

COMMUNICATIONS (TELEPHONE AND DATA)

1 PART 1 – General Requirements

1.1 Purpose

The purpose of this document is to provide architects, engineers, designers, and project managers the information necessary for the proper design and construction of a Telecommunication Infrastructure System at Sam Houston State University. The contractor shall fully comply with the requirements of Sam Houston State University (IT@Sam) as stated here and maintain contact with the designated Information Technology (IT) Project Manager.

1.2 Coordination

- A. By default, work with IT@Sam Project Management Office (PMO) must be scheduled at least 5 business days in advance. Deviation from normal business hours (8:00 a.m. – 5:00 p.m., Monday through Friday) may be possible by coordinating, in advance, with IT@Sam.
- B. General: Installation of voice/data/video system components shall be coordinated with IT@Sam department. Provisions requiring minor modifications shall be made at no cost.
- C. Building Service: Provisions for voice/data/video cable entry to the building shall be coordinated with IT@Sam department, prior to installation.

1.3 Scope and Deliverables

- A. The Division of Information Technology Services (IT@Sam) utilizes applicable codes, standards, and industry guidelines for the planning and design of telecommunications infrastructure. In the initial design phase of a future building, consideration shall be made to provide the space requirements for present telecommunications design needs and more importantly for maximum growth. Some of the guidelines herein may exceed industry standards and take precedence over those standards.
- B. IT@Sam requires that a complete set of blueprints and specification manuals be submitted for IT@Sam review. Once the blueprints are finalized, a complete set of 15X22 size blueprints is required, plus the Architectural sheets and E-sheets in electronic format (PDF and DWG).
- C. This General Information outlines the major codes, standards, and guidelines to be followed when planning and installing facilities telecommunications infrastructure (including, but not limited to, telecom/equipment rooms, cabling and pathways).

1.4 Regulatory Requirements, Codes and Standards

- A. All designs shall be in compliance with the following codes, industry standards, and practices, as well as, IT@Sam specific requirements described in this document. It is the responsibility of the designer to know and comply with the most current version of each document referenced below:
- ANSI/EIA/TIA-568-B, Commercial Building Telecommunications Cabling Standard or its most recent successor document
 - ANSI/EIA/TIA-570, Residential and Light Commercial Building Telecommunications Wiring Standard or its most recent successor document
 - ANSI/EIA/TIA-569, Commercial Building Telecommunications Pathways and Spaces or its most recent successor document
 - ANSI/EIA/TIA-606, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings or its most recent successor document
 - ANSI/TIA/EIA-607, Commercial Building Grounding and Bonding Requirements for Telecommunications
 - ANSI/NFPA-70, The National Electrical Code
 - BICSI (Building Industry Consulting Service International) Telecommunications Distribution Methods Manual
 - BICSI Outside Wireless Design Reference Manual
- B. Additional major codes and standards are specified by:
- OSHA (Occupational Safety and Health Administration)
 - NEC (National Electrical Code)
 - NESC (National Electrical Safety Code)
 - IEEE (Institute of Electrical and Electronics Engineers)
- C. Testing Standards should follow:
- Each Category 6 cable system shall be tested for compliance with requirements:
 - i. Termination Standards: ANSI/TIA/EIA-568-B.1-2000 T568A
 - ii. Compliance Testing Standard: TIA/EIA-568-A
 - Each Fiber Optic cable shall be tested for compliant with requirements:
 - i. ANSI/TIA/EIA-455
 - ii. OFSTP-7
 - iii. OFSTP-14
 - iv. Corning EWP

1.5 Specific Equipment

As an effort to reduce maintenance inventory and to provide consistency across the campus, IT@Sam has standardized on specific brands and warranties for Telecommunications Systems. All designs and specifications shall be based on the following approved manufacturers without substitution:

- Enclosed Cabinets
 - APC AR3150 750mm wide cabinet for the network switches and cabling
- Enclosed Wall Mounted Cabinets
 - APC AR100 wall mount 13U rack.

- Chatsworth 19" Universal Rack 7' with 2 post Black Freestanding Aluminum Rack
 - 46353-703
- Chatsworth Master Cable System (MCS) with 10" vertical wire managers for 7'
 - CCS-30163-703
- Siemon 24 or 48 Port Patch Panel
 - 24 Ports: HD6-24
 - 48 Ports: HD6-48
- Siemon Horizontal Switch Wire Management
 - 1U
 - WM-145-5
 - 2U
 - RS3-RWM-2
- Telecommunications cable
 - CommScope Ultra Media 6
 - CAT 6 Teal Plenum CommScope Ultramedia 7504
 - 4763404/10
 - CAT 6 Yellow Plenum CommScope Ultramedia 7504
 - 4763504/10
- Arlington Industries The Loop Cable Hanger in 5" diameter
 - AI-TL50
- Siemon Assembly
 - Siemon Wall Phone Faceplate
 - MW-WP-K6-SS
 - Single Gang Faceplate
 - MX-FP-S-04-02
 - Double Gang Faceplate
 - MX-FP-D-06-02
 - MX-FP-D-12-02
 - Siemon Flat Module
 - MX6-F02-D
 - Siemon Surface Mount Box
 - CT4-BOX-02
 - CT8-BOX-02
 - MX-SM1
 - MX-SM2
- FSR Series 600 Floor Box with the FL-GRD Series Floor Pan
- Corning Ribbon OSP Fiber
 - 048EC5-141-01D53
 - 144EC5-141-01D53
 - 216EC5-141-01D53
- Corning Ribbon Plenum Fiber
 - 024EC8-14101-20
- Corning Housing with pre-terminated heads
 - PR4E4P24-A9-3RJ3L0
 - PR148P24-A9-3RJ1D0
 - PR124P24-A9-3RJ1D0
- Chief CMS 440 Suspended Ceiling Tile Bridge

- Circa 100 PAIR INDOOR BET 710/110
 - 1880ECS1-100
- Circa Semi-Conductor Unit
 - 3B1EW
- 3M Cross Connect Box 600 I/O
 - 4220D-SSHT0/600-600-GBM-A.
- Ant Poison
 - Rainbow 4480 Fire Ant Control
- Emergency Talk-A-Phone
 - Phone: ETP-400V
Description: The ETP-400 is an outdoor-rated, ADA-compliant hands-free Emergency Phone
 - Phone: ETP-400KV
Description: The ETP-400K is an outdoor-rated, ADA-compliant hands-free Emergency/Information Phone with Keypad
 - Housing: ETP-SMH
Description: weather-protective stainless steel hooded mount for any 400-Series flush mounting Emergency Phone
 - Housing: MS-400
Description: The MS-400 is a mounting sleeve box for flush mounting 400 Series Talk-A-Phone Emergency Phones
 - Pedestal: ETP-MT
Description: Vandal-resistant Emergency/Information Tower systems
 - Pedestal: ETP-WM
Description: Wall Mount Emergency/Information station provides an integrated security solution
 - This link, <http://www.talkaphone.com/category.cfm?sct=1&sbs=2>, contains information on these products as well as E&G specs for each model.

1.5.1 A/V Equipment

- Floorbox
 - FSR Series 600 with the FL-GRD Floor Pan to provide required fire rating
- Lectern Switching Equipment
 - Crestron DMPS Series 100/200/300 or Crestron DM matrix Switcher
 - Crestron TCPS4-SM Touch Screen Control System
 - Crestron RMC 201 Scaler
- Document Camera
 - Elmo P30HD
- Projection Mounting System
 - Chief CMS440 Tile Bridge, to be suspended according to manufacturer's specifications
 - Chief CMA470 Plenum Box
 - Fixed Extension Column Chief CMS012
 - Projector Mount Chief RPMAU Locking Mount
- Projector
 - NEC NP-M311W
 - Panasonic PT-DZ570U (large venue)
- Projection screen
 - DaLite HD quality 16:9 aspect ratio, screen surface to be specified by IT@Sam

- Television
 - TV to include RS232, RJ45, Tuner, 3-year manufacturer warranty
- Lecture Capture Rooms
 - Vaddio ClearVIEW HD-USB PRO PTZ
 - Vaddio Zoom, Wide or PTZ model
 - AcousticMagicVoice Tracker 2
 - USB Video/Audio Capture device for digitizing video into owner provide computer
- Lectern
 - Spectrum Media Manager
 - Spectrum Media Director (large venue)
 - Extron Cable Cubby 300S with AC power and HDMI/VGA laptop cables
 - Crestron Wired Touch Panel
 - TPMC-9 wall mount or on stand depending on the installation. Consult IT@Sam for final selection. (ITV only)
 - Sympodim smart monitor.
- ITV Video Conferencing Equipment
 - Polycom Group Series 700 CODEC
 - Polycom HD EagleEye III cameras
 - Software option for Multisite operation – MPPlus
 - Software Option for RTV/CCCP Lync 2013 Compatibility
 - Software Option for 1080p Video + Content
 - Instructor’s monitor mounted to the back wall or ceiling. LED display shall be 60-90 inches based on the viewing distance from the podium. An RS232 port is also required. IT@Sam shall approve final selection of display.
- Audio
 - BSS Audio SoundWeb London BLU Series with COBRANET
 - BIAMP Audia with COBRANET
 - Crown CTS series amp
 - JBL control series ceiling mounted speakers

1.6 Certification Requirements and Documentation

- A. Work will be performed by a telecommunications contractor who has a Registered Communications Distribution Designer (RCDD) on staff full-time and is participating in the Corning Extended Warranty Program (EWP). From hereinafter the telecommunications contractor will be referred to as the contractor. IT@Sam may waive the requirements for a contractor at its discretion.
- B. The Contractor, utilizing his Registered Communications Distribution Designer (RCDD), shall be responsible for designing the communications distribution within the scope of the project, including any underground conduit necessary to provide telecommunications service from existing point of service availability, distributing throughout the project area, and within the structures. Considerations for any adverse conditions shall also be accommodated per instance, advising IT@Sam of the necessary variances from the outlined specifications.
- C. The Contractor shall perform all work per the BICSI Cabling Installation Manual including NEC and ANSI Standards referenced therein, unless otherwise directed herein, meeting Category 6 wiring standards.

- D. All punch down of Category 6 cabling shall conform to T568A punch down method. A service loop of 10 feet is required in all data closets. The service loop shall be bundled neatly and ran over the cable ladder or along wall to keep it out of the work space. A service loop of ten feet is required in all rooms. The service loop shall be secured and bundled neatly in the ceiling.
- E. The Contractor's proposal shall provide submittals to IT@Sam for all materials and equipment to be provided and installed by the Contractor on this project, to include but not to be limited by the following list: Telephone cable, Fiber Optic cable, Category 6 cable, telecommunications outlets and components, patch panels, telephone entrance terminals, protectors, hanger devices, conduit, and equipment cabinets or racks and all rack component parts.

1.7 Warranty

- A. The contractor shall provide IT@Sam a warranty for performance of the Structured Cabling System and against defects in materials and workmanship for a period of no less than seven (7) years after close of the project. All material, labor, and expenses to correct the problem(s) are to be included in the warranty.
- B. The Contractor shall enroll the installed Structured Cabling System into the cabling component manufactures' warranty program. They shall provide IT@Sam with a certificate of warranty from the manufacturer. All materials, labor, and expenses to correct the problem(s) shall be included in the warranty.
- C. The Contractor shall correct any problems reported within 5 business days.

1.8 Performance Requirements

- A. The Contractor, by submitting their RCDD number, certifies that he has a Registered Communications Distribution Designer on staff who will design the layout for this project, and that his cabling staff has the technical training and ability to install the cabling in a professional manner consistent with the best standards of the trade within BICSI guidelines. He further certifies that each cable system shall be tested fully to verify compliance with Category 6 standards and will be labeled consistently end to end meeting specifications given by IT@Sam. IT@Sam shall be notified prior to testing, and shall have the option to have a representative present during any or all testing. The Contractor shall complete the job within the expectations of Sam Houston State University's defined timeframe.
- B. The Contractor shall provide all the labor and scheduling coordination, as well as all materials and equipment, per IT@Sam specification as stated herein, which are required to render a BICSI Standard Category 6 (CAT6) compliant cabling system from each telecommunications port designated on the schematic floor plans to the patch panel termination point in the telecommunications closet. When complete, each telecommunications port location will have a minimum of two Category 6 plenum rated lines, unless specified otherwise. Each line will consist only of a continuous home run back to the telecommunications closet and will be terminated in a patch panel.
- C. Upon completion of the work but before final payment, the Contractor shall provide the

following "As-Built" in both electronic format and hard copy: Wire / Cable Routing Diagram showing locations of any new or pertinent man holes, conduits, pull boxes, chases, and the cable pathways between them; complete floor plan Diagrams depicting telecommunications closet and port locations listed by label identification; and Test Results demonstrating full compliance with Category 6 wiring standards for each cable system.

- D. Each Category 6 cable shall be tested for compliance using a Fluke DSP-4 or more current model, with CAT6 rated modules for the test conditions and the ability to fully test compliance with Category 6 Standards and comply with Federal Standards. Test set should have a current NIST traceable calibration sticker on it. The contactor shall provide to SHSU a submittal stating the type of equipment to be used for testing of both CAT6 cabling prior to the beginning of testing. The test results shall be provided in paper and electronic format, verifying the compliance of every cable system.
- E. End to end bidirectional loss analysis shall be provided for each fiber strand using OLTS and OTDR test sets. The test results shall be provided in paper and electronic format, verifying the compliance of every cable system.

1.9 Grounding and Bonding

- A. All telecommunications facilities shall be grounded per BICSI specification for large telecommunication systems.

1.10 Administration (Labeling)

- A. The Contractor shall place identical labels at the telecommunications faceplate and the patch panel in numerical order, as well as on each end of every cable for each Category 6 cable system. The labeling scheme shall be consistent with: the room number where it originates, a letter indicating which faceplate within the room, and a number indicating the port within that faceplate, i.e., 203.a2, or 110.b1. If there are multiple faceplates within the room, the alphabetical sequence shall begin at the door and will increment sequentially in a clockwise direction around the room.
 - 1. For special circumstance connections, such as for wireless, camera, courtesy phone, or door access connections, these should be placed together in a common area on the patch panel. These should be labeled with WAP-closet-room, or CAM-closet-room.1 (if multi in same room, .1 to left of door then clockwise), CPH-closet-room and DOOR-closet-room, on both ends, as CPH-A-215, WAP-C-400.1.
 - 2. Cable TV wiring will also be labeled identically on each end with cable-wrap labels.

2 PART 2 – Telecommunications and Equipment Room Guidelines

2.1 Definitions

- A. The Main Distribution Facility (MDF) is a special purpose room that provides and maintains a suitable environmentally controlled space for communications and computing equipment.

- B. Intermediate Distribution Facility (IDF)
- C. MDFs differ from Intermediate Distribution Facility (IDF) in that a MDF generally considered serving a building or campus, whereas an IDF serves a floor or area of the building.

2.2 Room Planning and Spacing

Serving Area (Sq.Ft.)	Room Size
40,000	12' X 14' min.
19,000	9' X 7' min.
8,000	6' X 7' min.

***Note: Special purpose rooms, such as laboratories, computer rooms and certain instructional spaces, may have a higher than average density of communications outlets. The size of the MDF/IDF serving these rooms shall be increased/decreased accordingly, as determined by IT@Sam.**

- A. The MDF and IDF closets shall be dedicated to the telecommunications function and related support facilities. For security purposes, non-IT@Sam systems shall not be co-located in the MDF and IDFs. The MDF and IDF closets shall not be shared with electrical installations other than those supporting telecommunications. Equipment not related to support of the MDF or IDF closets (e.g., Piping, HVAC systems, pneumatic tubing) shall not be installed in, pass through, enter, nor be stored in the MDF or IDF closets.
- B. Telephone cable entering the building shall be terminated on Entrance Terminals and grounded in accordance with NEC and BICSI standards. Cross-connect panels and Telephone Tie Cables shall be installed where necessary within and between telecommunications closets, and shall be terminated into patch panels in the equipment cabinet. These panels shall be placed in a group separated from the Category 6 patch panels distributing horizontal cable. Final placement of panels in equipment cabinets shall be pre-approved by IT@Sam.
- C. Telephone Tie Cable run between telecommunications closets within the building shall be Superior Essex Plenum rated cable of a size determined by IT@Sam commensurate with the size of the cable providing service to the building.
- D. Telco style ladders shall be bolted together for stabilization and used to run cable horizontally and vertically in the data closets.
- E. The patch panels shall be mounted in an open rack meeting this guidelines specifications, secured both to the wall by ladder rack, and to the floor by bolts. The patch panel shall be sized to provide not less than 20% spare terminal ports available to accommodate future expansion of the system.
- F. Rack size shall be determined in a way so as to provide not less than 40% free space.
- G. MDF and IDF design, including location, should be developed in accordance with security and disaster avoidance plans of the building. The IDF closets shall be located directly above the MDF closet, where applicable.
- H. The Contractor shall assure the space allocated for the telecommunications closets or other designated spaces are appropriate to comply with BICSI standards, and are in agreement with specifications provided in this document. Any concerns should be

discussed with the IT@Sam prior to installation.

- I. The MDF/IDF HVAC system(s) shall be able to operate on a 24 hour basis independent of building HVAC scheduling or temperature settings. This is to include independent thermostats in each MDF/IDF. If emergency power is available, the HVAC system should remain operational.
- J. Receptacles shall be provided at the top of each data rack. These receptacles shall be fed from a whip at the UPS rack. UPS rack and plug type shall be designated by IT@SAM.
- K. If there are fewer than 48 telecommunications ports to be terminated in a closet, a wall mounted rack or cabinet may be acceptable with prior agreement by IT@Sam.
- L. Free standing racks shall be provided according to space requirements. Vertical cable management shall be provided in minimum quantity of at least one with each separately placed rack, otherwise one between each rack when placed in a single row.
- M. Each copper patch panel shall have a horizontal wire management systems installed above.

2.3 Construction

- A. False ceiling shall not be provided.
- B. For MDF or IDFs, the minimum clear height in the room shall be 8 ft. without obstructions.
- C. Walls shall be layered with 3/4" plywood and finished to BICSI specification.
- D. Floors shall be layered with a static free treatment or sealed to minimize dust; finishes shall be light in color to enhance room lighting.
- E. Lighting shall be a minimum of 400 lux. IT@Sam requires that at least two lighting fixtures be installed per MDF/IDF. These lights shall be installed in front and behind the telecommunication equipment rack(s). The location of the lighting fixtures is to be coordinated with IT@Sam. Lighting shall be controlled by one or more switches located near the entrance door(s) to the room. Dimmer switches shall not be used. All lights will be covered by wire cages. If energy efficient timed lighting is utilized they must allow the lights to be engaged for at least 30 minutes before powering off.
- F. Floor loading capacity of MDF/IDFs shall be at least 500 lb/sq. ft. or located on a load bearing wall. The architect/engineer shall verify that concentrations of proposed equipment do not exceed the floor loading limit, which may require increasing the floor loading capacity in some cases.
- G. The door shall be a minimum of 36 in. wide and 80 in. high, without door sill, hinged to open outward (codes permitting) and fitted with a lock. The doors shall have a lever handle, pick guard. The locks for the MDF and IDFs shall not be on the building master keys. These locks shall be incapable of remaining in an unlocked state when the key is removed. The door shall be equipped with an auto closing device. The fire rating of the door shall be consistent with the fire rating of the walls of the room. On outward opening doors, the hinges shall be of the anti-tampering type. These hinges shall be

consistent with and match similar mechanisms throughout the building.

2.4 Fire Protection

- A. The Contractor shall provide fire protection for the room as required by code.
- B. Sprinkler heads if required shall be provided with wire cages to prevent accidental operation.
- C. Penetrations through or into firewalls shall use an appropriate EZ Path product per the referenced codes and standards.

3 Part 3 - Inside Plant Guidelines

3.1 Pathways and Room Penetrations

- A. References to specific equipment in this area can be found in Section 1.5.
- B. The Contractor shall be responsible for construction of the cable pathways and to overcome obstacles, install conduit as specified and as further need is determined by the RCDD, and to correct any building alterations made necessary by their installations. Pathways shall follow along hallways and vertical chases designated for telecommunications. The pathway location of all cable runs shall be from the telecommunications port to the hallway, along adjoining hallways to the telecommunications closet or location designated. Cable shall not be run over groups of offices or work areas when a pathway recommended herein is available.
- C. When crossing through a mechanical room, or other areas requiring additional protection, rigid metal conduit/EMT (with nylon bushings) or metal cable tray shall be supplied to protect telecommunications cables and reduce the potential of EMI/RFI interference. Cable separation shall be maintained from possible sources of EMI/RFI. All EMT conduit, metal cable trays, equipment racks or cabinets shall be grounded per BICSI Standards.
- D. Telecommunications cable concealed within a wall shall be run from the outlet box within a minimum of ¾" metal conduit with nylon bushings and stubbed out into the ceiling space a minimum of two inches above drop ceilings. If the finished ceiling will not provide ready access, metal conduit must provide a continuous pathway to the accessible cable path allowing no more than two 90 degree sweeping turns.
- E. Outside of main cable corridors, all cable pathways shall be supported per BICSI standards, by loop cable hangers. The support distance shall not exceed 5 feet. Each hanger shall be suspended from systems provided by the Contractor and not from any other structures which are not intended to support cabling.
- F. There shall be no splice other than within the termination trays for the fiber install. All runs shall be home runs and complete from end to end. If OSP cable is used, it should be brought into the MDF in a plenum rated conduit per BICSI standard. IT@Sam will have to be notified and approve any special cases that require a splice. If a splice is required, the splice must be a fusion splice and maintain no more than a 0.2 dB of loss.

- G. All cable shall be run with basket trays in main corridors within ceilings and maintain a 6 inch clearance on the top of the tray.
- H. Telephone entrance terminals shall be filled with protectors.
- I. There shall be a service loop of 50' routed appropriately in the telecommunications closets at each end of a fiber run.
- J. Provide a polypropylene spare pull cord in all voice/data service entrance and tie conduits. Provide pull cords in all interior cable trays.
- K. Two 4" EMT conduits shall be installed to interconnect each of the telecommunications closets, and connect to the exterior service source, unless otherwise specified by IT@Sam. Telephone tie cable and fiber optic cable shall be run together within one of the two conduits. All conduits shall be left with an intact pull string to facilitate future pulls. Pull boxes shall be placed where necessary, allowing a maximum total of two 90 degree sweeping turns between pull access locations, and any other requirements per the BICSI Cabling Installation Manual.
- L. All conduits shall have a nylon bushing installed on exposed ends.
- M. All firewall penetrations shall use the appropriate sized EZ-Path product
- N. All data lines terminating in the MDF or an IDF shall be teal Cat 6.
- O. All data lines that are point-to-point, or terminate in an auxiliary support room (ie. video control) shall be yellow Cat 6.

***Note on Misuse: Do not use voice/data sleeves for temporary construction power wiring.**

3.2 Station Wiring and Jacks

- A. Unused spaces in a face plate shall have a blank filler module.
- B. In areas designed for vending or laundry service machines, there shall be one CAT6 data line per machine.
- C. Fire alarm panels shall have 2 Category 6 data cables installed to the nearest data closet.
- D. Elevators shall have 3 Category 6 cables installed to the nearest data closet.
- E. Station Wiring Minimum
 1. All rooms at minimum shall have 1 faceplate consisting of 2 lines per every 25 linear feet of wall.
 2. All rooms designated as offices shall at minimum have 2 faceplates consisting of 2 lines placed on opposing walls
 3. 4 data ports shall be installed in any floor boxes that are required, and dust covers used on modules.

- F. Where telecommunications cables cannot be concealed within the walls at a telecommunications port location, surface mounted wire mold shall be installed. The wire mold shall extend into and above the ceiling a minimum of two inches, and continue down to a surface mounted box. The surface mounted full-sized, single gang box will house the faceplate and modular jacks as well as provide mechanical protection for the terminals. The wire mold and surface mounted box colors shall match, and shall complement the existing wall color. Wire mold may be of either metal or plastic which shall be mechanically affixed to the surface. Mounting brackets will be concealed or pre-approved by IT@Sam.

3.3 Inside Plant Wireless

- A. Wireless access point locations shall be located above ceiling when practical and shall consist of a data line terminated into a small surface mount box at the end of a 15 foot service loop. The loop shall be suspended above the ceiling and labeled for easy identification as well as being labeled on face plate and cable
- B. A building shall have at least 1 wireless access point line for every 500 sq. ft. of floor space with staggered locations so that they don't overlap on the adjacent floor.
- C. Wireless access point line locations above the ceiling shall be marked with a removable sticker that is visible from the floor.

3.4 Inside Plant Telephone

- A. There shall be at least one courtesy phone location per floor in a structure. The location shall be 40" AFF and be terminated with a wall phone keystone jack, as specified. The location should be generally in the area of the elevator but final placement shall be decided after consulting with SHSU.
- B. All courtesy phone locations shall have a single gang telephone face plate in lieu of a normal face plate
- C. All telephone station lines shall be data station lines and shall follow the appropriate standards.

3.5 Inside Plant Public Safety and Cellular Communications

3.5.1 Bidirectional Amplification for Public Safety Two-Way Radio and Cellular/Smart Phone

- A. Provide RF amplified communications within the public areas including stairwells and mechanical areas of a building to ensure that public safety two-radios and cellular telephones/3G/4G services do not encounter dead spots or zones.
- B. System should be made up of a distributed antenna system for the interior of the building.

- C. An external Roof Donor Antenna(s) will be mounted to provide communications to local RF access points for the service being amplified.
- D. A radio mounting point on the roof shall be provided for the mounting of up to three antennas with appropriate grounding to building. A roof penetration shall be provided for multiple antenna feed line down to a radio mounting room which may be a data or AV IDF. Power to support the radio mounting point shall be located in close proximity.
- E. Two-Way Radio coverage will be in the 700 and 800 MHz range to serve public safety radios. The system shall be designed and programmed to enhance specified/channelized locally used public safety channels including interoperability channels and will require input and signoff from SHSU University Police Department.
- F. Cellular communications that are amplified shall be coordinated with the carriers so that the system meets their requirements for acceptable operations. Contractor shall be liable and responsible for correction of any omissions or system operation due to design and construction that does not meet carrier requirements and or FCC Regulations.
- G. The contractor shall submit plan to IT@Sam for the bidirectional systems that includes a description of operation, coverage plots and evidence of collaboration with cellular companies and public safety agencies. Upon commissioning and signoff by the customer, as built drawings, cut sheets, equipment manuals and documentation shall be provided in hard copy and digital form. The contractor shall provide training to IT@Sam on system operation and configuration. Drawings shall be in DWG or DXF file type as well as PDF. If the units are programmable, IT@Sam shall be provided all un-complied code, programming software and any required passwords.
- H. Unit(s) shall be warrantied for a period of three years for on-site parts and labor. Warranty shall begin upon customer acceptance of installation of the unit.

3.5.2 Roof Top Antenna Mounting Hard Points

- A. An antenna mounting point on the roof shall be provided for the mounting of multiple antennas with appropriate grounding to building lightning protection system.
- B. Mounting points shall be made up of 3 inch galvanized pipe extending 8 feet above the roof surface on four points 10 foot by 10 foot square with 3 inch pipe connecting the four pipes horizontally four feet above the roof surface. The top of the vertical pipes shall be sealed.
- C. A walk door or roof hatch shall provide access to the antenna mounting point.
- D. A roof penetration and access path shall be provided for antenna feed line down to a radio mounting room which may be a data IDF, AV IDF or dedicated closet.

- E. Power to support the radio mounting point shall be located in close proximity. Two 120 volt 20 amp circuits shall be provided.
- F. Distance between roof penetration and radio room must be minimized.
- G. The roof penetration shall be comprised of two three inch conduits into an individual weather proof box for each located on the roof top within the antenna mounting.
- H. A 120 volt 20 amp outlet shall be provided in a weather proof enclosure shall be located next to the antenna feed line enclosure.
- I. Conduits are preferred to have one foot physical separation to avoid possible interference.

3.6 Inside Plant Audio/Video

3.6.1 General Information

- A. Contractor shall consult with IT@Sam during the AV design phase to ensure that the design conforms to SHSU requirements and standardizations.
- B. Contractor shall provide IT@SAM a comprehensive plan for the AV install highlighting milestones.
- C. Submittals shall be provided to IT@Sam with cut sheets and design drawings during the design phase. Upon completion of the project as built drawings shall be provided in PDF and DWG or DXF digital format. Copies of all manuals shall be part of the final digital submissions.
- D. Progress reports shall be provided to IT@SAM at least once per month and once per week once principle installation of AV equipment has begun.
- E. All AV Cable Testing documentation shall be provided to IT@Sam for review before the final inspection of the system.
- F. All AV equipment and cables shall be labeled.
- G. Designer and Installer qualifications: The lead AV designer shall be a fulltime staff member and shall hold a CTS-D InfoComm Certification. The lead installer shall hold a CTS-I InfoComm Certification or other industry standard certification deemed acceptable by IT@SAM.
- H. Contractor shall deliver the un-compiled code for any systems configured as part of the A/V design after final testing has been completed.
- I. Contractor shall schedule three training sessions with the owner for each system type installed in the building.
- J. Warranty – All AV Systems shall be covered by a next business day on-site parts and labor warranty against defects in parts, workmanship, equipment failure and cabling infrastructure. This warranty shall be for a term of three years.

- K. A set of spare parts for major AV system components shall be provided by contractor.
Discuss equipment list with IT@Sam for final approval of required spares list.
- L. Commissioning – Contractor shall provide to IT@Sam a commissioning plan for approval. The InfoComm “Audiovisual Systems Performance Verification Checklist” shall serve as a format and content guide for this list. Upon approval contractor will schedule the commissioning with IT@Sam personnel who will participate in the process.

3.6.2 Audio Visual IDF Closet

- A. When an AV IDF is specified for a project, the IDF shall have two 4” EMT conduits running between the AV IDF and a telecommunications closet. In addition, one 4” EMT conduit shall provide a pathway between the AV IDF and the hallway cable tray. The IDF shall have at least one free standing rack. Consult owner for final rack count.

3.7 Classroom Planning and Spacing

3.7.1 Lighting and Control

- A. In classrooms that have zoned lighting to provide appropriate lighting level for use with projection systems, the zones shall have an interface of contact closure to toggle between the lighting zones of the room that can be controlled by a Crestron control system. Where tungsten or halogen dimmable lighting is specified, the control system should be RS232 or serial. Other types of control interfaces may be acceptable, consult IT@Sam for final selection.
- B. AV consultant and MEP shall coordinate to ensure that the location of pendant lighting shall not obstruct the throw of the projector image.

3.7.2 Floor Boxes

- A. When floor boxes are used in a classroom, the position of the box, which defines the teaching position, shall be coordinated so that when the teaching podium is placed over the box, it does not obstruct the function of the projection screen(s) and is not an obstruction to the projected image from the projector(s) and does not allow for any cables to become a tripping hazard. The number of data ports located in a floor box to support the teaching position is generally considered to be three, but may vary by classroom. Consult IT@Sam for final port count.
- B. The floor box shall have one 20 amp, 120 volt duplex outlet mounted in the box. A floor box should have as a minimum three ¾” conduits that terminate at the pull box for the classroom with one conduit going to the hallway cable tray, two conduits going to the projector position. Dust plugs will be utilized in vacant ports in floor box.

3.7.3 Teaching Position

- A. The teaching position is defined by the positioning of the floor box, the screen(s) and the projector(s). Coordination with MEP and others will be necessary to ensure that the teaching podium can be placed over the floor box without creating obstructions to the projected image.
- B. All classrooms shall have at least one CATV drop terminated with a Female F connector into a floor box located at the teaching position.

- C. The CATV head-end shall be located in the MDF and all cables from the classrooms shall be home runs of RG6 cable.
- D. A 4' x 8' ¾ inch plywood board shall be provided for mounting of CATV amplifiers and taps. Final installation and activation of the CATV system shall be performed by the SHSU CATV vendor.

3.7.4 *Projector and Screen Information*

- A. The projector position in the ceiling will depend on the size of the screen vary depending on the projector to be used, so IT@Sam should be consulted to determine the projector model make and model so the throw distance can be calculated. See specific equipment for ceiling Projection Mounting System required by IT@Sam.
- B. Mounting hardware for non-suspended ceiling mount projector locations shall be recommended by AV consultant and approved by owner. A 120Volt service outlet shall be located in close proximity. Exact distance from front of the room should be determined by consulting with SHSU.
- C. Projector power shall have a duplex 120 volt power outlet and two (2) data outlets at the calculated distance from the screen and be mounted in an approved plenum enclosure or be flush mounted in the tile with the projector's support column.
- D. Projector used in SHSU classrooms, conference rooms and larger venues shall have an RJ-45 Ethernet capability with a web interface for setting the projector configuration remotely. The projector shall also be Crestron RoomView compatible.
- E. Projectors used in SHSU classrooms shall have a DVI or HDMI Input.
- F. Projectors used in SHSU classrooms shall be capable of fitting the Chief RPMAU mount listed under specific equipment.
- G. All projectors will have a locking mechanism provided.
- H. All projector locations shall have two (2) data lines located above ceiling in close proximity to the projector when practical and shall consist of a data line terminated into a small surface mount box at the end of a 15 foot service loop. The loop shall be suspended above the ceiling and labeled for easy identification as well as being labeled on face plate and cable.
- I. Projection screens shall be a Dalite with build-in low voltage controller used in a classrooms or conference rooms. The screen shall be a HD fabric screen, with a 16:9 aspect ratio.
- J. The screen shall be electric and have a low voltage interface for contact closure control using Crestron control systems. The cable used to connect the low voltage controller to the low voltage wall switch shall conform to manufacturer's published guidelines. Coordinated with the MEP and IT@Sam early in the project to avoid possible problems with teaching position placement.

3.7.5 *Lectern*

- A. The teaching lectern for classrooms shall be a Spectrum Industries. Lectern size will vary based on classroom size using the Media Manager Series in the small and Media Director Series in the larger venues. Color and additional options (number of shelves, racks, lights, etc.) consult IT@Sam.
- B. All network cables connecting Lectern devices to floor box or other network entry point shall be labeled by the AV Installer on the cable at the entry point stating the equipment that it connects – such as DMPS200 – and on the device end the cable shall be labeled with the port label information.
- C. Lectern shall be supplied with power strips located inside the lectern and shall have thirty-five percent expansion capacity after all equipment, including owners supplied equipment is planned for.
- D. Lectern Logo: the owner may want a logo on the front of the lectern. For Spectrum lecterns approved artwork is on file, but the owner shall sign off on any artwork prior to production.
- E. The standard classroom lectern will include the following features:
- A desktop computer (provided by Owner) with an output of Display port plus. Computer shall be located on a contractor supplied shelf that can be accessed through a window of the locked podium doors. Contractor shall remove Plexiglas window at the time of the shelf installation.
 - A document camera that has an output of HDMI.
 - A smart touchscreen with stylus for desktop computer annotation that integrates with the owner provided computer. Touch Screen shall be at least 20 inch diagonal and be on a spectrum industries hydraulic loaded arm that mounts to the podium.
 - A cable cubby with 120 Volt AC power to support the laptop cables.
 - Cables for use with a laptop that retracts back into the podium to support a laptop computer. There shall be one cable for HDMI and one cable for VGA/Audio. Laptop cables shall be capable of extending at least 36 inches from cable cubby.
 - An external amplifier for 70 Volt distributed sound with power output providing 40% headroom when used in normal operating parameters.
 - A video and audio switching system that supports both analog and digital video sources interfaced into the SHSU local area network.
 - The ability to transmit Audio/Video information via CAT6 or fiber optic to display sources such as projectors and LED Displays.
 - o HDMI clips such as the Extron LockIt HDMI Lacing Bracket shall be used on all HDMI connections to provide strain relief and secure connection.

- A. A camera with ceiling view mount shall be provided in each classroom to allow for distance learning. Additional functionality shall include pan tilt zoom, powered by Cat6, RS232 Controller shall be provided by contractor.
- B. Two Yellow Cat6 data cables shall be pulled from lectern to each camera location. Consult IT@Sam for final camera placement.
- C. Provide a USB Video and Audio Capture device for use with the lectern desktop computer.
- D. Camera shall be mounted on the back wall or the ceiling so that the camera view of the podium and front of room is not obstructed. IT@Sam shall approve position of all cameras.

3.7.7 Sound System

- A. Sound system in the classroom shall be a 70 Volt distributed system with speakers placement determined based on an analysis of the height of the ceiling, the dispersion of the speakers crossing at 50 inches above the floor and a constant sound footprint over the seating area of the room with a sound pressure level of 50-60 dB that shall be attainable at 50% of total system gain.
- B. Speakers for classrooms and other venues.
- C. Amplifiers shall be sized for the number of channels of sound reinforcement required for the application or if sound zones are required.

3.7.8 ITV Room Sound System

- A. A ceiling pendant mounted microphone system coupled with voice tracking technology for camera switching and positioning.. In room systems with two or more cameras the camera position presets available shall be greater than ten with the final number available coordinated with IT@Sam.B. All microphones shall be connected to a DSP sound mixer and be programmed to minimize feedback and provide the sound reinforcement of the student speaking while turning off the closest overhead speaker. (Mix Minus). Unit shall be configured with expansion cards as needed and have at least two spare inputs and outputs.

3.7.9 AV Control System

- A. Audio Visual control systems of choice shall be manufactured by Crestron and be part of the Digital Media family of products. All control systems subject to IT@Sam approval prior to installation.
- B. Crestron Wired Touch Panel shall be used in all classrooms and conference rooms.
- C. Crestron Digital Media network connections of control systems and DM receivers and other devices shall use the private network feature of the DM line of equipment. When

designing and interfacing AV equipment for/to the SHSU network, only one MAC address is allowed on a single network port.

- D. Contractor shall be responsible for networking all projector and control system devices in consultation with SHSU to integrate all Crestron network devices into the SHSU local area network and program existing Crestron Fusion RoomView server including XPanel functionality of individual devices. Contractor shall provide demonstration of all new RoomView functionality and provide training.
- E. All Crestron Control System interconnect cabling shall comply with the Crestron specifications for cabling and fiber infrastructure.

3.7.10 Interactive Television Video Conferencing Rooms/ITV Classrooms

- A. When a videoconference capability has been specified for a classroom, meeting room or conference room it shall be designed with the following features and equipment.
- B. Video Conferencing System shall be capable of sending and receiving shared content.
- C. Shall be capable of hosting multi-point calls using the software option.
- D. Shall be capable of 1080p camera and Video + Content resolution. If required, the appropriate software key shall be installed.
- E. Shall be furnished with a Polycom Certified three year next day parts warranty, phone support as needed, provide test call sites that are available 24/7.

3.7.11 Conference Rooms

- A. Conference rooms shall be equipped with an LED display of 60 to 80 inches depending on the size of the room. The display shall have an ATSC/NTSC digital/Analog tuner, support for an HDMI and VGA/Audio. An RS232 port is also required.
- B. The display wall mount shall be from Chief Manufacturing and have tilt capability.
- C. If the room is equipped with a floor box this may be used to provide the AV connections to the conference table, but an AV plate may be an option in the room depending on the owner's furniture selection. Consult with IT@SAM for a decision on the type of AV cable interface.

3.8 Video Surveillance

- A. When required as part of the project, IP camera location shall consist of a data line terminated into a small surface mount box at the end of a 15 foot service loop. The loop shall be suspended above the ceiling and labeled for easy identification as well as being labeled on face plate and cable.
- B. The cameras shall be owner provided and owner installed.
- C. The camera mounts will be owner provided but installed by the contractor.
- D. IP camera line locations above the ceiling shall be marked with a removable sticker that is visible from the floor.

4 Part 4 – Outside Plant Guidelines

4.1 Pathways

- A. All duct banks shall be constructed of non-metallic schedule 40 conduit. All bends shall have a minimum radius of 36 inches. Manufactured bends shall be utilized.
- B. All ducts shall be a minimum of 30 inches below grade.
- C. All ducts in pertinent maintenance holes or those connecting to exterior locations, whether in use or empty, shall be sealed with duct plugs at each end.
- D. All ducts shall be able to hold 100 psi for 10 minutes
- E. All ducts shall have locatable tracertape installed and properly secured in them.
- F. All buildings shall have divergent pathways enter the building from separate maintenance holes.
- G. All ducts shall be inspected by IT@Sam prior to being back filled

4.2 Maintenance Holes

- A. Feeder ducts shall enter on the narrow walls of the maintenance holes. Ducts providing Service Laterals to buildings may enter on the long walls.
- B. Ducts shall not enter the maintenance hole in the cover chimney.
- C. Ducts shall enter maintenance holes perpendicular to the wall.
- D. Utilize installed TERMADUCTS for all conduits entering the maintenance hole wherever possible. Populate the lowest knock-outs available to allow for future expansion. Ducts shall be installed flush with the interior wall of the maintenance hole and shall not protrude into the interior space.
- F. Splay all ducts entering the narrow wall of Telecommunication Maintenance holes. Equally separate duct banks so that half the ducts will enter near the left corner of the narrow wall and the other half will enter near the right corner of the same narrow wall.

The splaying of the ducts should start at least 20' from the maintenance hole. Service lateral ducts are not required to be splayed.

- G. Where possible, organize ducts in such a manner as to provide "in-line" or "pull-through" cable installations.
- H. At all road and driveway crossings the duct bank shall be reinforced with engineer designed reinforcement.
- I. Provide Rigid Metal Conduit at the entrance to each building starting at 6' minimum outside the foundation wall to termination in the Equipment Room. Bond the conduits to the TMGB with a #6 AWG copper ground wire and bonding bushings.

4.2a Hand Holes

- A. Handholds shall have minimum dimensions of 30"x48"x36".
- B. Feeder ducts shall enter on the narrow walls of the Hand Hole. Ducts providing service laterals to buildings shall enter on the long side of the walls.
- C. Hand holes shall have 4" of large gravel covering the bottom.
- D. All hand holes shall have 2 bags of rainbow 4480 granular fire ant killer or equivalent placed in hand hole
- E. All ducts entering hand hole shall extend 6" into the hand hole and be plugged with an expanding duct plug.
- F. Any penetrations made to hand hole shall be sealed appropriately.

4.3 Splicing

- A. All splices of copper cable up to 300 pair shall be set up as a butt splice and housed in an appropriately sized stainless case. All stainless cases shall be pressure encapsulated. The splice itself shall be made utilizing a fold back technique. Splices up to 300 pair shall be made using 3m UY-2 filled connectors.
- B. All splices of copper cable over 300 pair shall be made using 710-sc1 connectors.
- C. There shall be no 3 way splicing, half-tapping, back tapping, or bridging of any type.
- D. The field side of any un-spliced copper cable shall be cleared using 3m UCC clearing caps.
- E. For all splices there shall be sufficient slack left in the maintenance hole to allow moving the splice out of the maintenance hole and onto a nearby work surface.
- F. For all splices there shall be a minimum of 15' of slack left in the maintenance hole. All slack shall be neatly coiled and affixed to the side of the hand hole in a manner which places the splice at the top of the maintenance hole.

- G. All splices shall have sufficient clearance between splice and maintenance hole lid.
- H. All splices shall have a metallic tag indicating cable count permanently attached to the cable near the splice case.
- I. Splice procedure and setup for copper cables larger than 300 pair shall be on a per project basis and will be determined by IT@Sam.
- J. All fiber splices will be set up as a butt splice and housed in an appropriate coyote splice enclosure.
- K. All fiber splices shall be fusion splices, and shall have a loss of less than .2 db.
- L. There shall be no mechanical connections of any kind in a fiber splice.
- M. Fiber splices shall be set up in such a way that there is sufficient slack stored appropriately in case to facilitate any future repairs or cable throws with minimal interruption of service.
- N. All splice cases shall be pressure tested to the manufacturer's specifications.
- O. All splices (copper and fiber) must be approved and inspected by IT@SAM prior to sealing.

4.4 Katsafe Emergency Telephones & Towers

- A. When required as part of the project, entrance phones must be approved by SHSU. A list of acceptable Talk-A-Phone models and housings depending on the installation are listed in the Specific Equipment area of this document.
- B. When required as part of the project, Emergency telephone shall be pole mounted Talk-A-Phone Tower and a single emergency phone or approved equal by IT@Sam.

4 Part 4 – Software, Licenses and Connectivity

- A. All software or systems must provide a minimum of LDAP authentication. Preferred authentication mechanisms include RADIUS and CAS.
- B. All technologies should support high availability and online backups. Virtualization is preferred.
- C. Software should not require Operating System-level administrative privileges to operate.
- D. Where applicable, software should have the capability to integrate with the central campus SIS/ERP to synchronize data in real-time. Additionally, IT@Sam should have the ability to extract data housed in the software to load into the campus data warehouse.
- E. All software licenses should include licenses for a minimum of a production and a development system.

- F. Software should support a mainstream, current database such as Oracle or Microsoft SQL Server. Software should provide high-availability using active-active technologies for failover and redundancy as well as supporting load balancing.
- G. Hosted Mass-email service:
 - a. SMTP service to be RFC5321 compliant.
 - b. Must support multiple recipients (SHSU defined value) per single message as blind carbon copies.
- H. Hosted Web Services:
 - a. Authentication and session (example = cookies) information must be encrypted.
 - b. User import/export must use encrypted protocol for transmission.