system shall be digital addressable system and include an automatic voice evacuation sequence for audible alarm notification including the standard tornado warning, intruder notification and all-clear message.

4. The equipment installation and supervision furnished under this specification is to be provided by a manufacturer who has been engaged in production of this type (software-driven) of equipment for at least five years, has a fully-equipped service organization within 75 miles of the installation, and is certified by NICET Level III installation standards.

5. The system manufacturer shall be responsible for furnishing engineering drawings that indicate the interlocking of all equipment external to the various control panels. These drawings shall be included in the submittal to the Architect/Engineer for approval.

SECTION 27 51 23 – INTERCOMMUNICATIONS SYSTEM

1. Provide for ceiling-mount audio speakers in all occupied spaces including corridors for emergency notification. Link this system to the fire alarm system, the Atertus Technologies Mass Notification and beacon system, and the telephone system.

2. Provide an administrative control console at the security desk and as directed by the College.

SECTION 27 52 23 – TELEPHONE SYSTEM

1. Provide for telephones in occupied administrative and staff spaces (i.e., offices, conference rooms, work rooms, bookstore, ER/TRs, etc.). Provide in classrooms only upon specific request.

2. System shall include voice mail for all staff and faculty.

3. An integrated IP-based system is strongly encouraged. If non-IP-based systems exist, provide hybrid components allowing for a migration path towards an IP-based system.

4. Link this system with the public address system for emergency announcements after hours.

5. Telephony is typically provided by the College.

SECTION 27 77 10 – INSTRUCTIONAL VIDEO SYSTEM

1. Provide AV delivery system with projectors or monitors and controls in all instructional spaces. System should include a computer with network access, DVD, audio enhancement, and a lectern (typically part of the furniture package) to house the equipment. All components shall be viewable through the display equipment such as it is.

    A. Provide the appropriate projector to serve the specific space needs.

    B. Projector wall mounting is preferred where possible to keep the ceiling uncluttered and reduce construction coordination issues.

    C. Projectors will typically project on a wall versus a projection screen unless specifically requested by the College such as in higher-end conferencing spaces.

    D. Small conference rooms will receive monitors versus projectors due to room size as determined by the A/E and the College.

    E. All AV source switching and scaling will be provided by the instructional video system.

    F. Provide wall-mount push button controller to serve AV equipment with the following features:

        1. AV input source selection.

        2. Volume control.

        3. Display/projector on/off.

        4. Up/down projection screen control if a projection screen is provided.

        5. LAN connectivity for desktop computer AV control.

    G. Provide audio/video conferencing as directed by the College.

    H. Provide AV systems to serve special spaces as directed by the College. Items to consider are as follows:

        1. Video display method such as projectors or monitors.

        2. Projection screens versus wall paint.

        3. Sound system.

        4. Microphones.

        5. Assisted listening.

        6. Wireless microphones.

7. AV systems control.

8. AV systems zoning for partitioned spaces.

9. AV systems switching and scaling.

10. Audio video event recording.

11. Public media connections.

12. Lighting control integration.

13. UPS for AV systems.

I. Provide for permanently mounted monitors in common spaces and as directed by the College.

J. Suggest adding minimum performance standards for AV systems – i.e.,

1. Camera & display resolution.

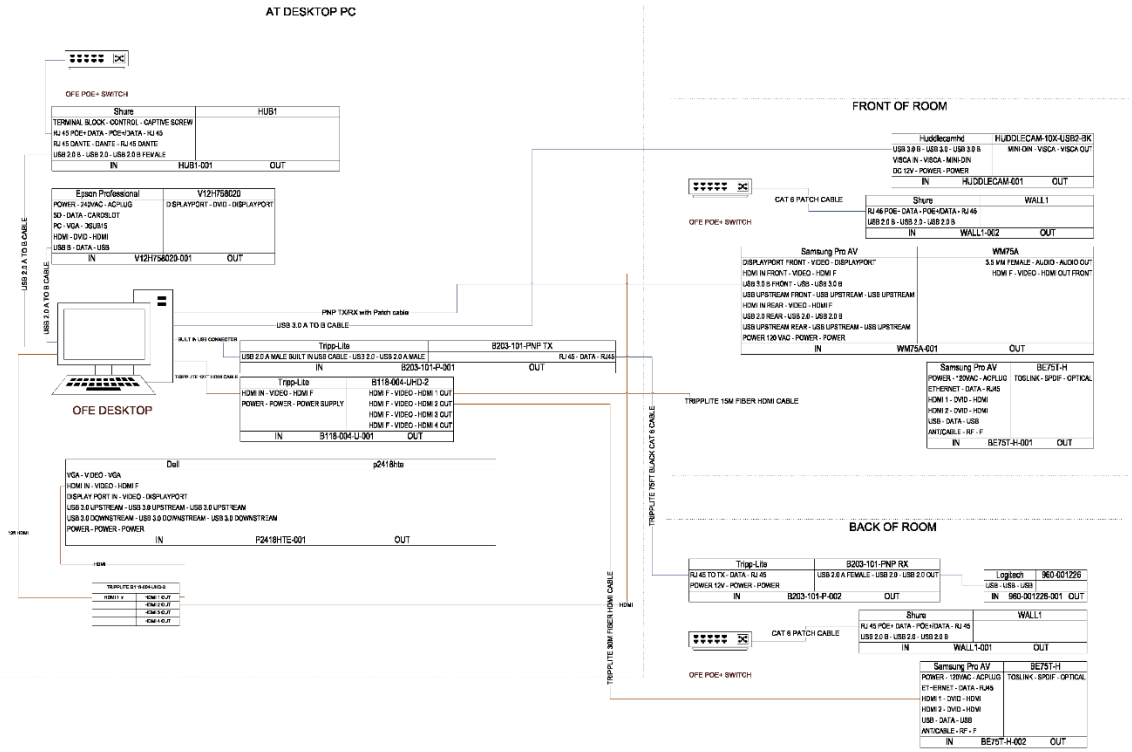
2. 4K, Pro Series displays with 3-year warranty.

3. Document camera with minimum 1920x1080 resolution and 10x zoom.

K. Suggest utilizing menu-type questionnaire system with each college department for "needs" vs. "wants" for AV technology in various spaces – an example (Ivy Tech to indicate requested revisions and additions):

### Department at #### Ivy Tech Campus				
Space	**Technology**	**See as a "Need"**	**See as a "Would Like"**	**Not Needed**
Classroom	8K Displays			
Classroom	Annotation Device			
Conference Room	8K Displays			
Conference Room	Annotation Device			

L. The following is the current BOD – Learn Anywhere Typical One Line:



YES NO

DRAFT

Legend

- Video
- HDMI
- Digital
- Ethernet
- Control
- LV Power
- 120volts
- USB
- Speaker
- Line Audio
- Microphone

2 / 2

Scale: 1/2" = 1'-0"

CCS
Presenting Better Solutions
1256 Westminster Street
Columbus, IN 47201

SECTION 27 77 40 – LOCAL AREA NETWORK/WIDE AREA NETWORK, AND WIRELESS LOCAL AREA NETWORK (LAN/WAN AND WLAN)

1. Provide LAN electronics in each ER/TR/TE to accommodate access to system recourses. Components should provide for gigabit ethernet performance at each workstation and 25 gigabit through the fiber backbone.

2. Provide for wireless access to network resources through properly placed access points for full-premise coverage as directed by the College.

3. PoE devices such as Cameras, APs, and other wireless devices must not be grouped together at patch panels – spread evenly across patch panels and switches.

4. Access points cabling to be CAT6A.

5. Provide surface ceiling-mounted wireless access points.

6. For ease of management and consistency, single manufacturer of system components should be considered to include all LAN, WAN, and WLAN components.

7. LAN, WAN, and WLAN are typically provided by the College, at the approval of the CTO.

8. Wireless access points provided by College OIT Group.

9. Suggest Ivy Tech provide BOD with preferred manufacturer and minimum performance specification.